OCORA

Open CCS On-board Reference Architecture

Application Layer Interface Specification ETCS/ CCS – TCMS Interface – ETCS Functionality

Revision history

Version	Change Description	Initial	Date of change
2.00	Official version for OCORA Delta Release	BJ	30.06.2021

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References

Reader's note: please be aware that the numbers in square brackets, e.g. [1], as per the list of referenced documents below, is used throughout this document to indicate the references to external documents. Wherever a reference to a TSI-CCS SUBSET is used, the SUBSET is referenced directly (e.g. SUBSET-026). OCORA always reference to the latest available official version of the SUBSET, unless indicated differently.

[1] OCORA-BWS01-010 – Release Notes

[2] OCORA-BWS01-020 – Glossary

[3] OCORA-BWS01-030 – Question and Answers

[4] OCORA-BWS01-040 – Feedback Form

[5] OCORA-BWS03-010 – Introduction to OCORA

[6] OCORA-BWS04-010 – Problem Statements

[7] OCORA-BWS08-010 – Methodology

[8] OCORA-BWS08-020 – Tooling

[9] OCORA-TWS01-030 – System Architecture

[10] OCORA-TWS04-010 – Functional Vehicle Adapter – Introduction

[11] OCORA-TWS04-011 – Functional Vehicle Adapter – Requirements

[12] OCORA-TWS04-012 – Functional Vehicle Adapter – Standard Communication Interface Specification

[13] OCORA-TWS04-013 – Functional Vehicle Adapter – Design Guideline

[14] OCORA-TWS15-010 – Prototyping – ATO Demonstrator - Case Study - S2R-IP-5-ARCC

[15] OCORA-TWS15-030 – CCS-TCMS-Interface-ATO-Functionality

[16] ETCS System Requirements Specification – SUBSET-026 – UNISIG – Version 3.6.0

[17] ETCS Driver Machine Interface-DMI – ERA_ERTMS_015560

[18] Train Interface FFFIS – SUBSET-119 – UNISIG – Version 1.0.15

[19] Specific Transmission Module (FFFIS) – SUBSET-035 – UNISIG

[20] Safety Requirements for the Technical Interoperability of ETCS in Levels 1 & 2 – SUBSET-091 – UNISIG

[21] TSI LOC & PAS – 2011/291/EU & 2012/464/EU – European Commission

[22] HS TSI RST – 2008/232/EU & 2012/464/EU – European Commission

[23] Train Interface - FIS – SUBSET-34 – UNISIG – Version 3.1.0

[24] FFFIS TI - Safety Analysis – SUBSET-120 – UNISIG

[25] Failure Modes and Effects Analysis for TCMS – SUBSET-080 – UNISIG

[26] Glossary of Terms and Abbreviations – SUBSET-023 – UNISIG – Version 3.1.0

[27] Performance Requirements for STMs – SUBSET-059 – UNISIG

[28] Safety related communication in transmission systems – EN50159 – CENELEC

[29] Train Communication Network - General Architecture – IEC61375-1 TCN – International Electrotechnical Commission

[30] Train Communication Network - WTB – IEC61375-2-1 TCN – International Electrotechnical Commission

[31] Train Communication Network - Communication Profile – IEC61375-2-3 TCN – International Electrotechnical Commission

[32]   Train Communication Network - MVB – IEC61375-3-1 TCN – International Electrotechnical Commission

[33]   Train Communication Network - CAN – IEC61375-3-3 TCN – International Electrotechnical Commission

[34]   Train Communication Network - ECN – IEC61375-3-4 TCN – International Electrotechnical Commission

[35]   Railway Applications - Braking Systems of High Speed Trains – EN15734

[36]   Railway Applications - Braking Systems of Multiple Unit Trains – EN16185

[37]   Railway Applications - Brakes – EN14478

[38]   Serie Profinet – IEC61158 – International Electrotechnical Commission

[39]   Profisafe – IEC61784-2/-3-3 – International Electrotechnical Commission

[40]   CIP Networks Library from ODVA

[41]   Dimensioning and Engineering rules – SUBSET-040 – UNISIG

[42]   Assignment of values to ETCS variables – ERA_ERTMS_040001 – ERA

[43]   API Requirements for OpenETCS - Appendix – Application Layer v1.2 – openETCS Foundation

[44]   ATO over ETCS: ATO-OB / ETCS-OB FFFIS - Application Layer – SUBSET-130 – UNISIG – Version 3.1.0

Abbreviations and definitions

- For ATO abbreviations and definitions see SUBSET-125.
- For ETCS abbreviations and definitions see SUBSET-023 [26].
- Other definitions used in this document:

Term	Explanation
Electric Multiple Unit	Electric multiple unit, the vehicle with common brake control (separate control of dynamic and train air brake is not possible). DMUs, railbuses or electric rail cars are also included in this term.
Functional Vehicle Adaptor	The Functional Vehicle Adapter (FVA) is a piece of software deployed on the OCORA Computing Platform, or on the OCORA Gateway, or on the TCMS. Its job is to provide an OCORA unified and standardized interface towards the CCS applications and services for vehicle functions and vehicle information needed by the OCORA on-board applications and services. Although the TSI-CCS subsets 034, 119, and 139 are defining the interface to the TCMS system, vehicle from different suppliers and especially from different generations have still different interfaces implemented. This adapter allows to map, on a functional level, the commands sent, and the information received from a specific TCMS into the OCORA standard. In addition, the FVA can also be used to integrate vehicles without a TCMS moule that abstracts the specifities of the Subset-119 FFFIS for a given project. The functional module ensures that the API published to the ETCS remains unchanged independently with respect to the vehicle specific interface architecture
Future Railway Mobile Communication System	The Future Railway Mobile Communication System (FRMCS) is the future worldwide telecommunication system designed by UIC, in close cooperation with the different stakeholders from the rail sector, as the successor of GSM-R but also as a key enabler for rail transport digitalisation.
Mandatory Data	Vehicle data that are part of the minimal set of data required for safe and TSI conformal ETCS operation
Mandatory Functions	Vehicle functions that are part of the minimal set of functions required for safe and TSI conformal ETCS operation
Specific Vehicle Interface	Functional Module that ensures data exchange with the vehicle for data that can't be handled by the Subset-119 FFFIS and/ or the TCMS. This SVI is purely on a functional level, while the OCORA Gateway is on system level.
Train Control & Management System	Train Control & Management System (TCMS) is a train-borne distributed control system. It comprises computer devices and software, human-machine interfaces, digital and analogue input/ output (I/O) capability and the data networks to connect all these together in a secure and fault-resistant manner.
Train Interface Unit	ETCS Train Interface Unit

- Other abbreviations used in this document:

Term	Explanation
API	Application Programming Interface
CCS	Command, Control and Signalling
EMU	Electric Multiple Unit
FRMCS	Future Railway Mobile Communication System
FVA	Functional Vehicle Adaptor
SVI	Specific Vehicle Interface
TCMS	Train Control & Management System
TIU	Train Interface Unit

1 Introduction

1.1 Purpose of the document

The purpose of this document is to publish the prototype model developed by Deutsche Bahn AG. The prototype was implemented to foster and verify a transparent functional interface between the CCS on-board and the physical train unit (TCMS) for ETCS on-board functionality.

This document is addressed to experts in the CCS domain and to any other person, interested in the OCORA concepts for on-board CCS. The reader is invited to provide feedback to the OCORA collaboration and can, therefore, engage in shaping OCORA. Feedback to this document and to any other OCORA documentation can be given by using the feedback form [4].

If you are a railway undertaking, you may find useful information to compile tenders for OCORA compliant CCS building blocks, for tendering complete on-board CCS system, or also for on-board CCS replacements for functional upgrades or for life-cycle reasons.

If you are an organization interested in developing on-board CCS building blocks according to the OCORA standard, information provided in this document can be used as input for your development.

1.2 Applicability of the document

This document is considered informative and the findings are being integrated progressively in other OCORA documentation (e.g. in the "Functional Vehicle Adapter - Design Guideline" [13]). This document will be removed from the OCORA publications, once this process is completed.

1.3 Context of the document

This document is published as part of the OCORA Delta release, together with the documents listed in the release notes [1]. Before reading this document, it is recommended to read the Release Notes [1]. If you are interested in the context and the motivation that drives OCORA we recommend to read the Introduction to OCORA [5], and the Problem Statements [6]. The reader should also be aware of the Glossary [2] and the Question and Answers [3].

Furthermore, this document must be seen in the technical context of the Functional Vehicle Adapter. Therefore we invite to read the Functional Vehicle Adapter introduction document [10] which provides an overview of the concept, in [11] the Functional Vehicle Adapter requirements are defined while in [12] the interface to the different CCS on-board applications is developed.

1.4 Disclaimer

- This specification and the referred models are following state of the art engineering rules, best practice and proofed implementation work.

- Some possible improvements are already identified and the specification and models will be optimized and maintained by feedback from experts, implementation and application within the future release phases and process defined by OCORA as published on https://github.com/OCORA-Public/Publication.

- The technical solutions developed by OCORA must not favour any particular product or supplier. Technical solutions shall allow a variety of products and methods/process.

- This analysis is based on the actual OCORA knowledge base. Since UNISIG is preparing a revision of SUBSET-119 version 1.1.0, to be published at about the same time as this OCORA Delta release document, and important empirical information is expected to be generated by ongoing retrofit projects, a revision of this document will be prepared for a later OCORA release.

2 Integration specification for an ETCS on-board system

2.1 Challenge and solution

2.1.1.1 The ETCS- TCMS interface is subject to a standardization effort, resulting in the definition of Subset-119 [18] / 034 [23].

2.1.1.2 A large part of ETCS deployment will however affect existing vehicles with various TCMS and TCMS concepts and -architectures. Not all the aspects of ETCS integration on legacy vehicles are covered by Subset-119 [18] / 034 [23].

2.1.1.3 In the context of the OCORA effort, the current version of this document is a first iteration. It is following the concept of the OCORA FVA (see [10], Functional Vehicle Adapter - Introduction & Overview) as also described in the figure below. This document describes already the logical concept of the ETCS- specific part of the FVA, while retaining the data formats and coding of the existing Onboard Units and the existing TCMS. During the following iterations, the abstraction on the application layer will be developed further, so that at the end the OCORA ETCS on-board system needs no prior knowledge about the vehicle (apart some configuration parameters), all vehicle specifics are handled in the FVA or in the related systems that are described in this specification. In the current state of the design, which is aimed at the TSI 2022 baseline, this abstraction is already partially realized.
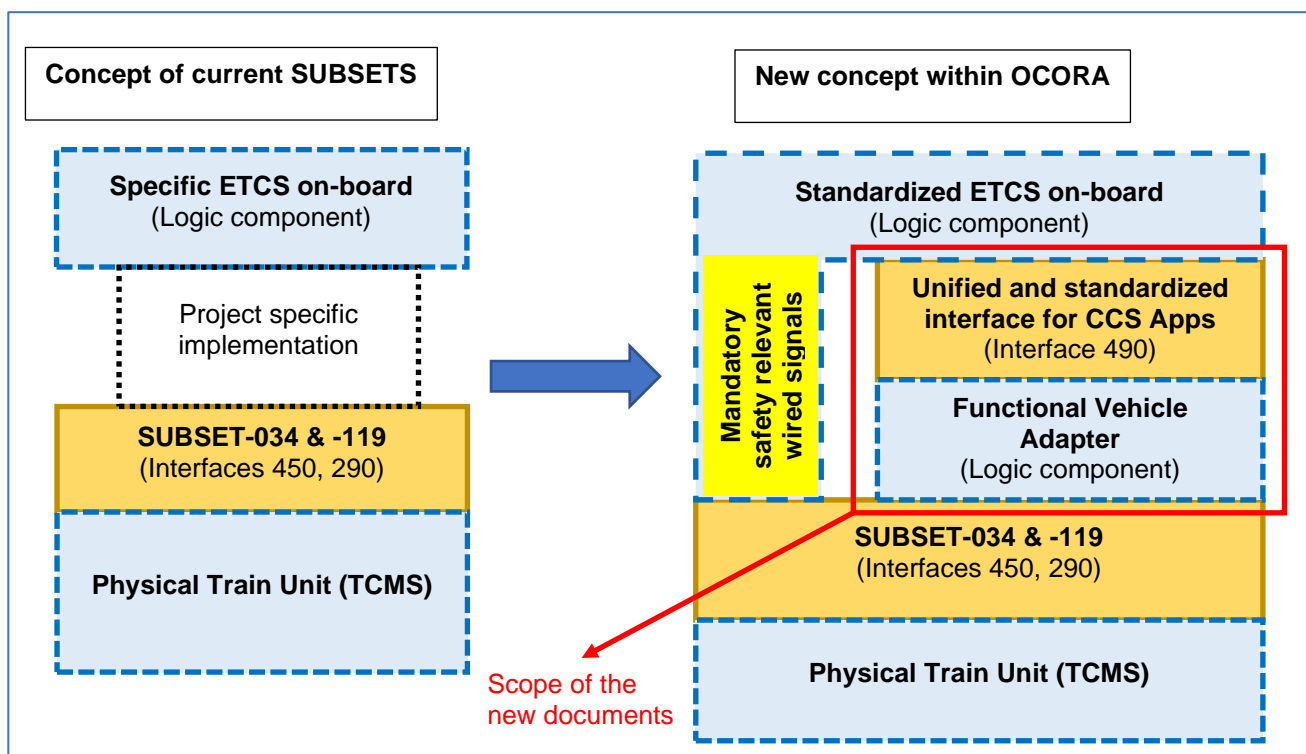
Figure 1: Scope of this document and relationship to OCORA architecture

2.1.1.4 Subset-119 [18] is does not deliver sufficient guidance for a harmonized implementation of the of the ETCS OBU/ TCMS interface to have a Plug & Play interface. It does not clearly separate the application and communication layer according to the OSI IEC 61375-3-4:2014 according to the OCORA requirements and deliver options for the application of lower layer communication

(MVB, CAN-Bus, Ethernet and Hard-Wire). This document is intended to give more precise guidance on various TCMS configurations and – situations.

2.1.1.5　　Subset-034 [23] is mandatory in the TSI and describing the high-level functions of the ETCS OBU/TCMS interface. It does not describe any form of communication or data set.

2.1.1.6　　This specification is to be understood in context of Subset-119 [18] / 034 [23]. It describes the following:

- standardized application interface for the ETCS OBU core application,
- additional data TCMS interface for data that is outside of Subset-119 [18] / 034 [23].
- Functional Vehicle Adapter including its logic.

2.1.1.7　　The current version of Subset-119 [18] is mainly focused on providing guidance for TCMS integration. It does not fully harmonise the application layer presented to the ETCS Core functionality specified within Subset 26 [16].

2.1.1.8　　This specification describes an application layer interface to be presented to the ETCS and/ or the OCORA VS (Vehicle Supervisor).

2.1.1.9　　The goal is to enable a standardized ETCS core application that can be used without modification on any vehicle. The specific vehicle adaptations shall be implemented in the Functional Vehicle Adapter specifically for each vehicle type/class. This specification is to be understood in the context of Subset-119 [18] / 034 [23]. It describes an application- layer interface which uses Subset-119 [18] for communication with the TCMS.

2.1.1.10　　This document describes the ETCS perspective on the TCMS interface.

2.1.1.11　　This document describes a standardized interface for the ETCS Onboard Unit. The ETCS core can access vehicle functions and vehicle data provided by the TCMS and by Specific Vehicle Interface adapted to a particular project.

2.1.1.12　　The interface is intended to be stable and independent of the architecture and features of the vehicle. However, a minimum set of functions and data needs to be provided by the combination of the TCMS and a Specific Vehicle Interface in order to enable the vehicle for ETCS functionality. These functions and data are marked as mandatory in this document.

2.1.1.13　　The standardized interface described in this document provides standardised access to the Subset-119 application layer [18]. Any project- specific configurations and settings are encapsulated by the Functional Vehicle Adaptor.

2.2　　Compliance with the TSI/UNISIG/S2R documents and Configuration Management

2.2.1.1　　This document is compliant with existing TSI/UNISIG/S2R subsets and updated once the subsets is changed. Feedback from the implementations will result in updating and enriching this document. In a future step, OCORA will propose a detailed configuration management to support technical compatibility.

1.1.1.1.1　　Compliance with subset 119 [18]: This work is mainly based and fully compliant on the Subset 119 Train Interface FFFIS [18], which remains untouched and stable. The subset 119 [18] is also describing options for the communication layer. This specification is fully compatible to the

2.3   Relation and reference of Model Based System Engineering to this work

2.3.1.1   OCORA has chosen a model-based system engineering methodology by application of formal methods to ensure the quality, completeness, maintainability and evolvability of all OCORA specifications. This document has to be understood as an outcome of the formal model described with the Scade tool based on a fully formal language called "Lustre". The Scade Code Generator is also certified on CENELEC 50128.The formal model will also be used for generating complete test cases as a part of a modular safety concept. It is important to test the correctness of the implementation. This modular safety concept will be developed in the next OCORA releases to support the certification and V&V process.

2.4   Implementation procedure

This specification is based on a systematic analysis of the following documents and standards:
- Subset-026 System Requirements Specification [16]
- API Requirements for OpenETCS – appendix - Application Layer v1.2 [43]
- Subset-034 FIS for the Train Interface [23]
- Subset-119 Train Interface FFFIS [18]
- Subset-130 [44]

The analysis has been carried as follows:
- All the documents were transferred to a documentation / requirements management system
- A requirements traceability matrix has been derived
- The gaps have been analysed
    - The main parameters of the analysis were consistency of data flows and a functional analysis.
- A formal model has been developed. The scope of the formal model encompasses:
    - The API Exposed to the ETCS
    - The Functional Vehicle Adaptor
    - The Application Layer of the Subset-119 FFFIS
    - The Specific Vehicle Interface
with respect to best proofed implementations, state of the art engineering experience and best practices.

The formal model enables static analysis for data coupling, consistency, completeness and determinism of the complete data flow between the ETCS and the vehicle. It is also possible to use the model as an executable specification and as a formal basis for the validation of project- specific implementations.

2.5 Relation to other documents

2.5.1.1 This document builds on the Train Interface FFFIS [18] and on the OCORA Train Interface Architecture Document [10].

2.5.1.2 The intention is to provide design guidance for integration of ETCS and the vehicle interface.

2.5.1.3 It extends the scope of Subset-119 [18] to non- standard and legacy vehicles and aims to provide a uniform interface for ETCS as far as possible.

2.5.1.4 This document is intended to be used in conjunction with Subset-119 [18]. In case of doubt, subset 119 [18] shall not be violated by this document. But feedback shall on this specification.

2.6 How to use this specification

2.6.1.1 This document provides an overview of the interface for accessing the functions and data provided through the TCMS. For this purpose, an overview of the architecture and the data (structured in packets, variables and hard- wired signals) is given.

2.6.1.2 The interface as described in this document provides standardised access to the Subset-119 FFFIS.

2.6.1.3 The definitive specification of the FVA is provided in the form of a model and the derived formal documentation. This document provides the basic information that is required as an entry point into the model.

2.6.1.4 No changes to the ETCS shall be required in order to connect it to a vehicle. For vehicles that have a fully Subset-119- compliant TCMS, the ETCS-TCMS standardised interface will work without changes to the default parameter set. In case of gaps (the ETCS does not support all data sent and received by the TCMS, and/ or the TCMS doesn't support the standard set of packets covered by Subset-119, it may be required to adapt the parameters of the FVA and/ or to add Specific Vehicle Interface functionality in the form of a Specific Vehicle Interface system or Specific Vehicle Interface software modules.

3   Architecture

3.1   Introduction

3.1.1   Context

The Remote API for ETCS- TCMS connection is to be seen in context of the emerging OCORA Architecture.
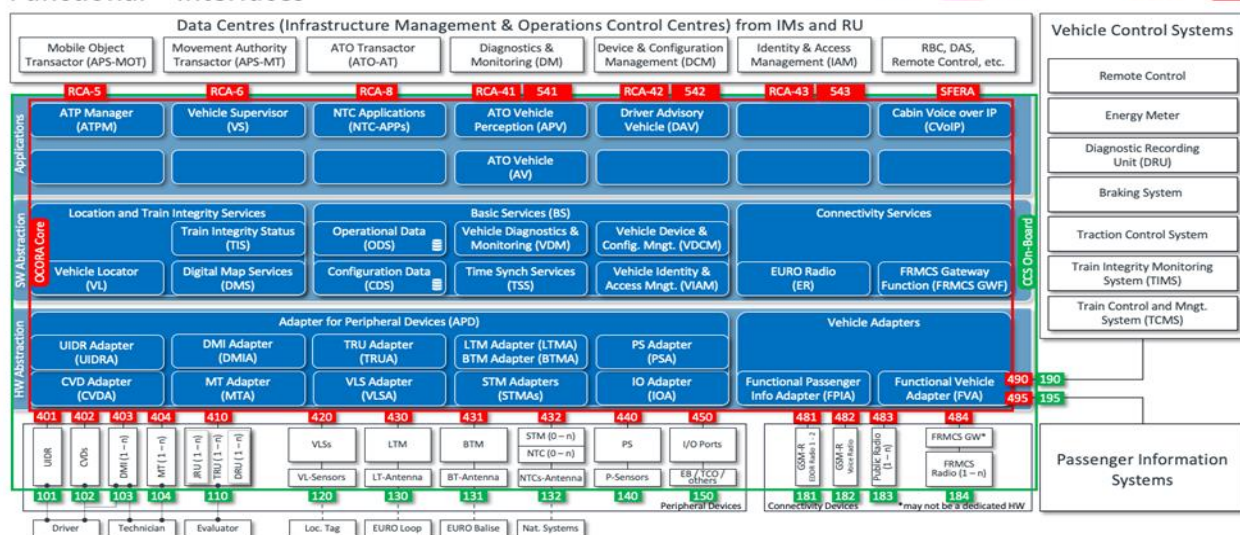
Figure 2: OCORA Overview OSI Layer 7

3.1.1.1   In OCORA architecture, the Vehicle Supervisor Application (VS) will access the vehicle functions through interfaces 490 (in order to access the Braking System and the Traction Control System, as well the Train Control and Management System). In addition, the hard-wired interfaces are connected via port 450.

3.1.1.2   In context of TSI 2022, the ETCS- TCMS Remote API is part of the CCS- TCMS interface.

3.1.1.3   The ETCS API provides an interface presented to the ETCS. In this release, we provide a packet-based interface following the packet structure as defined in[16].

3.1.1.4   The FVA takes the inputs from the ETCS API. Depending on the ParameterSet, the data may be forwarded to the Subset-119 FFFIS, forwarded to the Gateway or discarded.

3.1.1.5   The FVA takes the inputs from the Gateway and the FFFIS. Depending on the ParameterSet, the data will be forwarded to the ETCS.

3.1.1.6   The FVA provides a stateful interface to all participants.

3.1.1.7   The Train Interface FFFIS is using the term TIU, in line with the definition in the ETCS System Requirements Specification. We are using the term TCMS. This may include the usage of a TIU, depending on the vehicle architecture.

4   ETCS Core Interface

4.1   General

4.1.1   Interface

4.1.1.1   All data is transmitted between the ETCS and the application layer of the interface in the form of packets via data communication.

4.1.1.2   For the communication between the application layer of the interface, data are routed through the FVA. Depending on the architecture of the underlying vehicle, a combination of data communication and hard- wired connection is used.

4.1.1.2.1   Note: The Train Interface FFFIS [18] is using the term "serial communication". We are using the more general term "data communication" in order to also cover future CCS bus developments.

4.2   Hardwired Interface

4.2.1.1   Subset-119 FFFIS defines signals that must be transmitted through hardwired connection.

4.2.1.2   In case of a safe CCS bus that fulfils SIL4 requirements, the requirement for hard- wired signals shall not apply.

4.2.1.3   Signals that shall be transmitted by means of hardwired connection:

Name	Description	Remark	Direction/ Scope
B_OBU_Isolation_ETCS	Isolation of ETCS		ETCS to TCMS
B_EB_Command_ETCS	Emergency Brake Command	Also on bus	ETCS to TCMS
B_TCO_ETCS	Traction Cut- Off	Also on bus	ETCS to TCMS

Table 1: Subset-119 FFFIS mandatory hardwired connections

4.2.1.4   The ETCS Core Interface allows for configuration of the FFFIS interface architecture. Depending on the Emergency Brake Architecture and on the Service Brake Architecture of the specific FFFIS implementation, the data will be routed accordingly.

4.2.1.5   From FVA point of view, the set of hardwired interfaces is considered a set of binary in- and outputs.

4.2.1.6   The ETCS Core Interface and the VFA are logical units and can be implemented either as a part of the ETCS Onboard Unit, as an OCORA Application or as a separate system.

4.3   Quality of Service

4.3.1   Principles

The properties of packets are expressed as quality of service (QoS).

The following qualities can be expressed

4.3.1.1   Bandwidth
Bandwidth refers to the data rate that can be transmitted within 1s and is expressed in kBytes.

4.3.1.2   Delay
Maximum delay between availability of a set of data at the sender and its reception at the receiver.

4.3.1.2.1   Note: This is also applicable to publish/ subscribe architectures

4.3.1.3   Integrity
The reliability of data transport.

4.3.1.4   Safety
Safety Requirements

4.3.1.5   Persistence
The lifetime of the data.

4.3.1.5.1   Note: This approach is in preparation for future CCS systems

4.4   Packet Overview

4.4.1   Packets of the ETCS Core Interface

Packet ID	Description	QoS	Direction/ Scope
0	Safety Critical ETCS Commands to the TCMS		ETCS to TCMS
1	Track Conditions		ETCS to TCMS
2	Odometric Data		ETCS to TCMS

Packet ID	Description	QoS	Direction/ Scope
3	Mode and Level		ETCS to TCMS
4	Train Type		ETCS to TCMS
5	Track Condition Change of traction System		ETCS to TCMS
6	Location reference update		ETCS to TCMS
7	Miscellaneous sporadic commands		ETCS to TCMS
8	STMs states		ETCS to TCMS
9	Train Information		ETCS to TCMS
10	Doors control		ETCS to TCMS
11	Track description deletion information		ETCS to TCMS
12	Gradients information		ETCS to TCMS
20	Configuration information request		Config from ETCS
21	Configuration information		Config to ETCS
30	Inputs from train devices		TCMS to ETCS
31	Plain text message		TCMS to ETCS
32	Fixed text message		TCMS to ETCS
33	Brake models		TCMS to ETCS
34	Test and failure detection		TCMS to ETCS
35	STMs specific behavior		TCMS to ETCS
36	Diagnostic		TCMS to ETCS
37	Train Data		TCMS to ETCS

4.5   Packets of the ETCS Core Interface

4.5.1   Packets From ETCS to TCMS

4.5.1.1   The following packets are sent by the ETCS Core and processed by the FVA. They are being forwarded to the TCMS

4.5.1.2   Packet 0 : Cyclic Commands

Packet ID	**0**		
Description	**Safety Critical ETCS Commands to the TCMS**		
Sent	**At each computer cycle**		
Content	Variable	Length	Comment
	NID_PACKET	8	
	L_PACKET	13	
	EB_COMMAND_ETCS	1	
	SB_COMMAND_ETCS	2	
	TRACTION_CUT_OFF_ETCS	1	
	VIGIL_DISABLE_ORDER_ETCS	1	

4.5.1.3   Packet 1: Track Conditions

Packet ID	**1**		
Description	**The packet gives details concerning the track ahead**		
Sent	Sporadically (sending triggered by event)		
Content	*Variable*	*Length*	*Comment*
	NID_PACKET	8	
	L_PACKET	13	
	Q_SCALE	2	
	NID_C_ETCS	10	
	NID_BG_ETCS	14	
	Q_LINK_ETCS	1	

Packet ID	1		
	Q_TRACKINIT_ETCS	1	
	D_TRACKINIT_ETCS	16	Only if Q_TRACKINIT_ETCS = 1
	D_TRACKCOND_ETCS	16	Only if Q_TRACKINIT_ETCS = 0
	L_TRACKCOND_ETCS	16	Only if Q_TRACKINIT_ETCS = 0
	M_TRACKCOND_ETCS	4	Only if Q_TRACKINIT_ETCS = 0
	N_ITER	5	Only if Q_TRACKINIT_ETCS = 0
	D_TRACKCOND_ETCS(k)	16	
	L_TRACKCOND_ETCS(k)	16	
	M_TRACKCOND_ETCS(k)	4	

4.5.1.4   Packet 2: Odometric Data

Packet ID	2		
Description	**Periodic transmission of odometric data**		
Sent	At each computer cycle		
Content	Variable	Length	Comment
	NID_PACKET	8	
	L_PACKET	13	
	Q_LOCATION_PRESENT_ETCS	1	
	Q_SCALE	2	present only if Q_LOCATION_PRESENT_ETCS = 1
	NID_C_ETCS	10	idem
	NID_BG_ETCS	14	idem
	D_MAX_SAFE_FRONT_END_ETCS	16	idem
	D_MIN_SAFE_FRONT_END_ETCS	16	idem
	D_ESTIMATED_FRONT_END_ETCS	16	idem
	L_MIN_SAFE_REAR_END_ETCS	16	idem
	NO_MOTION_ETCS	2	
	Q_DIRTRAIN_ETCS	2	
	V_TRAIN_NOMINAL_ETCS	15	

4.5.1.5   Packet 3: Mode and Level

Packet ID	3		
Description	**Mode and Level information**		
Sent	At each computer cycle		
Content	Variable	Length	Comment
	NID_PACKET	8	
	L_PACKET	13	
	MODE_ETCS	4	
	M_LEVEL_ETCS	3	
	NID_NTC_ETCS	8	If M_LEVEL_ETCS = NTC

4.5.1.6   Packet 4: Train Type

Packet ID	4		
Description	**Information used by the TCMS smart board, to select appropriate models to be sent to the Core CPU**		
Sent	Sporadically (sending triggered by event)		
Content	Variable	Length	Comment
	NID_PACKET	8	
	L_PACKET	13	
	DECELERATION_CLASS_ID_ETCS	8	
	BRAKE_DELAY_CLASS_ID_ETCS	8	
	TRAIN_TYPE_ETCS	5	

4.5.1.7　Packet 5: Track Condition Change of traction power

Packet ID	5		
Description	**Information about change of the traction power system.**		
Sent	Sporadically (sending triggered by event)		
Content	Variable	Length	Comment
	NID_PACKET	8	
	L_PACKET	13	
	Q_SCALE	2	
	NID_C_ETCS	10	
	NID_BG_ETCS	14	
	Q_LINK_ETCS	1	
	Q_TRACKINIT_ETCS	1	
	D_TRACKINIT_ETCS	16	Only if Q_TRACKINIT_ETCS = 1
	D_TRACTION_MAX_ETCS	16	Only if Q_TRACKINIT_ETCS = 0
	D_TRACTION_MIN_ETCS	16	Only if Q_TRACKINIT_ETCS = 0
	M_VOLTAGE_ETCS	4	Type of traction, only if Q_TRACKINIT_ETCS = 0.
	NID_CTRACTION_ETCS	10	Only if M_VOLTAGE_ETCS <> 0

4.5.1.8　Packet 6: Location reference update

Packet ID	6		
Description	**Information about the new reference location balise group to be used by the TCMS**		
Sent	Sporadically (sending triggered by event)		
Content	Variable	Length	Comment
	NID_PACKET	8	
	L_PACKET	13	
	Q_SCALE	2	
	NID_C_OLD_ETCS	10	
	NID_BG_OLD_ETCS	14	
	NID_C_NEW_ETCS	10	
	NID_BG_NEW_ETCS	14	
	D_OLD_TO_NEW_LINKED_ESTI_ETCS	16	
	D_OLD_TO_NEW_LINKED_MIN_ETCS	16	
	D_OLD_TO_NEW_LINKED_MAX_ETCS	16	
	D_OLD_TO_NEW_NOT_LINKED_ESTI_ETCS	16	
	D_OLD_TO_NEW_NOT_LINKED_MIN_ETCS	16	
	D_OLD_TO_NEW_NOT_LINKED_MAX_ETCS	16	

4.5.1.9　Packet 7: Miscellaneous sporadic commands

Packet ID	7		
Description	**Miscellaneous sporadic commands**		
Sent	Sporadically (sending triggered by event)		
Content	Variable	Length	Comment
	NID_PACKET	8	
	L_PACKET	13	
	Q_SCALE	2	
	START_EB_TESTS_ON_DEMAND_ETCS	2	
	VIGIL_RESET_ORDER_ETCS	1	
	SB_MONITORING_STATE_ETCS	1	

4.5.1.9.1　Note: This packet can be extended to accommodate additional future variables

4.5.1.10   Packet 8: STMs states

Packet ID	8		
Description	States of STMs		
Sent	Sporadically (sending triggered by event)		
Content	Variable	Length	Comment
	NID_PACKET	8	
	L_PACKET	13	
	N_ITER	5	
	NID_NTC_ETCS	8	
	NID_STMSTATE_ETCS	4	
	NID_STMSTATEORDER_ETCS	4	

4.5.1.11   Packet 9: Train information

Packet ID	9		
Description	Train Information		
Sent	Sporadically (sending triggered by event)		
Content	Variable	Length	Comment
	NID_PACKET	8	
	L_PACKET	13	
	CORE_INHIBITION _ETCS	1	
	NID_OPERATIONAL_ETCS	32	
	RUNNING_DIRECTION_CHANGE_FOR_DATA_ETCS	1	
	Q_L_TRAIN_ETCS	1	
	L_TRAIN_ETCS	12	Only if Q_L_TRAIN = 1

4.5.1.12   Packet 10: Doors control

Packet ID	10		
Description	Information required by the TCMS from the Core CPU to manage a doors control section		
Sent	Sporadically (sending triggered by event)		
Content	Variable	Length	Comment
	NID_PACKET	8	
	L_PACKET	13	
	Q_SCALE	1	
	NID_C_ETCS	10	
	NID_BG_ETCS	14	
	Q_TRACKINIT_ETCS	1	
	D_TRACKINIT_ETCS	15	Only if Q_TRACKINIT_ETCS = 1
	D_TRACKCOND_ETCS	15	Only if Q_TRACKINIT_ETCS = 0, D_TRACKCOND and the following variables follow
	L_TRACKCOND_ETCS	15	
	M_PLATFORM_ETCS	4	
	Q_PLATFORM_ETCS	2	
	N_ITER	5	
	D_TRACKCOND_ETCS	15	
	L_TRACKCOND_ETCS	15	
	M_PLATFORM_ETCS	4	
	Q_PLATFORM_ETCS	2	

4.5.1.13   Packet 11: Track description deletion information

Packet ID	11
Description	Track description deletion info

Sent	Sporadically (sending triggered by event)		
Content	Variable	Length	Comment
	NID_PACKET	8	
	L_PACKET	13	
	Q_SCALE	1	
	NID_C_ETCS	32	
	NID_BG_ETCS	1	
	TRACK_DESC_DELETION_LOCATION_ESTI_ETCS	15	not used by the TCMS
	TRACK_DESC_DELETION_LOCATION_MIN_ETCS	15	
	TRACK_DESC_DELETION_LOCATION_MAX_ETCS	15	not used by the TCMS

4.5.1.13.1 Optional packet for global track description deletion

4.5.1.14   Packet 12: Gradients information

Packet ID	12		
Description	**Gradient information about track description.**		
Sent	Sporadically (sending triggered by event)		
Content	Variable	Length	Comment
	NID_PACKET	8	
	L_PACKET	13	
	Q_SCALE	1	
	NID_C_ETCS	32	
	NID_BG_ETCS	1	
	N_ITER	6	
	D_GRADIENT_ETCS(k)	16	
	G_A_ETCS(k)	9	
	Q_GDIR_ETCS(k)		

4.5.2   Configuration packets sent by the ETCS Core

4.5.2.1   The following packets are sent by the ETCS Core and processed by the FVA. They are not being forwarded to the TCMS

4.5.2.2   Packet 20: Configuration information request

Packet ID	20		
Description	**Configuration information request**		
Sent	Sporadically (sending triggered by event)		
Content	Variable	Length	Comment
	NID_PACKET	8	
	L_PACKET	13	
	CONFIG_DATA_REQUEST_ETCS	2	

4.5.3   Packets of the ETCS API: Configuration packets received by the ETCS Core

4.5.3.1   The following packets are being generated by the FVA and sent to the ETCS Core

4.5.3.2   Packet 21: Configuration information

Packet ID	21		
Description	**Configuration information**		
Sent	Sporadically (sending triggered by event)		
Content	Variable	Length	Comment
	NID_PACKET	8	

Packet ID	21		
	L_PACKET	13	
	P_SBI_ARCHITECTURE	2	
	P_EBI_ARCHITECTURE	2	
	P_VDO_ARCHITECTURE	2	
	P_ODO_ARCHITECTURE	2	
	P_ML_ARCHITECTURE	2	
	P_TTD_ARCHITECTURE	2	
	P_LRU_ARCHITECTURE	2	
	P_BT_ARCHITECTURE	2	
	P_DRCTRL_ARCHITECTURE	2	
	P_VRO_ARCHITECTURE	2	
	P_SBM_ARCHITECTURE	2	
	P_TI_ARCHITECTURE	2	
	P_GRD_ARCHITECTURE	2	
	P_TRDEL_ARCHITECTURE	2	
	P_STMS_ARCHITECTURE	2	
	P_TCCTP_ARCHITECTURE	2	
	P_TC_ARCHITECTURE	2	
	P_V_EB_STATE_TCMS	2	
	P_V_SB_STATE_TCMS	2	
	P_V_TRACTION_CUT_OFF_STATE_TCMS	2	
	P_V_ISOLATION_STATE_TCMS	2	
	P_V_SLEEPING_STATE_TCMS	2	
	P_V__TILTING_STATE_TCMS	2	
	P_V_DIRCONT_STATE_TCMS	2	
	P_V_DESKS_STATE_TCMS	2	
	P_V_INTEGRITY_STATE_TCMS	2	
	P_V_DRIVEREM_STATE_TCMS	2	
	P_V_VIGIL_ACTION_STATE_TCMS	2	
	P_V_VIGIL_DISABLE_STATE_TCMS	2	
	P_V_COLD_MOVE_STATE_TCMS	2	
	P_CIRCUIT_BREAKER_COHERENCY_TCMS_TCMS	2	
	P_PANTOGRAPH_COHERENCY_TCMS	2	
	P_V_COMMANDING_EB_TCMS	2	
	P_V_COMMANDING_SB_TCMS	2	
	P_V_TRACTION_STATUS_TCMS	2	
	P_V_EB_STATE_TCMS_FILTERED	2	
	P_V_SB_STATE_TCMS_FILTERED	2	
	P_V_TRACTION_CUT_OFF_STATE_TCMS_FILTERED	2	
	P_V_ISOLATION_STATE_TCMS_FILTERED	2	
	P_V_SLEEPING_STATE_TCMS_FILTERED	2	
	P_V__TILTING_STATE_TCMS_FILTERED	2	
	P_V_DIRCONT_STATE_TCMS_FILTERED	2	
	P_V_DESKS_STATE_TCMS_FILTERED	2	
	P_V_INTEGRITY_STATE_TCMS_FILTERED	2	
	P_V_DRIVEREM_STATE_TCMS_FILTERED	2	
	P_V_VIGIL_ACTION_STATE_TCMS_FILTERED	2	
	P_V_VIGIL_DISABLE_STATE_TCMS_FILTERED	2	
	P_V_COLD_MOVE_STATE_TCMS_FILTERED	2	

4.5.3.3   Some TCMS supply sensor data in raw and filtered quality. This gives the ETCS onboard the option to monitor the raw data directly and to apply its own analysis. Filtered data are smoothed and integrated over a certain period of time.

4.5.3.4   The _FILTERED variables are optional.

4.5.4   Packets from TCMS to ETCS

4.5.4.1   The following packets are sent from the FVA to the ETCS Core. They contain information received from the TCMS

4.5.4.2   Packet 30 : Inputs from train devices

Packet ID	30		
Description	**Gives the state of the train devices, received from the I/O board inputs or from the data interface.**		
Sent	Sporadically (sending triggered by event)		
Content	Variable	Length	Comment
	NID_PACKET	8	
	L_PACKET	13	
	V_EB_STATE_TCMS_FILTERED	2	
	V_SB_STATE_TCMS_FILTERED	2	
	V_TRACTION_CUT_OFF_STATE_TCMS_FILTERED	2	
	V_ISOLATION_STATE_TCMS_FILTERED	2	
	V_SLEEPING_STATE_TCMS_FILTERED	2	
	V__TILTING_STATE_TCMS_FILTERED	2	
	V_DIRCONT_STATE_TCMS_FILTERED	2	
	V_DESKS_STATE_TCMS_FILTERED	2	
	V_INTEGRITY_STATE_TCMS_FILTERED	2	
	V_DRIVEREM_STATE_TCMS_FILTERED	2	
	V_VIGIL_ACTION_STATE_TCMS_FILTERED	2	
	V_VIGIL_DISABLE_STATE_TCMS_FILTERED	2	
	V_COLD_MOVE_STATE_TCMS_FILTERED	2	
	V_EB_STATE_TCMS	2	
	V_SB_STATE_TCMS	2	
	V_TRACTION_CUT_OFF_STATE_TCMS	2	
	V_ISOLATION_STATE_TCMS	2	
	V_SLEEPING_STATE_TCMS	2	
	V__TILTING_STATE_TCMS	2	
	V_DIRCONT_STATE_TCMS	2	
	V_DESKS_STATE_TCMS	2	
	V_INTEGRITY_STATE_TCMS	2	
	V_DRIVEREM_STATE_TCMS	2	
	V_VIGIL_ACTION_STATE_TCMS	2	
	V_VIGIL_DISABLE_STATE_TCMS	2	
	V_COLD_MOVE_STATE_TCMS	2	
	CIRCUIT_BREAKER_COHERENCY_TCMS	2	
	PANTOGRAPH_COHERENCY_TCMS	2	
	V_COMMANDING_EB_TCMS	2	
	V_COMMANDING_SB_TCMS	2	
	V_TRACTION_STATUS_TCMS	2	

4.5.4.3   Packet 31: Plain text message

Packet ID	31
Description	**Plain text given by TCMS, to be displayed on the MMI by the Core CPU**

Packet ID	31		
Sent	Sporadically (sending triggered by event)		
Content	Variable	Length	Comment
	NID_PACKET	8	
	L_PACKET	13	
	Q_TEXTCLASS_TCMS	2	
	Q_TEXTDISPLAY_TCMS	1	
	L_TEXTDISPLAY_TCMS	15	End condition
	T_TEXTDISPLAY_TCMS	10	End condition
	Q_TEXTCONFIRM_TCMS	2	
	Q_CONFTEXTDISPLAY	1	
	L_TEXT_TCMS	5	
	X_TEXT_TCMS (L_TEXT_TCMS)	8	

4.5.4.4   Packet 32: Fixed text message

Packet ID	32		
Description	**Fixed text given by TCMS, to be displayed on the MMI by the Core CPU**		
Sent	Sporadically (sending triggered by event)		
Content	Variable	Length	Comment
	NID_PACKET	8	
	L_PACKET	13	
	Q_TEXTCLASS_TCMS	2	
	Q_TEXTDISPLAY_TCMS	1	
	L_TEXTDISPLAY_TCMS	15	End condition
	T_TEXTDISPLAY_TCMS	10	End condition
	Q_TEXTCONFIRM_TCMS	2	
	Q_CONFTEXTDISPLAY	1	
	Q_TEXT_TCMS	8	

4.5.4.5   Packet 33: Brake models

Packet ID	33		
Description	**Model of the emergency brake, traction, and service brake (if present), to be used by the Core CPU**		
Sent	Sporadically (sending triggered by event)		
Content	Variable	Length	Comment
	NID_PACKET	8	
	L_PACKET	13	
	Q_BRAKE_MODEL_TCMS	1	The following fields only if Q_BRAKE_MODEL = 1
	MODEL_BEGIN_BRAKE_TCMS	8	Part of EB model
	MODEL_FULL_BRAKE_TCMS	11	Part of EB model
	N_ITER	5	Part of EB model max. value: 5
	MODEL_SPEED_TCMS(k)	8	Part of EB model
	MODEL_DECELER_TCMS(k)	8	Part of EB model
	CUT_TRACT_DELAY_TCMS	8	Part of traction model
	TRAIN_MAX_ACC_TCMS	10	Part of traction model
	ACC_COEF_SB_UNUSED_TCMS	2	Part of traction model
	ACC_COEF_SB_USED_TCMS	2	Part of traction model
	Q_SB_MODEL_PRESENT_TCMS	1	Part of SB model
	MODEL_BEGIN_BRAKE_TCMS	8	Part of SB model
	MODEL_FULL_BRAKE_TCMS	11	Part of SB model
	N_ITER	5	Part of SB model max. value: 5
	MODEL_SPEED_TCMS(k)	8	Part of SB model

Packet ID	33		
	MODEL_DECELER_TCMS(k)	8	Part of SB model
	MIN_ROT_MASS_PERCENT_TCMS	8	Part of rot mass model
	NOM_ROT_MASS_PERCENT_TCMS	8	Part of rot mass model
	MAX_ROT_MASS_PERCENT_TCMS	8	Part of rot mass model
	T_W _TCMS	13	Part of driver delay
	T_P_TCMS	13	Part of driver delay
	T_I_P_TCMS	13	Part of driver delay
	T_RSMA_TCMS	13	Part of driver delay

4.5.4.6 Packet 34: Test and failure detection

Packet ID	34		
Description	**Result of EB tests on demand and safety failure detection**		
Sent	Sporadically (sending triggered by event)		
Content	**Variable**	**Length**	**Comment**
	NID_PACKET	8	
	L_PACKET	13	
	EB_TESTS_ON_DEMAND_RESULT_TCMS	3	
	SAFETYFAIL_DETECT_TCMS	2	

4.5.4.7 Packet 35: STMs specific behavior

Packet ID	35		
Description	**List of STMs identified by the TCMS as "having an inappropriate behavior" or "having a specific behavior after an inappropriate behavior"** **This packet is related to the management of the TI and BI units for STM interfaces.**		
Sent	Sporadically (sending triggered by event)		
Content	**Variable**	**Length**	**Comment**
	NID_PACKET	8	
	L_PACKET	13	
	N_ITER	5	
	NID_STM	8	
	NID_STMSPECIFICSTATE_ETCS	3	

4.5.4.8 Packet 36 Diagnostic

Packet ID	36		
Description	**The packet gives reason information about diagnostic: emergency and service braking.**		
Sent	Sporadically (sending triggered by event)		
Content	**Variable**	**Length**	**Comment**
	NID_PACKET	8	
	L_PACKET	13	
	N_ITER	5	
	MAINTENANCE_EVENT_ID_TCMS	8	

4.5.4.9 Packet 37: Train Data

Packet ID	37		
Description	**The packet gives information concerning train data.**		
Sent	Sporadically (sending triggered by event)		
Content	**Variable**	**Length**	**Comment**
	NID_PACKET	8	
	L_PACKET	13	
	Q_ NC_CDTRAIN_TCMS	1	

Packet ID	37		
	NC_CDTRAIN_TCMS	4	Only if Q_NC_CDTRAIN_TCMS = 1
	BRAKE_PERCENTAGE	8	
	Q_NC_TRAIN_TCMS	1	
	NC_TRAIN_TCMS	2	Only if Q_NC_TRAIN_TCMS = 1
	M_LOADINGGAUGE_TCMS	8	
	M_AXLELOADCAT_TCMS	7	
	NID_CTRACTION_TCMS	10	
	M_VOLTAGE_TCMS	4	
	M_AIRTIGHT_TCMS	2	
	CCPU_NTC_ISOLATED	1	
	Q_L_TRAIN_TCMS	1	
	L_TRAIN_TCMS	12	Only if Q_L_TRAIN = 1

4.6 Variables

4.6.1 List of variables

4.6.1.1 M_AIRTIGHT_TCMS

Name	M_AIRTIGHT_TCMS
Description	Train Fitted with Airtight System The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.61

4.6.1.2 A_TRAIN_NOMINAL_ETCS

Name	A_TRAIN_NOMINAL_ETCS		
Description	Nominal train acceleration		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 11 bits used	-10.24 [m/s2] -1024	10.23 [m/s2] 1023	0.01

4.6.1.3 M_AXLELOADCAT_TCMS

Name	M_AXLELOADCAT_TCMS
Description	Axle load category The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.62

4.6.1.4 BRAKE_DELAY_CLASS_ID_ETCS

Name	BRAKE_DELAY_CLASS_ID_ETCS		
Description	Brake delay class ID		
Type	Minimum Value	Maximum Value	Resolution/ Formula

Name	BRAKE_DELAY_CLASS_ID_ETCS		
Integer	0	255	1
8 bits used	0	255	

4.6.1.5 BRAKE_PERCENTAGE_ETCS

Name	BRAKE_PERCENTAGE_ETCS		
Description	Brake Percentage		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer	10%	250%	1%
8 bits used	10	250	

4.6.1.6 CONFIG_DATA_REQUEST_ETCS

Name	CONFIG_DATA_REQUEST_ETCS		
Description	ETCS Request to send configuration data set		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Bool			
1 bit			
Special/ Reserved Values			
	0	Do not request	
	1	Data request	

4.6.1.7 CORE_INHIBITION ETCS

Name	CORE_INHIBITION_ETCS		
Description	Core signal to inhibit pantograph optimization in powerless section and change of traction power		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Boolean			
1 bit			
Special/ Reserved Values			
	0	Do not inhibit	
	1	Inhibit	

4.6.1.8 D_OLD_TO_NEW_LINKED_ESTI_ETCS

Name	D_OLD_TO_NEW_LINKED_ESTI_ETCS
Description	Estimated distance between the old (the previous) reference balise group and the new reference balise group with information linked to the balise The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.22

4.6.1.9 D_OLD_TO_NEW_LINKED_MAX_ETCS

Name	D_OLD_TO_NEW_LINKED_MAX_ETCS
Description	Maximum distance maximum between the old (the previous) reference balise group and the new reference balise group with information linked to the balise. The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.22

4.6.1.10   D_OLD_TO_NEW_LINKED_MIN_ETCS

Name	D_OLD_TO_NEW_LINKED_MIN_ETCS
Description	Minimum distance between the old (the previous) reference balise group and the new reference balise group with information linked to the balise The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.22

4.6.1.11   D_OLD_TO_NEW_NOT_LINKED_ESTI_ETCS

Name	D_OLD_TO_NEW_NOT_LINKED_ESTI_ETCS
Description	Estimated distance between the old (the previous) reference balise group and the new reference balise group with information not linked to the balise The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.22

4.6.1.12   D_OLD_TO_NEW_NOT_LINKED_MAX_ETCS

Name	D_OLD_TO_NEW_NOT_LINKED_MAX_ETCS
Description	Maximum distance between the old (the previous) reference balise group and the new reference balise group with information not linked to the balise The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.22

4.6.1.13   D_OLD_TO_NEW_NOT_MIN_ESTI_ETCS

Name	D_OLD_TO_NEW_NOT_MIN_ESTI_ETCS
Description	Minimum distance between the old (the previous) reference balise group and the new reference balise group with information not linked to the balise The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.22

4.6.1.14   D_TRAIN_NOMINAL_ETCS

Name	D_TRAIN_NOMINAL_ETCS		
Description	Absolute distance moved		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer	-15000000.00 m	15000000.00 m	0.01 m
32 bits	-1500000000	1500000000	

4.6.1.15   DECELERATION_CLASS_ID_ETCS

Name	DECELERATION_CLASS_ID_ETCS		
Description	Deceleration class ID		
Type	Minimum Value	Maximum Value	Resolution/ Formula

| Integer

8 bits	0	255	1

4.6.1.16   EB_COMMAND_ETCS

Name	EB_COMMAND_ETCS		
Description	Emergency brake command		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Boolean

1 Bit | | | |
Special/ Reserved Values			
	0	Do not apply EB	
	1	Apply EB	

4.6.1.17   D_ESTIMATED_FRONT_END_ETCS

Name	D_ESTIMATED_FRONT_END_ETCS
Description	Absolute location of the estimated front end of the train.

The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.13 |

4.6.1.18   D_MAX_SAFE_FRONT_END_ETCS

Name	D_MAX_SAFE_FRONT_END_ETCS
Description	Absolute location of the maximum safe front end of the train

The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.13 |

4.6.1.19   D_MIN_SAFE_FRONT_END_ETCS

Name	D_MIN_SAFE_FRONT_END_ETCS
Description	Absolute location of the minimum safe front end of the train

The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.13 |

4.6.1.20   L_MIN_SAFE_REAR_END_ETCS

Name	L_MIN_SAFE_REAR_END_ETCS
Description	Absolute location of the minimum safe rear end of the train

The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.22 |

4.6.1.21   M_LEVEL_ETCS

Name	M_LEVEL_ETCS
Description	Current Operating Level

The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.65 |

4.6.1.22 M_LINEGAUGE_TCMS

Name	M_LINEGAUGE_TCMS
Description	Defining which loading gauge(s) are permitted on a line (refer to TSI INF) The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.67.1

4.6.1.23 Q_PLATFORM_ETCS

Name	Q_PLATFORM_ETCS
Description	Side(s) authorized to be opened inside the allowed area The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.126.2

4.6.1.24 MODE_ETCS

Name	MODE_ETCS
Description	ETCS Onboard operating mode The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.72

4.6.1.25 NID_BG_ETCS

Name	NID_BG_ETCS
Description	Identity number of a balise group or loop within the country or region defined by NID_C_ETCS The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.85 Values to be assigned according to [16] SUBSET-026 System Requirements Specification, 7.3.1.3

4.6.1.26 NID_BG_NEW_ETCS

Name	NID_BG_NEW_ETCS
Description	Identity number of the new balise group or loop within the country or region defined by NID_C_ETCS The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.85 Values to be assigned according to [16] SUBSET-026 System Requirements Specification, 7.3.1.3

4.6.1.27 NID_BG_OLD_ETCS

Name	NID_BG_OLD_ETCS
Description	Identity number of the old balise group or loop within the country or region defined by NID_C_ETCS

The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.85

Values to be assigned according to [16] SUBSET-026 System Requirements Specification, 7.3.1.3 |

4.6.1.28 NID_C_ETCS

Name	NID_C_ETCS
Description	Identity number of the country or region where the reference balise group is located.

Code used to identify the country or region in which the balise group is situated. These need not necessarily follow administrative or political boundaries.

The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.86

Values to be assigned according to [16] SUBSET-026 System Requirements Specification, 7.3.1.3 |

4.6.1.29 NID_C_NEW_ETCS

Name	NID_C_NEW_ETCS
Description	Identity number of the country or region where the new reference balise group is located.

Code used to identify the country or region in which the balise group is situated. These need not necessarily follow administrative or political boundaries.

The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.86

Values to be assigned according to [16] SUBSET-026 System Requirements Specification, 7.3.1.3 |

4.6.1.30 NID_C_OLD_ETCS

Name	NID_C_OLD_ETCS
Description	Identity number of the country or region where the old reference balise group is located.

Code used to identify the country or region in which the balise group is situated. These need not necessarily follow administrative or political boundaries.

The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.86

Values to be assigned according to [16] SUBSET-026 System Requirements Specification, 7.3.1.3 |

4.6.1.31 NID_OPERATIONAL_ETCS

Name	NID_OPERATIONAL_ETCS
Description	Train Running Number This is the operational train running number. The NID_OPERATIONAL consists of up to 8 digits which are entered left adjusted into the data field, the leftmost digit is the digit to be entered first. In case the NID_OPERATIONAL is shorter than 8 digits, the remaining space is to be filled with special character "F". The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.92

4.6.1.32 NO_MOTION_ETCS

Name	NO_MOTION_ETCS		
Description	Movement state of train Indicates if a movement of the train is detected or if a no motion state can be considered.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	Motion	
	1	No Motion	
	2	Unknown	
	3	Spare	

4.6.1.33 RUNNING_DIRECTION_CHANGE_FOR_DATA_ETCS

Name	RUNNING_DIRECTION_CHANGE_FOR_DATA_ETCS		
Description	This flag indicates if a modification of orientation has to be taken into account for the data supervision.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Boolean 1 bit			
Special/ Reserved Values	0	no running direction change for data supervision	
	1	a running direction change occurred at this cycle for data supervision	

4.6.1.34 SB_COMMAND_ETCS

Name	SB_COMMAND_ETCS		
Description	Service brake command		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bit			
Special/ Reserved Values	0	Do not apply SB	
	1	Apply SB	
	2	Apply SB not protected	
	3	Spare	

4.6.1.35 SB_MONITORING_STATE_ETCS

Name	SB_MONITORING_STATE_ETCS		
Description	State of SB monitoring		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Boolean 1 bit			
Special/ Reserved Values	0	NOT_RELEVANT (no monitoring running or running in order)	
	1	FAILED (monitoring running and failed)	

4.6.1.36 START_EB_TESTS_ON_DEMAND_ETCS

Name	START_EB_TESTS_ON_DEMAND_ETCS		
Description	Triggers the EB tests on demand		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	NO_TEST: do not start brake tests (but do not stop them if already started)	
	1	Start EB tests	
	2	Start SB tests	
	3	Spare	

4.6.1.37 TRACTION_CUT_OFF_ETCS

Name	TRACTION_CUT_OFF_ETCS		
Description	Traction cut off command		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Boolean 1 bit			
Special/ Reserved Values	0	False (=Release traction cut off command)	
	1	True (=Cut off traction)	

4.6.1.38 NC_TRAIN_TCMS

Name	NC_TRAIN_TCMS
Description	Other International Train Category. Other train category (different from Cant Deficiency) to which the train belongs. Thanks to NC_TRAIN, the train knows the "Other specific" SSP category it must consider. By receiving a list of static speed profile, thanks to NC_DIFF, the train can select the SSP it must obey. Each bit represents one category. A train can belong to various categories. The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.84

4.6.1.39   L_TRAIN

Name	**L_TRAIN**
Description	Train length deduced from validated train data. This is the absolute real length of the train. Q_L_TRAINbecomes „false" if the train data are not validated or not correct. The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.56

4.6.1.40   Q_L_TRAIN

Name	**Q_L_TRAIN**		
Description	Q_L_TRAIN becomes „false" if the train data are not validated or not correct.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Boolean 1 bit			
Special/ Reserved Values	0	Train length data unknown	
	1	Train length information valid	

4.6.1.41   Q_NC_CDTRAIN_TCMS

Name	**Q_NC_CDTRAIN_TCMS**		
Description	Q_NC_CDTRAIN_TCMS becomes „false" if the train data are not validated or not correct.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Boolean 1 bit			
Special/ Reserved Values	0	Cant deficiency data unknown	
	1	Cant deficiency information valid	

4.6.1.42   Q_NC_TRAIN_TCMS

Name	**Q_NC_TRAIN_TCMS**		
Description	Q_NC_TRAIN_TCMS becomes „false" if the train data are not validated or not correct.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Boolean 1 bit			
Special/ Reserved Values	0	Train category data unknown	
	1	Train category information valid	

4.6.1.43   Q_DIRTRAIN_ETCS

Name	**Q_DIRTRAIN_ETCS**
Description	Direction of train movement in relation to the LRBG orientation. The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.105

4.6.1.44   TRAIN_TYPE_ETCS

Name	**TRAIN_TYPE_ETCS**

Description	A train data set is selected among pre-configured train data sets input.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits	0	31	

4.6.1.45 V_TRAIN_NOMINAL_ETCS

Name	**V_TRAIN_NOMINAL_ETCS**
Description	Nominal train speed The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.172

4.6.1.46 VIGIL_DISABLE_ORDER_ETCS

Name	**VIGIL_DISABLE_ORDER_ETCS**		
Description	Order to disable the external driver vigilance device.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Boolean 1 bit			
Special/ Reserved Values	0	False (do not disable the device)	
	1	True (disable the device)	

4.6.1.47 VIGIL_RESET_ORDER_ETCS

Name	**VIGIL_RESET_ORDER_ETCS**		
Description	Order to reset the external driver vigilance device. When the driver touches the MMI, this can be considered as a vigilance action by the external driver vigilance device		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Boolean 1 Bit			
Special/ Reserved Values	0	False (do not reset)	
	1	True (reset)	

4.6.1.48 CIRCUIT_BREAKER_COHERENCY_TCMS

Name	**CIRCUIT_BREAKER_COHERENCY_TCMS**		
Description	Information from the sensor of the circuit breaker state		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 3 bit			
Special/ Reserved Values	0	CIRCUIT_BREAKER_CLOSED_OK	
	1	CIRCUIT_BREAKER_CLOSED_NOT_OK	
	2	CIRCUIT_BREAKER_OPEN_OK	
	3	CIRCUIT_BREAKER_OPEN_NOT_OK	
	4	FAIL_STATE	
	5	INFORMATION_NOT_AVAILABLE	

4.6.1.49 D_GRADIENT_ETCS

Name	D_GRADIENT_ETCS
Description	Incremental distance to next change of gradient. The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.7

4.6.1.50 D_TRACKCOND_ETCS

Name	D_TRACKCOND_ETCS
Description	Track condition distance The incremental distance to where the track conditions change. The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.33

4.6.1.51 D_TRACKINIT_ETCS

Name	D_TRACKINIT_ETCS
Description	Distance to start of empty profile Distance to where initial states of the related track description in the packet shall be resumed. The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.32

4.6.1.52 G_A_ETCS

Name	G_A_ETCS
Description	This is the absolute value of the engineered gradient between two defined locations. The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.37

4.6.1.53 TRACK_DESC_DELETION_LOCATION_ESTI_ETCS

Name	TRACK_DESC_DELETION_LOCATION_ESTI_ETCS
Description	Estimated distance to location from where all track descriptions shall be truncated Based on D_TRACKINIT The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.32

4.6.1.54 TRACK_DESC_DELETION_LOCATION_MAX_ETCS

Name	TRACK_DESC_DELETION_LOCATION_MAX_ETCS
Description	Maximum distance to location from where all track descriptions shall be truncated

	Based on D_TRACKINIT
	The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.32

4.6.1.55 TRACK_DESC_DELETION_LOCATION_MIN_ETCS

Name	TRACK_DESC_DELETION_LOCATION_MIN_ETCS
Description	Minimum distance to location from where all track descriptions shall be truncated
	Based on D_TRACKINIT
	The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.32

4.6.1.56 D_TRACTION_MAX_ETCS

Name	D_TRACTION_MAX_ETCS
Description	Distance to the start location of the track condition change of traction power
	Based on D_TRACTION
	The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.34

4.6.1.57 D_TRACTION_MIN_ETCS

Name	D_TRACTION_MIN_ETCS
Description	Distance to the end location of the track condition change of traction power.
	Based on D_TRACTION
	The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.34

4.6.1.58 L_PACKET

Name	L_PACKET
Description	L_PACKET indicates the length of the packet in bits, including all bits of the packet header
	The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.49

4.6.1.59 M_PLATFORM_ETCS

Name	M_PLATFORM_ETCS
Description	Nominal height of platform above rail level (refer to TSI infrastructure)
	The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.75.5

4.6.1.60 L_TRACKCOND_ETCS

Name	L_TRACKCOND_ETCS
Description	Length for which the defined track condition is valid The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.55

4.6.1.61 M_TRACKCOND_ETCS

Name	M_TRACKCOND_ETCS
Description	Type of track condition The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.77

4.6.1.62 M_VOLTAGE_ETCS

Name	M_VOLTAGE_ETCS
Description	Traction System voltage It indicates the voltage of the traction system installed on a specific line or respectively that can be used by an engine The identity of the traction system is given by M_VOLTAGE_ETCS and, if M_VOLTAGE_ETCS =/0, by the country identifier of the traction system (NID_CTRACTION_ETCS) The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.78

4.6.1.63 M_VOLTAGE_TCMS

Name	M_VOLTAGE_TCMS
Description	Traction System voltage It indicates the voltage of the traction system installed on a specific line or respectively that can be used by an engine The identity of the traction system is given by M_VOLTAGE_ETCS and, if M_VOLTAGE_ETCS =/0, by the country identifier of the traction system (NID_CTRACTION_ETCS) The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.78

4.6.1.64 Q_GDIR_ETCS

Name	Q_GDIR_ETCS
Description	Qualifier for gradient slope. The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.110

4.6.1.65 N_ITER

Name	N_ITER
Description	Number of iterations of a data set following this variable in a packet

	If N_ITER is 0 then no data set is following. Two nested levels of iterations can exist.
	The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.110

4.6.1.66 NC_CDTRAIN_TCMS

Name	NC_CDTRAIN_TCMS
Description	Cant Deficiency Train category to which the train belongs.
	Thanks to NC_CDTRAIN, the train knows the "Cant Deficiency" SSP it must obey. By receiving a list of static speed profile, thanks to NC_CDDIFF, the train can select the "Cant Deficiency" SSP best suiting its NC_CDTRAIN.
	A train belongs to one and only one category of Cant Deficiency.
	The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.82.2

4.6.1.67 NID_CTRACTION_ETCS

Name	NID_CTRACTION_ETCS
Description	Country identifier of the traction system
	It identifies the information, additional to M_VOLTAGE_ETCS, required to fully define the traction system.
	The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.86.1
	Values to be assigned according to [16] SUBSET-026 System Requirements Specification, 7.3.1.3

4.6.1.68 NID_CTRACTION_TCMS

Name	NID_CTRACTION_TCMS
Description	Country identifier of the traction system
	It identifies the information, additional to M_VOLTAGE_ETCS, required to fully define the traction system.
	The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.86.1
	Values to be assigned according to [16] SUBSET-026 System Requirements Specification, 7.3.1.3

4.6.1.69 NID_NTC_ETCS

Name	NID_NTC_ETCS
Description	STM identity
	One value of this variable represents the identity of an NTC reflecting each composition of national infrastructure.

Name	NID_NTC_ETCS		
	The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.98 Values to be assigned according to [16] SUBSET-026 System Requirements Specification, 7.3.1.3		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 8 bits	0	255	

4.6.1.70 NID_PACKET

Name	NID_PACKET
Description	Packet identifier This is used in the header for each packet, allowing the receiving equipment to identify the data that follows. The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.93

4.6.1.71 NID_STMSPECIFICSTATE_ETCS

Name	NID_STMSPECIFICSTATE_ETCS		
Description	Current specific behavior of a given STM. Indicates a specific state of a STM (disconnected, temporarily disconnected, again connected after temporary disconnection, STM not in correct mode)		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 3 bits			
Special/ Reserved Values	0	CONNECTED (after versions validation)	
	1	DISCONNECTED (at TCMS request if no validation of the versions included in STM packet 1 or at STM request)	
	2	TEMPORARILY_DISCONNECTED	
	3	CONNECTED_AGAIN (end of temporary disconnection)	
	4	FAILURE_REQUESTED (STM not in correct state, missing packet 15,...)	
	5-7	Spare	

4.6.1.72 NID_STMSTATE_ETCS

Name	NID_STMSTATE_ETCS		
Description	Actual STM state		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 4 bit			
Special/ Reserved Values	0	NO_ORDER	
	1	Reserved (mapped to PO for consistency)	
	2	Configuration (CO)	
	3	Data Entry (DE)	

Name	NID_STMSTATE_ETCS	
	4	Unconditional Cold Standby (U-CS)
	5	Conditional Cold Standby (C-CS)
	6	Hot Standby (HS)
	7	Data Available (DA)
	8	Failure (FA)
	9	Data Available_For_Test (DA_FOR_TEST)
	10	Spare
	11	Spare
	12	Spare
	13	Spare
	14	Spare
	15	Spare

4.6.1.73 NID_STMSTATEORDER_ETCS

Name	NID_STMSTATEORDER_ETCS		
Description	STM state ordered by the ERTMS/ETCS on-board		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 4 bits			
Special/ Reserved Values	0	NO_ORDER	
	1	Reserved (mapped to PO for consistency)	
	2	Configuration (CO)	
	3	Data Entry (DE)	
	4	Unconditional Cold Standby (U-CS)	
	5	Conditional Cold Standby (C-CS)	
	6	Hot Standby (HS)	
	7	Data Available (DA)	
	8	Failure (FA)	
	9	Data Available_For_Test (DA_FOR_TEST)	
	10	Spare	
	11	Spare	
	12	Spare	
	13	Spare	
	14	Spare	
	15	Spare	

4.6.1.74 PANTOGRAPH_COHERENCY_TCMS

Name	PANTOGRAPH_COHERENCY_TCMS		
Description	Coherency of the pantograph state according to currently expected state. Information computed only when pantograph status is relevant according to the track condition.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 3 bits			
Special/ Reserved Values	0	PANTO_UP_OK	
	1	PANTO_UP_NOT_OK	
	2	PANTO_DOWN_OK	
	3	PANTO_DOWN_NOT_OK	
	4	INFO_NOT_AVAILABLE	

4.6.1.75 Q_LINK_ETCS

Name	Q_LINK_ETCS

Description	Qualifier indicating if the track conditions defined in the packet 1 or 5 are linked to the balise or not
	The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.114

4.6.1.76 Q_LOCATION_PRESENT_ETCS

Name	Q_LOCATION_PRESENT_ETCS		
Description	Qualifier indicating if train location information is present in the packet or not		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Boolean 1 bit			
Special/ Reserved Values	0	Not present	
	1	Present	

4.6.1.77 Q_SB_MODEL_PRESENT_TCMS

Name	Q_SB_MODEL_PRESENT_TCMS		
Description	Qualifier for indicate if a SB model has been found or not		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Boolean 1 bit			
Special/ Reserved Values	0	Model is not found	
	1	Model is found	

Q_SCALE

Name	Q_SCALE
Description	Qualifier for the distance scale.
	Qualifier to indicate the scale used for describing all distances inside the packet that contains Q_SCALE. Exception is made for variable CCPU_LRBG_ABSOLUTE_LOC that is always in [m]
	The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.129

4.6.1.78 Q_SET_TARGET_SPEED_ETCS

Name	Q_SET_TARGET_SPEED_ETCS		
Description	Qualifier for presence of set target speed. Qualifier to tell if the packet contains the variable SET_TARGET_SPEED_ETCS or not		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Boolean 1 bit			
Special/ Reserved Values	0	variable SET_TARGET_SPEED_ETCS is NOT present in the packet	
	1	variable SET_TARGET_SPEED_ETCS is present in the packet	

4.6.1.79 Q_TRACKINIT_ETCS

Name	Q_TRACKINIT_ETCS
Description	Qualifier for resuming the initial states of the related track description of the packet. The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.141

4.6.1.80 ACC_COEF_SB_UNUSED_TCMS

Name	ACC_COEF_SB_UNUSED_TCMS		
Description	Acceleration coefficient when the service brake is not present or not available. Ponderation coefficient to be applied on maximum train acceleration when the service brake is not available.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer	0	1	0,01
7 bits	0	100	

4.6.1.81 ACC_COEF_SB_USED_TCMS

Name	ACC_COEF_SB_USED_TCMS		
Description	Acceleration coefficient when the service brake is available. Ponderation coefficient to be applied on maximum train acceleration acceleration when the service brake is available.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer	0	1	0,01
7 bits	0	100	

4.6.1.82 M_AXLELOADCAT_TCMS

Name	M_AXLELOADCAT_TCMS
Description	Axle load category The values allocated below correspond to a list of increasing axle load categories (i.e. B1 > HS17, B2 > B1, D2 > C4, ...etc) and it is used by the on-board equipment to compare its axle load category with the axle load category sent by trackside. For the underlying meaning of the axle load categories listed below (with the exception of HS17) refer to CR INF TSI. The category HS17 (axle load <= 17t) corresponds to a static load per axle only, as specified in HS RST TSI clause 4.2.3.2. The introduction of this artefact is necessary to ensure backward compatibility, without any negative performance impact, in case ASPs are used on lines operated with system version X = 1. The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.62

4.6.1.83 BRAKE_POSITION_TCMS

Name	BRAKE_POSITION_TCMS		
Description	Brake position value		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 3 bits			
Special/ Reserved Values	0	Passenger train in P	
	1	Freight train in P	
	2	Freight train in G	
	3	Unknown	
	4-7	Invalid	

4.6.1.84 CUT_TRACT_DELAY_TCMS

Name	CUT_TRACT_DELAY_TCMS		
Description	Delay to cut off traction Delay between the ordering of traction cut off and the effective cut off of the traction		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 8 bits	0 s 0	25,5 s 255	0,1 s

4.6.1.85 EB_TESTS_ON_DEMAND_RESULT_TCMS

Name	EB_TESTS_ON_DEMAND_RESULT_TCMS		
Description	EB tests on demand result		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 3 bits			
Special/ Reserved Values	0	EB tests on demand not OK on both EV (fatal error(s) has been detected during EB tests on demand)	
	1	EB tests on demand not OK on EV1 (fatal error(s) has been detected during EB tests on demand)	
	2	EB tests on demand not OK on EV2 (fatal error(s) has been detected during EB tests on demand)	
	3	EB tests on demand OK	
	4	EB tests on demand aborted	
	5	Irrelevant	
	6	Reserved	
	7	Reserved	

4.6.1.86 L_TEXT_TCMS

Name	L_TEXT_TCMS
Description	Length of text string. L_TEXT defines the length of a text string (L_TEXT * X_TEXT).

	The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.53

4.6.1.87   L_TEXTDISPLAY_TCMS

Name	**L_TEXTDISPLAY_TCMS**
Description	Length on which a text shall be displayed The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.54 The special value is defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.54 is not valid in this variable. See 4.6.1.87 L_TEXTDISPLAY_

4.6.1.88   Q_L_TEXTDISPLAY_TCMS

Name	**Q_L_TEXTDISPLAY_TCMS**		
Description	Qualifier for length on which a text shall be displayed		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Boolean 1 bit			
Special/ Reserved Values	0	The display of the text shall not be distance limited.	
	1	The display of the text shall be distance limited.	

4.6.1.89   Q_CONFTEXTDISPLAY_TCMS

Name	**Q_CONFTEXTDISPLAY_TCMS**
Description	Qualifier for text confirmation versus end of text display Gives the relationship between the event "driver acknowledgement" and the list of events "location", "time", "mode", "level" defining the end condition for text display The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.101.1

4.6.1.90   MAINTENANCE_EVENT_ID_TCMS

Name	**MAINTENANCE_EVENT_ID_TCMS**		
Description	Current specific reason of an emergency or service braking. Indicates a list of specific reason of a present braking		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 8 bits			
Special/ Reserved Values	0	Bowl EB Request	
	1	Reception_from_STM_Command_SB_Request	
	2	Reception_from_STM_Command_EB_Request	
	3	Bad Pneumatic Insertion_EB_Request	
	4	Protect_SB_by_EB_Request	
	5	EB_Failure_EB_Request	
	6	Use of Failed Port_SB_Request	
	7	Use of Failed Port_EB_Request (reserved)	
	8	Error Hamming on port_SB_Request	
	9	Error Hamming on port_EB_Request (reserved)	
	10	Monitoring result needs_SB_Request	

Name	MAINTENANCE_EVENT_ID_TCMS	
	11	Monitoring result needs_EB_Request
	12-255	Spare

4.6.1.91 MAX_ROT_MASS_PERCENT_TCMS

Name	MAX_ROT_MASS_PERCENT_TCMS		
Description	maximum rotating mass percentage maximum rotating mass of the train, expressed as a percentage of the total weight of the train		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 8 bit	0% 0	25,5 % 255	0,1 %

4.6.1.92 MIN_ROT_MASS_PERCENT_TCMS

Name	MIN_ROT_MASS_PERCENT_TCMS		
Description	minimum rotating mass percentage minimum rotating mass of the train, expressed as a percentage of the total weight of the train		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 8 bit	0 % 0	25,5 % 255	0,1 %

4.6.1.93 MODEL_BEGIN_BRAKE_TCMS

Name	MODEL_BEGIN_BRAKE_TCMS		
Description	Delay between ordering a brake application, and when brake begins to be applied (more than 0%)		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 8 bit	0 s 0	25,5 s 255	0,1 s

4.6.1.94 MODEL_DECELER_TCMS

Name	MODEL_DECELER_TCMS		
Description	Brake model deceleration point Coordinate on the Y axis (=train deceleration) of a point of the deceleration model		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 8 bit	0 m/s2 0	25,5 m/s2 255	0,1 m/s2

4.6.1.95 MODEL_FULL_BRAKE_TCMS

Name	MODEL_FULL_BRAKE_TCMS

Description	Delay between when the braking effort begins (>0%) and when the full braking effort is reached (100%)		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer	0 s	120, 0 s	0,1 s
11 bits	0	1200	

4.6.1.96 MODEL_SPEED_TCMS

Name	**MODEL_SPEED_TCMS**		
Description	Brake model speed point Coordinate on the X axis (=train speed) of a point of the deceleration model		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer	0 km/h	600 km/h	5 km/h
8 bit	0	120	

4.6.1.97 NOM_ROT_MASS_PERCENT_TCMS

Name	**NOM_ROT_MASS_PERCENT_TCMS**		
Description	nominal rotating mass of the train, expressed as a percentage of the total weight of the train		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer	0%	25,5 %	0,1 %
8 bit	0	255	

4.6.1.98 Q_BRAKE_MODEL_TCMS

Name	**Q_BRAKE_MODEL_TCMS**		
Description	This flag indicates if a brake model is contained in packet 33		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Boolean			
1 bit			
Special/ Reserved Values	0	no brake model available	
	1	Brake model available	

4.6.1.99 Q_TEXT_TCMS

Name	**Q_TEXT_TCMS**		
Description	Q_TEXT_TCMS is a pointer to select a fixed text message from the defined table. The language selected by the driver for the MMI shall be used additionally as a qualifier to choose the appropriate language table. This is not to me mixed with [16] SUBSET-026 System Requirements Specification, 7.5.1.136		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer			
8 bit			
Special/ Reserved Values	1	Emergency brake command error	
	3	Pneumatic insertion error	
	4	Service brake command error	
	5	Service brake release error	
	6	Traction cut off error	

Name	Q_TEXT_TCMS	
	105 ... 135	IO1_MONITORING_ERROR ... IO31_MONITORING_ERROR
	139	PANTO_ACTION_NOT_OK_FOR_TRACK_CONDITION
	140	CIRCUIT_BREAKER_ACTION_NOT_OK_FOR_TRACK_CONDITION
	141	TRACTION_CUT_OFF_ACTION_NOT_OK_FOR_TRACK_CONDITION

4.6.1.100 Q_TEXTCLASS_TCMS

Name	Q_TEXTCLASS_TCMS
Description	Q_TEXTCLASS specifies the class of the text message included in the same packet (either plain or fixed message) The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.137

4.6.1.101 Q_TEXTCONFIRM_TCMS

Name	Q_TEXTCONFIRM_TCMS
Description	Qualifies the need / reaction of text confirmation The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.138

4.6.1.102 Q_TEXTDISPLAY_TCMS

Name	Q_TEXTDISPLAY_TCMS
Description	Q_TEXTDISPLAY defines whether the start/end conditions for text message are to be combined or not The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.139

4.6.1.103 SAFETYFAIL_DETECT_TCMS

Name	SAFETYFAIL_DETECT_TCMS		
Description	Safety failure detected		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bit			
Special/ Reserved Values	0	False : no safety failure is detected	
	1	True: a safety failure(s) is(are) detected	
	2	Irrelevant: no diagnostic to be expected (diagnostic function is inhibited)	
	3	Spare	

4.6.1.104 T_I_P_TCMS

Name	T_I_P_TCMS		
Description	T_i_p parameter used by the ETCS in the braking curve calculation		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 13 bits	0 s 0	600 s 6000	0,1s

4.6.1.105 T_P_TCMS

Name	T_P_TCMS		
Description	T_p parameter used by the ETCS in the braking curve calculation		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer	0 s	600 s	0,1s
13 bits	0	6000	

4.6.1.106 T_RSMA_TCMS

Name	T_RSMA_TCMS		
Description	T_rsma parameter used by the ETCS in the braking curve calculation		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer	0 s	600 s	0,1s
13 bits	0	6000	

4.6.1.107 T_TEXTDISPLAY_TCMS

Name	T_TEXTDISPLAY_TCMS
Description	Time until when a text shall be displayed The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.152

4.6.1.108 Q_T_TEXTDISPLAY_TCMS

Name	Q_T_TEXTDISPLAY_TCMS		
Description	Determines if display of text is time- limited or not		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Boolean 1 bit			
Special/ Reserved Values	0	Display of text is not time- limited	
	1	Display of text is time- limited	

4.6.1.109 T_W _TCMS

Name	T_W _TCMS		
Description	T_w parameter used by the ETCS in the braking curve calculation		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer	0 s	600 s	0,1s
13 bits	0	6000	

4.6.1.110　TRAIN_MAX_ACC_TCMS

Name	TRAIN_MAX_ACC_TCMS		
Description	Maximum acceleration that the train is able to reach		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer	0 m/s^2	10,23 m/s^2	0,01 m/s^2
10 bits	0	1023	

4.6.1.111　TRAIN_TYPE_TCMS

Name	TRAIN_TYPE_TCMS		
Description	A train data set is selected among pre-configured train data sets input.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Boolean	0	31	1
5 bits	0	31	

4.6.1.112　X_TEXT_TCMS

Name	X_TEXT_TCMS		
Description	Text String Element Text strings are used to transmit plain text messages. Each element of a text string contains a single character encoded as ISO 8859-1, also known as Latin Alphabet #1. The format and coding are defined in [16] SUBSET-026 System Requirements Specification, 7.5.1.174		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer			
8 bit			

4.6.1.113　V_COLD_MOVE_STATE_TCMS

Name	V_COLD_MOVE_STATE_TCMS		
Description	Information from the sensor of train movement used when the onboard is powered off. Unfiltered, raw sensor value.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer			
2 bits			
Special/ Reserved Values	0	No movement	
	1	Detected movement	
	2	Fail_state (of the sensor)	
	3	Information_not_available	

4.6.1.114 V_COLD_MOVE_STATE_TCMS_FILTERED

Name	V_COLD_MOVE_STATE_TCMS_FILTERED		
Description	Information from the sensor of train movement used when the onboard is powered off. Validated sensor state.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	No movement	
	1	Detected movement	
	2	Fail_state (of the sensor)	
	3	Information_not_available	

4.6.1.115 V_COMMANDING_EB_TCMS

Name	V_COMMANDING_EB_TCMS		
Description	TCMS informs the Core that TCMS is commanding EB		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Boolean 1 bit			
Special/ Reserved Values	0	EB not applied	
	1	EB applied	

4.6.1.116 V_COMMANDING_SB_TCMS

Name	V_COMMANDING_SB_TCMS		
Description	TCMS informs the Core that TCMS is commanding SB		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Boolean 1 bit			
Special/ Reserved Values	0	EB not applied	
	1	EB applied	

4.6.1.117 V_DESKS_STATE_TCMS

Name	V_DESKS_STATE_TCMS		
Description	Information from the sensor of the desk(s) state Unfiltered, raw sensor value.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 3 bits			
Special/ Reserved Values	0	Desk_A_open_only	
	1	Desk_B_open_only	
	2	Desk_A_and_desk_B_open	
	3	No_desk_open	
	4	Spare	
	5	Spare	
	6	Fail_state (of the sensor)	
	7	Information_not_available	

4.6.1.118 V_DESKS_STATE_TCMS_FILTERED

Name	V_DESKS_STATE_TCMS_FILTERED		
Description	Information from the sensor of the desk(s) state Validated sensor state.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 3 bits			
Special/ Reserved Values	0	Desk_A_open_only	
	1	Desk_B_open_only	
	2	Desk_A_and_desk_B_open	
	3	No_desk_open	
	4	Spare	
	5	Spare	
	6	Fail_state (of the sensor)	
	7	Information_not_available	

4.6.1.119 V_DIRCONT_STATE_TCMS

Name	V_DIRCONT_STATE_TCMS		
Description	Information from the sensor of the direction controller state of the active cab Unfiltered, raw sensor value.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 3 bits			
Special/ Reserved Values	0	Neutral	
	1	Forward	
	2	Backward	
	3	Spare	
	4	Spare	
	5	Spare	
	6	Fail_state (of the sensor)	
	7	Information_not_available	

4.6.1.120 V_DIRCONT_STATE_TCMS_FILTERED

Name	V_DIRCONT_STATE_TCMS_FILTERED		
Description	Information from the sensor of the direction controller state of the active cab Validated sensor state.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 3 bits			
Special/ Reserved Values	0	Neutral	
	1	Forward	
	2	Backward	
	3	Spare	
	4	Spare	
	5	Spare	
	6	Fail_state (of the sensor)	
	7	Information_not_available	

4.6.1.121   V_DRIVEREM_STATE_TCMS

Name	V_DRIVEREM_STATE_TCMS		
Description	Information from the sensor of the driver emergency (=emergency button) Unfiltered, raw sensor value.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	Emergency_button_pushed	
	1	Emergency_button_released	
	2	Fail_state (of the sensor)	
	3	Information_not_available	

4.6.1.122   V_DRIVEREM_STATE_TCMS_FILTERED

Name	V_DRIVEREM_STATE_TCMS_FILTERED		
Description	Information from the sensor of the driver emergency (=emergency button) Validated sensor state.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	Emergency_button_pushed	
	1	Emergency_button_released	
	2	Fail_state (of the sensor)	
	3	Information_not_available	

4.6.1.123   V_EB_STATE_TCMS

Name	V_EB_STATE_TCMS		
Description	Information from the sensor of the emergency brake state Unfiltered, raw sensor value.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	EB_not_applied	
	1	EB_applied	
	2	Fail_state (of the sensor)	
	3	Information_not_available	

4.6.1.124   V_EB_STATE_TCMS_FILTERED

Name	V_EB_STATE_TCMS_FILTERED		
Description	Information from the sensor of the emergency brake state Validated sensor state.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	EB_not_applied	
	1	EB_applied	

	2	Fail_state (of the sensor)
	3	Information_not_available

4.6.1.125 V_INTEGRITY_STATE_TCMS

Name	V_INTEGRITY_STATE_TCMS		
Description	Information from the sensor of the train integrity state Unfiltered, raw sensor value.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	Train_integrity_not_OK	
	1	Train_integrity_OK	
	2	Fail_state (of the sensor)	
	3	Information_not_available	

4.6.1.126 V_INTEGRITY_STATE_TCMS_FILTERED

Name	V_INTEGRITY_STATE_TCMS_FILTERED		
Description	Information from the sensor of the train integrity state Validated sensor state.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	Train_integrity_not_OK	
	1	Train_integrity_OK	
	2	Fail_state (of the sensor)	
	3	Information_not_available	

4.6.1.127 V_ISOLATION_STATE_TCMS

Name	V_ISOLATION_STATE_TCMS		
Description	Information from the sensor of the isolation switch state Unfiltered, raw sensor value.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	Isolated	
	1	Not_isolated	
	2	Fail_state (of the sensor)	
	3	Information_not_available	

4.6.1.128 V_ISOLATION_STATE_TCMS_FILTERED

Name	V_ISOLATION_STATE_TCMS_FILTERED
Description	Information from the sensor of the isolation switch state

		Validated sensor state.		
Type	*Minimum Value*	*Maximum Value*	*Resolution/ Formula*	
Integer 2 bits				
Special/ Reserved Values	0	Isolated		
	1	Not_isolated		
	2	Fail_state (of the sensor)		
	3	Information_not_available		

4.6.1.129   V_SB_STATE_TCMS

Name	**V_SB_STATE_TCMS**		
Description	Information from the sensor of the service brake state Unfiltered, raw sensor value.		
Type	*Minimum Value*	*Maximum Value*	*Resolution/ Formula*
Integer 2 bits			
Special/ Reserved Values	0	SB_not_applied	
	1	SB_applied	
	2	Fail_state (of the sensor)	
	3	Information_not_available	

4.6.1.130   V_SB_STATE_TCMS_FILTERED

Name	**V_SB_STATE_TCMS_FILTERED**		
Description	Information from the sensor of the service brake state Validated sensor state.		
Type	*Minimum Value*	*Maximum Value*	*Resolution/ Formula*
Integer 2 bits			
Special/ Reserved Values	0	SB_not_applied	
	1	SB_applied	
	2	Fail_state (of the sensor)	
	3	Information_not_available	

4.6.1.131   V_SLEEPING_STATE_TCMS

Name	**V_SLEEPING_STATE_TCMS**		
Description	Information from the sensor of the remote-control connection Unfiltered, raw sensor value.		
Type	*Minimum Value*	*Maximum Value*	*Resolution/ Formula*
Integer 2 bits			
Special/ Reserved Values	0	Go to sleepinng	
	1	Do not go to sleeping	
	2	Fail_state (of the sensor)	
	3	Information_not_available	

4.6.1.132   V_SLEEPING_STATE_TCMS_FILTERED

Name	V_SLEEPING_STATE_TCMS_FILTERED		
Description	Information from the sensor of the remote-control connection Validated sensor state.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	Go to sleepinng	
	1	Do not go to sleeping	
	2	Fail_state (of the sensor)	
	3	Information_not_available	

4.6.1.133   V_TILTING_STATE_TCMS

Name	V_TILTING_STATE_TCMS		
Description	Information from the sensor of the tilting device state Unfiltered, raw sensor value.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	Tilting_system_is_active	
	1	Tilting_system_is_passive	
	2	Fail_state (of the sensor)	
	3	Information_not_available	

4.6.1.134   V_TILTING_STATE_TCMS_FILTERED

Name	V_TILTING_STATE_TCMS_FILTERED		
Description	Information from the sensor of the tilting device state Validated sensor state.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	Tilting_system_is_active	
	1	Tilting_system_is_passive	
	2	Fail_state (of the sensor)	
	3	Information_not_available	

4.6.1.135   V_TRACTION_CUT_OFF_STATE_TCMS

Name	V_TRACTION_CUT_OFF_STATE_TCMS		
Description	Information from the sensor of the traction cut off state Unfiltered, raw sensor value.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	Traction cut off is disabled	
	1	Traction cut off is enabled	
	2	Fail_state (of the sensor)	
	3	Information_not_available	

4.6.1.136   V_TRACTION_CUT_OFF_STATE_TCMS_FILTERED

Name	V_TRACTION_CUT_OFF_STATE_TCMS_FILTERED		
Description	Information from the sensor of the traction cut off state Validated sensor state.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	Traction cut off is disabled	
	1	Traction cut off is enabled	
	2	Fail_state (of the sensor)	
	3	Information_not_available	

4.6.1.137   V_TRACTION_STATUS_TCMS

Name	V_TRACTION_STATUS_TCMS		
Description			
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 3 bits			
Special/ Reserved Values	0	Null	
	1	Positive	
	2	Negative	
	3	Not_null	
	4	Fail_state	
	5	Information_not_available	
	6	Spare	
	7	Spare	

4.6.1.138   V_VIGIL_ACTION_STATE_TCMS

Name	V_VIGIL_ACTION_STATE_TCMS		
Description	Information from the sensor of the driver vigilance Unfiltered, raw sensor value.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	Driver_reaction	
	1	No_driver_reaction	
	2	Fail_state (of the sensor)	
	3	Information_not_available	

4.6.1.139   V_VIGIL_ACTION_STATE_TCMS_FILTERED

Name	V_VIGIL_ACTION_STATE_TCMS_FILTERED		
Description	Information from the sensor of the driver vigilance Validated sensor state.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer			

2 bits			
Special/ Reserved Values	0	Driver_reaction	
	1	No_driver_reaction	
	2	Fail_state (of the sensor)	
	3	Information_not_available	

4.6.1.140 V_VIGIL_DISABLE_STATE_TCMS

Name	**V_VIGIL_DISABLE_STATE_TCMS**		
Description	State of the external vigilance system Information from the sensor of the driver vigilance Unfiltered, raw sensor value.		
Type	*Minimum Value*	*Maximum Value*	*Resolution/ Formula*
Integer 2 bits			
Special/ Reserved Values	0	External vigilance system active	
	1	External vigilance system not active	
	2	Fail_state (of the sensor)	
	3	Information_not_available	

4.6.1.141 V_VIGIL_DISABLE_STATE_TCMS_FILTERED

Name	**V_VIGIL_DISABLE_STATE_TCMS_FILTERED**		
Description	State of the external vigilance system Information from the sensor of the driver vigilance Validated sensor state.		
Type	*Minimum Value*	*Maximum Value*	*Resolution/ Formula*
Integer 2 bits			
Special/ Reserved Values	0	External vigilance system active	
	1	External vigilance system not active	
	2	Fail_state (of the sensor)	
	3	Information_not_available	

5 Data exchanged between ETCS and TCMS outside the scope of Subset-119 (via Specific Vehicle Interface)

5.1 General

5.1.1.1 For project- specific solutions that diverge from a pure Subset-119- based architecture, it may be necessary to exchange data with the vehicle that are not defined in the standard Subset-119 telegrams and variables.

5.1.1.2   In the majority of the cases, the implementation would be done through a gateway unit, in most cases a programmable electronic system.

5.1.1.3   On the ETCS Core interface, these data are contained in the packets defined there. The follwing packets are intended for communication on the TCMS interface of the FVA.

5.2   Packets

5.2.1.1   The following packets are sent by the FVA to the TCMS. They contain information received from the ETCS on-board.

5.3   "Packet overview

Packet ID	Description	QoS	Direction/ Scope
2	Odometric Data		ETCS to TCMS
3	Mode and Level		ETCS to TCMS
4	Train Type		ETCS to TCMS
6	Location reference update		ETCS to TCMS
7	Miscellaneous sporadic commands		ETCS to TCMS
9	Train Information		ETCS to TCMS
11	Track description deletion information		ETCS to TCMS
12	Gradients information		ETCS to TCMS
40	Additional commands		ETCS_to_TCMS
30	Inputs from train devices		TCMS to ETCS
31	Plain text message		TCMS to ETCS
32	Fixed text message		TCMS to ETCS
33	Brake models		TCMS to ETCS
34	Test and failure detection		TCMS to ETCS
35	STMs specific behavior		TCMS to ETCS
36	Diagnostic		TCMS to ETCS
37	Additional Train Data		TCMS to ETCS

5.3.1   Packet List

5.3.1.1   Packet 0 : Cyclic Commands

Packet ID	0		
Description	**Safety Critical ETCS Commands to the TCMS**		
Sent	**At each computer cycle**		
Content	Variable	Length	Comment
	NID_PACKET	8	
	L_PACKET	13	
	TR_O_SBD_Cmd_ETCS	1	
	TR_O_ Vigil_Disable_Cmd_ETCS	1	
	TR_O_BT_Cmd_ETCS	2	
	TR_O_VRO_Cmd_ETCS	1	
	TR_O_SBM_State_ETCS	1	

5.4 Variables

5.4.1.1 TR_O_SBD_Cmd_ETCS

Name	TR_O_SBD_Cmd_ETCS		
Description	Direct Service Brake Command Optional Variable		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Boolean 1 bit			
Special/ Reserved Values	0	Direct brake not commanded	
	1	Direct brake commanded	

5.4.1.2 TR_O_ Vigil_Disable_Cmd_ETCS

Name	TR_O_ Vigil_Disable_Cmd_ETCS		
Description	Order to disable the external driver vigilance device Optional Variable		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Boolean 1 bit			
Special/ Reserved Values	0	False (do not disable the device)	
	1	True (disable the device)	

5.4.1.3 TR_O_BT_Cmd_ETCS

Name	TR_O_BT_Cmd_ETCS		
Description	Order to trigger brake tests Optional Variable		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Unsigned Integer 2 bit			
Special/ Reserved Values	0	NO_TEST: do not start brake tests (but do not stop them if already started)	
	1	Start EB tests	
	2	Start SB tests	
	3	Spare	

5.4.1.4 TR_O_VRO_Cmd_ETCS

Name	TR_O_VRO_Cmd_ETCS		
Description	Order to reset the external driver vigilance device. When the driver touches the MMI, this can be considered as a vigilance action by the external driver vigilance device		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Boolean 1 bit			
Special/ Reserved Values	0	False (do not reset)	
	1	True (reset)	

5.4.1.5 TR_O_SBM_State_ETCS

Name	TR_O_SBM_State_ETCS		
Description	State of SB monitoring		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Boolean 1 bit			
Special/ Reserved Values	0	NOT_RELEVANT (no monitoring running or running in order)	
	1	FAILED (monitoring running and failed)	

6 ETCS Functional Vehicle Adapter

6.1 Parameters

6.1.1.1 P_SBI_ARCHITECTURE

Parameter Name	P_SBI_ARCHITECTURE		
Description	Describes the architecture of the Service Brake Interface. This parameter is project specific and persistent.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	**SBI_standard: No direct brake interface**	
	1	SBI_extended: Direct brake interface via SVI	
	2	Spare	
	3	Spare	
Note: The default setting for this parameter is highlighted in **bold** letters.			

6.1.1.2 P_EBI_ARCHITECTURE

Parameter Name	P_EBI_ARCHITECTURE		
Description	Describes the architecture of the Emergency Brake Interface. This parameter is project specific and persistent. Architecture Solution 1 : add (§5.2.3.2.7 of Subset 119), Architecture Solution 2 : add (§5.2.3.2.8 of Subset 119), Architecture Solution 3 : add (§5.2.3.2.9 of Subset 119)		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	**EBI_4C_2L: Architecture Solution 1 with 4 NO contacts for 2 EB lines**	

	1	EBI_4C_2L: Architecture Solution 2 with 2 NO contacts for 2 EB lines
	2	EBI_1C_1S: Architecture Solution 3: One NO contact for one EB line and data interface
	3	Spare

Note: The default setting for this parameter is highlighted in **bold** letters.

6.1.1.3   P_VDO_ARCHITECTURE

Parameter Name	P_VDO_ARCHITECTURE		
Description	Describes the architecture of the Driver Vigilance Device Interface. This parameter is project specific and persistent. This parameter is used for routing of the information via hardwire or bus, depending on the FFFIS architecture		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	**VDO_none: ETCS cannot disable the driver vigilance device via this interface**	
	1	VDO_data: Connection via data interface	
	2	VDO_direct: Connection via direct wire	
	3	Spare	

Note: The default setting for this parameter is highlighted in **bold** letters.

6.1.1.4   P_ODO_ARCHITECTURE

Parameter Name	P_ODO_ARCHITECTURE		
Description	Determines, if Odometry data shall be transmitted to from the ETCS to the TCMS. This parameter is project specific and persistent. This parameter is used for routing of the information via hardwire or bus, depending on the FFFIS architecture		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	**ODO_not_present: Odometry data shall not be sent**	
	1	ODO_present: Odometry data shall be sent via data interface	
	2	Spare	
	3	Spare	

Note: The default setting for this parameter is highlighted in **bold** letters.

6.1.1.5   P_ML_ARCHITECTURE

Parameter Name	P_ML_ARCHITECTURE		
Description	Determines, if Mode and Level data shall be transmitted to from the ETCS to the TCMS. This parameter is project specific and persistent.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer			

Parameter Name	P_ML_ARCHITECTURE		
2 bits			
Special/ Reserved Values	0	**ML_not_present: Model/ Level data shall not be sent**	
	1	ML_present: Mode/ Level data shall be sent via data interface	
	2	Spare	
	3	Spare	
Note: The default setting for this parameter is highlighted in **bold** letters.			

6.1.1.6   P_TTD_ARCHITECTURE

Parameter Name	P_TTD_ARCHITECTURE		
Description	Determines, if train type data shall be transmitted to from the ETCS to the TCMS. This parameter is project specific and persistent.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	**TTD_not_present: Train type data shall not be sent**	
	1	TTD_present: Train type data data shall be sent via data interface	
	2	Spare	
	3	Spare	
Note: The default setting for this parameter is highlighted in **bold** letters.			

6.1.1.7   P_LRU_ARCHITECTURE

Parameter Name	P_LRU_ARCHITECTURE		
Description	Determines, if location reference update data shall be transmitted to from the ETCS to the TCMS. This parameter is project specific and persistent.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	**LRU_not_present: location reference update shall not be sent**	
	1	LRU_present: location reference update data shall be sent via data interface	
	2	Spare	
	3	Spare	
Note: The default setting for this parameter is highlighted in **bold** letters.			

6.1.1.8   P_BT_ARCHITECTURE

Parameter Name	P_BT_ARCHITECTURE		
Description	Determines, if brake tests can be initiated by the ETCS This parameter is project specific and persistent.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	**BT_not_present: no brake tests can be triggered by the ETCS**	

Parameter Name	P_BT_ARCHITECTURE	
	1	BT_present: brake tests can be triggered by the ETCS
	2	Spare
	3	Spare
Note: The default setting for this parameter is highlighted in **bold** letters.		

6.1.1.9 P_VRO_ARCHITECTURE

Parameter Name	P_VRO_ARCHITECTURE		
Description	Determines, if driver vigilance device can be reset by the ETCS This parameter is project specific and persistent.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	**VRO_not_present: driver vigilance device can not be reset by the ETCS**	
	1	VRO_present: driver vigilance device can be reset by the ETCS	
	2	Spare	
	3	Spare	

6.1.1.10 P_SBM_ARCHITECTURE

Parameter Name	P_SBM_ARCHITECTURE		
Description	Determines, if Service Brake Monitoring information is sent to the the TCMS This parameter is project specific and persistent.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	**SBM_not_present: Service Brake Monitoring Info not sent to TCMS**	
	1	SBM_present: Service Brake Monitoring Info sent to TCMS	
	2	Spare	
	3	Spare	
Note: The default setting for this parameter is highlighted in **bold** letters.			

6.1.1.11 P_TI_ARCHITECTURE

Parameter Name	P_TI_ARCHITECTURE		
Description	Determines, if train information shall be sent to the TCMS This parameter is project specific and persistent.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	**TI_not_present: Train Info not sent to TCMS**	
	1	TI_present: Train Info sent to TCMS	
	2	Spare	
	3	Spare	
Note: The default setting for this parameter is highlighted in **bold** letters.			

6.1.1.12　P_GRD_ARCHITECTURE

Parameter Name	P_GRD_ARCHITECTURE		
Description	Determines, if gradient information shall be sent to the TCMS This parameter is project specific and persistent.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	**GRD_not_present: Gradient Info not sent to TCMS**	
	1	GRD_present: Gradient Info sent to TCMS	
	2	Spare	
	3	Spare	
Note: The default setting for this parameter is highlighted in **bold** letters.			

6.1.1.13　P_TC_ARCHITECTURE

Parameter Name	P_TC_ARCHITECTURE		
Description	Determines, if Track Condition data shall be sent to the TCMS This parameter is project specific and persistent.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	**TC_not_present: Track Condition Data not sent to TCMS**	
	1	TC_present: Track Condition Data sent to TCMS	
	2	Spare	
	3	Spare	
Note: The default setting for this parameter is highlighted in **bold** letters.			

6.1.1.14　P_DRCTRL _ARCHITECTURE

Parameter Name	P_DRCTRL_ARCHITECTURE		
Description	Determines, if Door Control commands shall be sent to the TCMS This parameter is project specific and persistent.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	**DRCTRL_not_present: Door Control Commands not sent to TCMS**	
	1	DRCTRL_present: Door Control Commands sent to TCMS	
	2	Spare	
	3	Spare	
Note: The default setting for this parameter is highlighted in **bold** letters.			

6.1.1.15　P_STMS_ARCHITECTURE

Parameter Name	P_STMS_ARCHITECTURE		
Description	Determines, if STM State info shall be sent to the TCMS This parameter is project specific and persistent.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			

Special/ Reserved Values	0	**STMS_not_present: STM State info not sent to TCMS**
	1	STMS_present: STM State info sent to TCMS
	2	Spare
	3	Spare
Note: The default setting for this parameter is highlighted in **bold** letters.		

6.1.1.16   P_TCCTP_ARCHITECTURE

Parameter Name	P_TCCTP_ARCHITECTURE		
Description	Determines, if track condition change of traction power info shall be sent to the TCMS This parameter is project specific and persistent.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	**TCCTP_not_present: track condition change of traction power info not sent to TCMS**	
	1	TCCTP_present: track condition change of traction power info sent to TCMS	
	2	Spare	
	3	Spare	
Note: The default setting for this parameter is highlighted in **bold** letters.			

6.1.1.17   P_TRDEL _ARCHITECTURE

Parameter Name	P_TRDEL_ARCHITECTURE		
Description	Determines, if track description deletion info shall be sent to the TCMS This parameter is project specific and persistent.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	**TRDEL_not_present: Track description deletion Info not sent to TCMS**	
	1	TRDEL_present: Track description deletion Info sent to TCMS	
	2	Spare	
	3	Spare	
Note: The default setting for this parameter is highlighted in **bold** letters.			

6.1.1.18   P_V_DESKS_STATE_TCMS_FILTERED

Parameter Name	P_V_DESKS_STATE_TCMS_FILTERED		
Description	Information from the sensor of the desk(s) state. This parameter describes the configuration of the TCMS Interface. This parameter is project specific and persistent.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	DSK_S_F_not_present: No filtered desk(s) state available	
	1	**DSK_S_F_TCMS: Filtered desk(s) state available from TCMS data interface**	
	2	DSK_S_F_EXT: Filtered desk(s) state available from external interface	

Parameter Name	P_V_DESKS_STATE_TCMS_FILTERED	
	3	DSK_S_F_HW: Filtered desk(s) available from TCMS hardwired interface
Note: The default setting for this parameter is highlighted in **bold** letters.		

6.1.1.19 P_V_DIRCONT_STATE_TCMS

Parameter Name	P_V_DIRCONT_STATE_TCMS		
Description	Information from the sensor of the direction controller state of the active cab. This parameter describes the configuration of the TCMS Interface. This parameter is project specific and persistent.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	**DIR_S_not_present: No direction controller state available**	
	1	DIR_S_TCMS: Direction controller state available from TCMS data interface	
	2	DIR_S_EXT: Direction controller state available from external interface	
	3	DIR_S_HW: Direction controller state available from TCMS hardwired interface	
Note: The default setting for this parameter is highlighted in **bold** letters.			

6.1.1.20 P_V_DIRCONT_STATE_TCMS_FILTERED

Parameter Name	P_V_DIRCONT_STATE_TCMS_FILTERED		
Description	Information from the sensor of the direction controller state of the active cab. This parameter describes the configuration of the TCMS Interface. This parameter is project specific and persistent.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	DIR_S_F_not_present: No filtered direction controller state available	
	1	**DIR_S_F_TCMS: Filtered direction controller state available from TCMS data interface**	
	2	DIR_S_F_EXT: Filtered direction controller state available from external interface	
	3	DIR_S_F_HW: Filtered direction controller state available from TCMS hardwired interface	
Note: The default setting for this parameter is highlighted in **bold** letters.			

6.1.1.21 P_V_EB_STATE_TCMS

Parameter Name	P_V_EB_STATE_TCMS		
Description	Information from the sensor of the emergency brake state. This parameter describes the configuration of the TCMS Interface. This parameter is project specific and persistent.		
Type	Minimum Value	Maximum Value	Resolution/ Formula

Parameter Name	P_V_EB_STATE_TCMS		
Integer 2 bits			
Special/ Reserved Values	**0**	**EB_S_ not_present: No EB state available**	
	1	EB_S_ TCMS: EB state available from TCMS data interface	
	2	EB_S_ EXT: EB state available from external interface	
	3	EB_S_HW: EB state available from TCMS hardwired interface	
Note: The default setting for this parameter is highlighted in **bold** letters.			

6.1.1.22   P_V_EB_STATE_TCMS_FILTERED

Parameter Name	P_V_EB_STATE_TCMS_FILTERED		
Description	Information from the sensor of the emergency brake state This parameter describes the configuration of the TCMS Interface. This parameter is project specific and persistent.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	EB_S_F_not_present: No filtered EB state available	
	1	**EB_S_F_TCMS: Filtered EB state available from TCMS data interface**	
	2	EB_S_F_EXT: Filtered EB state available from external interface	
	3	EB_S_F_HW: Filtered EB state available from TCMS hardwired interface	

6.1.1.22.1 Either V_EB_STATE_TCMS_FILTERED or V_EB_STATE_TCMS must be available

6.1.1.23   P_V_ISOLATION_STATE_TCMS

Parameter Name	P_V_ISOLATION_STATE_TCMS		
Description	Information from the sensor of the isolation switch state. This parameter describes the configuration of the TCMS Interface. This parameter is project specific and persistent.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	**0**	**I_S_not_present: No isolation switch state available**	
	1	Spare	
	2	I_S_EXT: Isolation switch state available from external interface	
	3	Spare	
Note: The default setting for this parameter is highlighted in **bold** letters.			

6.1.1.24   P_V_ISOLATION_STATE_TCMS_FILTERED

Parameter Name	P_V_ISOLATION_STATE_TCMS_FILTERED		
Description	Information from the sensor of the isolation switch state. This parameter describes the configuration of the TCMS Interface. This parameter is project specific and persistent.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	**I_S_F_not_present: No filtered isolation switch state available**	
	1	Spare	
	2	I_S_F_EXT: Filtered isolation switch state available from external interface	
	3	Spare	
Note: The default setting for this parameter is highlighted in **bold** letters.			

6.1.1.24.1 Either V_ P_V_ISOLATION_STATE_FILTERED or P_V_ISOLATION_STATE must be available

6.1.1.25   P_V_SB_STATE_TCMS

Parameter Name	P_V_SB_STATE_TCMS		
Description	Information from the sensor of the service brake state. This parameter describes the configuration of the TCMS Interface. This parameter is project specific and persistent.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	**SB_S_ not_present: No SB state available**	
	1	SB_S_ TCMS: SB state available from TCMS data interface	
	2	SB_S_ EXT: SB state available from external interface	
	3	Spare	
Note: The default setting for this parameter is highlighted in **bold** letters.			

P_V_SB_STATE_TCMS_FILTERED

Parameter Name	P_V_SB_STATE_TCMS_FILTERED		
Description	Information from the sensor of the service brake state This parameter describes the configuration of the TCMS Interface. This parameter is project specific and persistent.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	SB_S_F_not_present: No filtered SB state available	
	1	**SB_S_F_TCMS: Filtered SB state available from TCMS**	
	2	SB_S_F_EXT: : Filtered SB state available from external interface	
	3	Spare	
Note: The default setting for this parameter is highlighted in **bold** letters.			

6.1.1.26 P_V_SLEEPING_STATE_TCMS

Parameter Name	P_V_SLEEPING_STATE_TCMS		
Description	Information from the sensor of the remote-control connection. This parameter describes the configuration of the TCMS Interface. This parameter is project specific and persistent.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	**SL_S_not_present: No remote-control connection state available**	
	1	SL_S_TCMS: Remote-control connection state available from TCMS data interface	
	2	SL_S_EXT: Remote-control connection state available from external interface	
	3	SL_S_HW: Remote-control connection state available from TCMS hardwired interface	
Note: The default setting for this parameter is highlighted in **bold** letters.			

6.1.1.27 P_V_SLEEPING_STATE_TCMS_FILTERED

Parameter Name	P_V_SLEEPING_STATE_TCMS_FILTERED		
Description	Information from the sensor of the remote-control connection. This parameter describes the configuration of the TCMS Interface. This parameter is project specific and persistent.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	SL_S_F_not_present: No filtered remote-control connection state available	
	1	**SL_S_F_TCMS: Filtered remote-control connection state available from TCMS data interface**	
	2	SL_S_F_EXT: Filtered remote-control connection state available from external interface	
	3	SL_S_F_HW: Filtered remote-control connection state available from TCMS hardwired interface	
Note: The default setting for this parameter is highlighted in **bold** letters.			

6.1.1.28 P_V__TILTING_STATE_TCMS

Parameter Name	P_V__TILTING_STATE_TCMS		
Description	Information from the sensor of the tilting device state. This parameter describes the configuration of the TCMS Interface. This parameter is project specific and persistent.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	**0**	**TLT_S_not_present: No tilting device state available**	

	1	TLT_S_TCMS: Filtered tilting device state available from TCMS data interface
	2	TLT_S_EXT: Filtered tilting device state available from external interface
	3	TLT_S_HW: Filtered tilting device state available from TCMS hardwired interface
Note: The default setting for this parameter is highlighted in **bold** letters.		

6.1.1.29   P_V__TILTING_STATE_TCMS_FILTERED

Parameter Name	P_V__TILTING_STATE_TCMS_FILTERED		
Description	Information from the sensor of the tilting device state. This parameter describes the configuration of the TCMS Interface. This parameter is project specific and persistent		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	TLT_S_F_not_present: No filtered tilting device state available	
	1	**TLT_S_F_TCMS: Filtered tilting device state available from TCMS data interface**	
	2	TLT_S_F_EXT: Filtered tilting device state available from external interface	
	3	TLT_S_F_HW: Filtered tilting device state available from TCMS hardwired interface	
Note: The default setting for this parameter is highlighted in **bold** letters.			

6.1.1.30   P_V_TRACTION_CUT_OFF_STATE_TCMS

Parameter Name	P_V_TRACTION_CUT_OFF_STATE_TCMS		
Description	Information from the sensor of the traction cut off state. This parameter describes the configuration of the TCMS Interface. This parameter is project specific and persistent.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	**0**	**TCO_S_not_present: No traction cut off state available**	
	1	Spare	
	2	TCO_S_EXT: Traction cut off state available from external interface	
	3	Spare	
Note: The default setting for this parameter is highlighted in **bold** letters.			

6.1.1.31   P_V_TRACTION_CUT_OFF_STATE_TCMS_FILTERED

Parameter Name	P_V_TRACTION_CUT_OFF_STATE_TCMS_FILTERED		
Description	Information from the sensor of the traction cut off state. This parameter describes the configuration of the TCMS Interface. This parameter is project specific and persistent.		
Type	Minimum Value	Maximum Value	Resolution/ Formula

Integer			
2 bits			
Special/ Reserved Values	0	**TCO_S_F_not_present: No filtered traction cut off state available**	
	1	Spare	
	2	TCO_S_F_EXT: Filtered traction cut off state available from external interface	
	3	Spare	
Note: The default setting for this parameter is highlighted in **bold** letters.			

6.1.1.31.1 Either V_ P_V_TRACTION_CUT_OFF_STATE_FILTERED or P_V_TRACTION_CUT_OFF_STATE must be available

6.1.1.32 P_V_INTEGRITY_STATE_TCMS_FILTERED

Parameter Name	P_V_INTEGRITY_STATE_TCMS_FILTERED		
Description	Information from the sensor of the train integrity state. This parameter describes the configuration of the TCMS Interface. This parameter is project specific and persistent.		
Type	*Minimum Value*	*Maximum Value*	*Resolution/ Formula*
Integer 2 bits			
Special/ Reserved Values	0	**TINT_S_F_not_present: No filtered train integrity state available**	
	1	1 TINT_S_F_TIU: Filtered desk(s) state available from TIU data interfac	
	2	TINT_S_F_EXT: Filtered train integrity state available from external interface	
	3	3 TINT_S_F_HW: Filtered desk(s) available from TIU hardwired interface	
Note: The default setting for this parameter is highlighted in **bold** letters.			

6.1.1.33 P_V_DRIVEREM_STATE_TCMS_FILTERED

Parameter Name	P_V_DRIVEREM_STATE_TCMS_FILTERED		
Description	Information from the sensor of the driver emergency (=emergency button). This parameter describes the configuration of the TCMS Interface. This parameter is project specific and persistent.		
Type	*Minimum Value*	*Maximum Value*	*Resolution/ Formula*
Integer 2 bits			
Special/ Reserved Values	0	**DEM_S_F_not_present: No filtered sensor of the driver emergency state available**	
	1	Spare	
	2	DEM_S_F_EXT: Filtered sensor of the driver emergency state available from external interface	
	3	Spare	
Note: The default setting for this parameter is highlighted in **bold** letters.			

6.1.1.34 P_V_VIGIL_ACTION_STATE_TCMS_FILTERED

Parameter Name	P_V_VIGIL_ACTION_STATE_TCMS_FILTERED		
Description	Information from the sensor of the driver vigilance. This parameter describes the configuration of the TCMS Interface. This parameter is project specific and persistent.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	**VA_S_F_not_present: No filtered sensor of the driver vigilance state available**	
	1	Spare	
	2	VA_S_F_EXT: Filtered sensor of the driver vigilance state available from external interface	
	3	Spare	
Note: The default setting for this parameter is highlighted in **bold** letters.			

6.1.1.35 P_V_VIGIL_DISABLE_STATE_TCMS_FILTERED

Parameter Name	P_V_VIGIL_DISABLE_STATE_TCMS_FILTERED		
Description	State of the external vigilance system. This parameter describes the configuration of the TCMS Interface.. This parameter is project specific and persistent.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	**VDS_S_F_not_present: No filtered external vigilance system disable state available**	
	1	Spare	
	2	VDS_S_F_EXT: Filtered external vigilance system disable state available from external interface	
	3	Spare	
Note: The default setting for this parameter is highlighted in **bold** letters.			

6.1.1.36 P_V_COLD_MOVE_STATE_TCMS_FILTERED

Parameter Name	P_V_COLD_MOVE_STATE_TCMS_FILTERED		
Description	Information from the sensor of train movement used when the onboard is powered off. This parameter describes the configuration of the TCMS Interface. This parameter is project specific and persistent.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	**CM_S_F_not_present: No filtered sensor of train movement used when the onboard is powered off state available**	
	1	Spare	
	2	CM_S_F_EXT: Filtered sensor of train movement used when the onboard is powered off state available from external interface	
	3	Spare	
Note: The default setting for this parameter is highlighted in **bold** letters.			

6.1.1.37   P_V_DESKS_STATE_TCMS

Parameter Name	P_V_DESKS_STATE_TCMS		
Description	Information from the sensor of the desk(s) state. This parameter describes the configuration of the TCMS Interface. This parameter is project specific and persistent.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	**0**	**DSK_S_not_present: No desk(s) state available**	
	1	DSK_S_TCMS: Desk(s) state available from TCMS data interface	
	2	DSK_S_EXT: Desk(s) state available from external interface	
	3	DSK_S_HW: Desk(s) state available from TCMS hardwired interface	
Note: The default setting for this parameter is highlighted in **bold** letters.			

6.1.1.38   P_V_INTEGRITY_STATE_TCMS

Parameter Name	P_V_INTEGRITY_STATE_TCMS		
Description	Information from the sensor of the train integrity state. This parameter describes the configuration of the TCMS Interface. This parameter is project specific and persistent.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	**0**	**TINT_S_not_present: No train integrity state available**	
	1	Spare	
	2	TINT_S_EXT: Train integrity state available from external interface	
	3	Spare	
Note: The default setting for this parameter is highlighted in **bold** letters.			

6.1.1.39   P_V_DRIVEREM_STATE_TCMS

Parameter Name	P_V_DRIVEREM_STATE_TCMS		
Description	Information from the sensor of the driver emergency (=emergency button). This parameter describes the configuration of the TCMS Interface. This parameter is project specific and persistent.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	**0**	**DEM_S_not_present: No sensor of the driver emergency state available**	
	1	Spare	

	2	DEM_S_EXT: Sensor of the driver emergency state available from external interface
	3	Spare

Note: The default setting for this parameter is highlighted in **bold** letters.

P_V_VIGIL_ACTION_STATE_TCMS

Parameter Name	P_V_VIGIL_ACTION_STATE_TCMS		
Description	Information from the sensor of the driver vigilance. This parameter describes the configuration of the TCMS Interface. This parameter is project specific and persistent.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	**VA_S_not_present: No sensor of the driver vigilance state available**	
	1	Spare	
	2	VA_S_EXT: Sensor of the driver vigilance state available from external interface	
	3	Spare	

Note: The default setting for this parameter is highlighted in **bold** letters.

6.1.1.40   P_V_VIGIL_DISABLE_STATE_TCMS

Parameter Name	P_V_VIGIL_DISABLE_STATE_TCMS		
Description	State of the external vigilance system This parameter describes the configuration of the TCMS Interface. This parameter is project specific and persistent.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	**VDS_S_not_present: No external vigilance system disable state available**	
	1	Spare	
	2	VDS_S_EXT: External vigilance system disable state available from external interface	
	3	Spare	

Note: The default setting for this parameter is highlighted in **bold** letters.

6.1.1.41   P_V_COLD_MOVE_STATE_TCMS

Parameter Name	P_V_COLD_MOVE_STATE_TCMS		
Description	Information from the sensor of train movement used when the onboard is powered off. This parameter describes the configuration of the TCMS Interface. This parameter is project specific and persistent.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	**CM_S_not_present: No sensor of train movement used when the onboard is powered off state available**	
	1	Spare	

Parameter Name	P_V_COLD_MOVE_STATE_TCMS	
	2	CM_S_EXT: Sensor of train movement used when the onboard is powered off state available from external interface
	3	Spare
Note: The default setting for this parameter is highlighted in **bold** letters.		

6.1.1.42   P_CIRCUIT_BREAKER_COHERENCY_TCMS

Parameter Name	P_CIRCUIT_BREAKER_COHERENCY_TCMS		
Description	Information from the sensor of the circuit breaker state. This parameter describes the configuration of the TCMS Interface. This parameter is project specific and persistent.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	**CBC_S_not_present: No sensor of the circuit breaker state available**	
	1	Spare	
	2	CBC_S_EXT: Sensor of the circuit breaker state available from external interface	
	3	Spare	
Note: The default setting for this parameter is highlighted in **bold** letters.			

6.1.1.43   P_PANTOGRAPH_COHERENCY_TCMS

Parameter Name	P_PANTOGRAPH_COHERENCY_TCMS		
Description	Coherency of the pantograph state according to currently expected state. Information computed only when pantograph status is relevant according to the track condition. This parameter describes the configuration of the TCMS Interface. This parameter is project specific and persistent.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	**PGC_S_not_present: No coherency of the pantograph state available**	
	1	Spare	
	2	PGC_S_EXT: Coherency of the pantograph state available from external interface	
	3	Spare	
Note: The default setting for this parameter is highlighted in **bold** letters.			

6.1.1.44   P_V_COMMANDING_EB_TCMS

Parameter Name	P_V_COMMANDING_EB_TCMS		
Description	TCMS informs the Core that TCMS is commanding EB. This parameter describes the configuration of the TCMS Interface. This parameter is project specific and persistent.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			

Parameter Name	P_V_COMMANDING_EB_TCMS	
Special/ Reserved Values	0	**CEB_S_not_present: No variable to inform the ETCS that TCMS is commanding EB available**
	1	Spare
	2	CEB_S_EXT: Variable to inform the ETCS that TCMS is commanding EB available from external interface
	3	Spare
Note: The default setting for this parameter is highlighted in **bold** letters.		

6.1.1.45   P_V_COMMANDING_SB_TCMS

Parameter Name	P_V_COMMANDING_SB_TCMS		
Description	Determines TCMS informs the Core that TCMS is commanding SB. This parameter describes the configuration of the TCMS Interface. This parameter is project specific and persistent.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	**CSB_S_not_present: No variable to inform the ETCS that TCMS is commanding SB available**	
	1	Spare	
	2	CSB_S_EXT: Variable to inform the ETCS that TCMS is commanding SB available from external interface	
	3	Spare	
Note: The default setting for this parameter is highlighted in **bold** letters.			

6.1.1.46   P_V_TRACTION_STATUS_TCMS

Parameter Name	P_V_TRACTION_STATUS_TCMS		
Description	Traction status available This parameter describes the configuration of the TCMS Interface. . This parameter is project specific and persistent.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	**TRS_S_not_present: No traction status available**	
	1	TRS_S_TCMS: Traction status available from TCMS data interface	
	2	TRS_S_EXT: Traction status available from external interface	
	3	TRS_S_HW: Traction status available from TCMS hardwired interface	
Note: The default setting for this parameter is highlighted in **bold** letters.			

6.1.1.47   P_PLAIN_TEXT

Parameter Name	P_PLAIN_TEXT		
Description	Determines if Plain Text Messages can be received from the train This parameter describes the configuration of the TCMS Interface. This parameter is project specific and persistent.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			

Special/ Reserved Values	0	**PT_not_present: No Plain Text Messages can be received**
	1	Spare
	2	PT_EXT: Plain Text Messages can be received
	3	Spare
Note: The default setting for this parameter is highlighted in **bold** letters.		

6.1.1.48   P_FIXED_TEXT

Parameter Name	P_FIXED_TEXT		
Description	Determines if Fixed Text Messages can be received from the train This parameter describes the configuration of the TCMS Interface. This parameter is project specific and persistent.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	**FT_not_present: No Fixed Text Messages can be received from the train**	
	1	Spare	
	2	FT_EXT: Fixed Text Messages can be received from the train	
	3	Spare	
Note: The default setting for this parameter is highlighted in **bold** letters.			

6.1.1.49   P_Q_BRAKE_MODELS

Parameter Name	P_Q_BRAKE_MODELS		
Description	Determines if Brake Models are available This parameter describes the configuration of the TCMS Interface. This parameter is project specific and persistent.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	**BM_not_present: No brake models avaliable**	
	1	BM_Fixed: Fixed brake model parameters are stored in the Functional Vehicle Adaptor	
	2	BM_EXT: Brake models can be received from the vehicle via external interface	
	3	Spare	
Note: The default setting for this parameter is highlighted in **bold** letters.			

6.1.1.50   P_BRAKE_MODELS

Parameter Name	P_BRAKE_MODELS		
Description	Model of the emergency brake, traction, and service brake (if present), to be used by the Core CPU		
Content	Variable	Length	Comment
	N_ITER	5	0 ...9
	DECELERATION_CLASS_ID_ETCS	8	
	BRAKE_DELAY_CLASS_ID_ETCS	8	
	MODEL_BEGIN_BRAKE_TCMS	8	Part of EB model
	MODEL_FULL_BRAKE_TCMS	11	Part of EB model

Parameter Name	P_BRAKE_MODELS		
	N_ITER	5	Part of EB model max. value: 5
	MODEL_SPEED_TCMS(k)	8	Part of EB model
	MODEL_DECELER_TCMS(k)	8	Part of EB model
	CUT_TRACT_DELAY_TCMS	8	Part of traction model
	TRAIN_MAX_ACC_TCMS	10	Part of traction model
	ACC_COEF_SB_UNUSED_TCMS	2	Part of traction model
	ACC_COEF_SB_USED_TCMS	2	Part of traction model
	Q_SB_MODEL_PRESENT_TCMS	1	Part of SB model
	MODEL_BEGIN_BRAKE_TCMS	8	Part of SB model
	MODEL_FULL_BRAKE_TCMS	11	Part of SB model
	N_ITER	5	Part of SB model max. value: 5
	MODEL_SPEED_TCMS(k)	8	Part of SB model
	MODEL_DECELER_TCMS(k)	8	Part of SB model
	MIN_ROT_MASS_PERCENT_TCMS	8	Part of rot mass model
	NOM_ROT_MASS_PERCENT_TCMS	8	Part of rot mass model
	MAX_ROT_MASS_PERCENT_TCMS	8	Part of rot mass model
	T_W_TCMS	13	Part of driver delay
	T_P_TCMS	13	Part of driver delay
	T_I_P_TCMS	13	Part of driver delay
	T_RSMA_TCMS	13	Part of driver delay
Note: The default setting for this parameters set is: All values are set to 0.			

6.1.1.50.1 It shall be possible to store up to 10 brake model data sets

6.1.1.51   P_AIRTIGHT_FITTED

Parameter Name	P_AIRTIGHT_FITTED		
Description	Train Fitted with Airtight System This parameter describes the configuration of the TCMS Interface. This parameter is project specific and persistent.		
Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	**ATF_TCMS: Airtight System data are received by data interface from the TCMS**	
	1	ATF_HW: Airtight System data are received by hardwired interface from the TCMS	
	2	ATF_ETCS: ETCS is responsible for Airtight System	
	3	Spare	
Note: The default setting for this parameter is highlighted in **bold** letters.			

6.1.1.52   P_BRAKE_POSITION

Parameter Name	P_BRAKE_POSITION
Description	Determines how Brake Position Data are transported from the TCMS to the ETCS This parameter describes the configuration of the TCMS Interface. This parameter is project specific and persistent.

Type	Minimum Value	Maximum Value	Resolution/ Formula
Integer 2 bits			
Special/ Reserved Values	0	**BPOS_TCMS: Brake Position data are received by data interface from the TCMS**	
	1	BPOS_HW: Brake Position data are received by hardwired interface from the TCMS	
	2	BPOS_ETCS: ETCS is responsible for brake position determination	
	3	Spare	

Note: The default setting for this parameter is highlighted in **bold** letters.

6.1.1.53   P_TEST_FAILURE_DETECTION

Parameter Name	P_TEST_FAILURE_DETECTION		
Description	Determines if TCMS test and failure detection is available This parameter describes the configuration of the TCMS Interface. This parameter is project specific and persistent.		
Type	*Minimum Value*	*Maximum Value*	*Resolution/ Formula*
Integer 2 bits			
Special/ Reserved Values	0	**TFD_not_present: No TCMS test and failure detection available**	
	1	Spare	
	2	TFD_EXT: TCMS test and failure detection available from external interface	
	3	Spare	

Note: The default setting for this parameter is highlighted in **bold** letters.

6.1.1.54   P_DIAGNOSTIC

Parameter Name	P_DIAGNOSTIC		
Description	Determines if TCMS diagnostic is available This parameter describes the configuration of the TCMS Interface. This parameter is project specific and persistent.		
Type	*Minimum Value*	*Maximum Value*	*Resolution/ Formula*
Integer 2 bits			
Special/ Reserved Values	0	**DIAG_not_present: No TCMS diagnostic available**	
	1	Spare	
	2	DIAG_EXT: TCMS diagnostic available via external interface	
	3	Spare	

Note: The default setting for this parameter is highlighted in **bold** letters.

6.1.1.55   P_TRAIN_DATA

Parameter Name	P_TRAIN_DATA		
Description	Determines how some train data are sent from the TCMS to the ETCS This parameter describes the configuration of the TCMS Interface. This parameter is project specific and persistent.		
Type	*Minimum Value*	*Maximum Value*	*Resolution/ Formula*

Integer 2 bits			
Special/ Reserved Values	**0**	**PDA_TCMS_only: Only the Subset-119 interface to TCMS is used**	
	1	Spare	
	2	PDA_Extended: in addition to the Subset-119, additional data are used via an optional vehicle interface	
	3	Spare	
Note: The default setting for this parameter is highlighted in **bold** letters.			

6.2 Functional Specification for FVA

6.2.1 General

6.2.1.1 The functional blocks are organised in line with the packets as defined in Chapter 5 of this specification.

6.2.1.2 It is recommended to organise any related application software in line with the structure of the functional blocks described here

6.2.1.3 Note: The organisation of the functional blocks in line with the defined packets ensures that the behaviour and timing is consistent with the requirements.

6.2.2 Service Brake

6.2.2.1 General

6.2.2.2 ETCS Interface

From ETCS	To ETCS	Remark
SB_COMMAND_ETCS	n/a	Service Brake Command Cyclic

6.2.2.3 TCMS Interface

From TCMS	To TCMS	Remark
n/a	OBU_TR_ServiceBrake	Service Brake Command Cyclic

6.2.2.4 Parameters and Settings

The following parameters control the functionality of the Service Brake Command:
P_SBI_ARCHITECTURE.

6.2.2.5　Functionality

6.2.2.5.1　The Service Brake Command shall be implemented in a way that ensures independent activation of the respective redundant TCMS variables.

6.2.2.5.2　The Service Brake Command shall be forwarded from the ETCS to the TCMS.

6.2.2.5.3　The following table describes the mapping of the values in case P_SBI_ARCHITECTURE is set to SBI_standard:

P_SBI_ARCHITECTURE = SBI_standard		
SB_COMMAND_ETCS	**OBU_TR_ServiceBrake**	**Remark**
0 Do not apply SB	0 Service brake not commanded	
1 Apply SB	1 Service brake commanded	

6.2.2.5.4　The following table describes the mapping of the values in case P_SBI_ARCHITECTURE is set to SBI_extended:

P_SBI_ARCHITECTURE = SBI_extended		
SB_COMMAND_ETCS	**TR_O_SBD_Cmd_ETCS**	**Remark**
0 Do not apply SB	0 Direct brake not commanded	Mapped to optional direct brake command
1 Apply SB	1 Direct brake commanded	
2 Apply SB not protected	1 Direct brake commanded	
SB_COMMAND_ETCS	**TR_O_SBD_Cmd_ETCS**	**Remark**
0 Do not apply SB	0 Service brake not commanded	
1 Apply SB	1 Service brake commanded	

6.2.2.6　Timing

6.2.2.6.1　The Service Brake Command shall be sent by the ETCS at every computer cycle with packet 0.

6.2.3　Emergency Brake

6.2.3.1　General

6.2.3.1.1　The Emergency Brake Command is received from the ETCS.

6.2.3.1.2　The implementation of the the Emergency Brake Command depends on the actual implementation selected for a specific project.

6.2.3.2　ETCS Interface

From ETCS	To ETCS	Remark
EB_COMMAND_ETCS	n/a	
B_EB_Command_ETCS	n/a	

6.2.3.3　TCMS Interface

From TCMS	To TCMS	Remark
n/a	O_EB1_C	Hardwired Interface
n/a	O_EB2_C	Hardwired Interface
n/a	OBU_TR_EB3_Cmd	Data interface

6.2.3.4 Parameters and Settings

6.2.3.4.1 The following parameters control the functionality of the Emergency Brake Command:

P_EBI_ARCHITECTURE.

6.2.3.5 Functionality

6.2.3.5.1 The Emergency Brake Command shall be implemented in a way that ensures independent activation of the respective redundant TCMS variables.

6.2.3.5.2 The Emergency Brake Command shall be forwarded from the ETCS to the TCMS.

6.2.3.5.3 The following table describes the mapping of the values in case P_EBI_ARCHITECTURE is set to EBI_4C_2L or EBI_2C_2L:

P_EBI_ARCHITECTURE = EBI_4C_2L or EBI_2C_2L			
EB_COMMAND_ETCS	O_EB1_C	O_EB2_C	Remark
0 Do not apply EB	1 EB not commanded from ERTMS/ETCS on-board	1 EB not commanded from ERTMS/ETCS on-board	Hard- wired signal on TCMS side only
1 Apply EB	0 EB commanded	0 EB commanded	

6.2.3.5.4 The following table describes the mapping of the values in case P_EBI_ARCHITECTURE is set to EBI_1C_1S

P_EBI_ARCHITECTURE = EBI_1C_1S			
EB_COMMAND_ETCS	O_EB1_C	OBU_TR_EB3_Cmd	Remark
0 Do not apply EB	1 EB not commanded from ERTMS/ETCS on-board	1 EB not commanded from ERTMS/ETCS on-board	O_EB1_C: Hard- wired signal OBU_TR_EB3_Cmd: Packet/ variable based variable
1 Apply EB	0 EB commanded	0 EB commanded (vehicle shall apply EB)	

6.2.3.6 Timing

6.2.3.6.1 The Emergency Brake Command shall be sent by the ETCS at every computer cycle with packet 0.

6.2.4 ETCS Isolation

6.2.4.1 General

ETCS Isolation is implemented through a hard-wired signal only.

6.2.4.2 ETCS Interface

From ETCS	To ETCS	Remark
B_OBU_Isolation_ETCS		Hard-wired signal

6.2.4.3 TCMS Interface

From TCMS	To TCMS	Remark

	O_IS_S	Hard- wired signal

6.2.4.4 Parameters and Settings

6.2.4.4.1 None

6.2.4.5 Functionality

B_OBU_Isolation_ETCS	O_IS_S	Remark
0 ERTMS/ETCS on-board not isolated	0 ERTMS/ETCS on-board not isolated	Hard- wired signal
1 ERTMS/ETCS on-board isolated	1 ERTMS/ETCS on-board isolated	

6.2.4.6 Timing

6.2.4.6.1 The ETCS Isolation Command shall be sent by the ETCS at every computer cycle.

6.2.5 Traction Cut- Off

6.2.5.1 General

6.2.5.1.1 The following variable is defined as the traction cut off as soon as the train passes the warning limit (see Table 1-2) of the braking curve model as defined in [16].

6.2.5.1.2 Note: With traction cut-off the driving force is cut. Electrical traction could still be used for braking, depending on the specific vehicle implementation.

6.2.5.1.3 The Traction Cut-Off command is used as defined in [16] 3.13.9.3.2.3 a) and 3.13.2.2.8.1.

6.2.5.2 ETCS Interface

From ETCS	To ETCS	Remark
TRACTION_CUT_OFF_ETCS		
B_TRACTION_CUT_OFF_ETCS		Hard-wired signal

6.2.5.3 TCMS Interface

From TCMS	To TCMS	Remark
	OBU_TR_TCO_Cmd	Packet/ variable based variable
	O_TC1_C	Hard- wired signal

6.2.5.4 Parameters and Settings

6.2.5.4.1 None

6.2.5.5 Functionality

B_TRACTION_CUT_OFF_ETCS	O_TC1_C	Remark
0 False (=Release traction cut off command)	1 Traction cut-off not commanded	Hard- wired signal
1 True (=Cut off traction)	0 Traction cut-off commanded.	

TRACTION_CUT_OFF_ETCS	OBU_TR_TCO_Cmd	Remark
0 False (=Release traction cut off command)	1 Traction cut-off not commanded	Packet/ variable based variable
1 True (=Cut off traction)	0 Traction cut-off commanded.	

6.2.5.6   Timing

6.2.5.6.1   The Traction Cut- Off Command shall be sent by the ETCS at every computer cycle with the packet 0.

6.2.6   Vigilance Disable Order

6.2.6.1   General

6.2.6.1.1   This command disables the external driver vigilance device.

6.2.6.1.2   The command is not necessarily to be connected to the TCMS, but directly to the system controlling the external driver vigilance device.

6.2.6.1.3   If implemented, it can either be connected via data interface or hardwired connection.

6.2.6.2   ETCS Interface

From ETCS	To ETCS	Remark
VIGIL_DISABLE_ORDER_ETCS		

6.2.6.3   TCMS Interface

From TCMS	To TCMS	Remark
	TR_O_ Vigil_Disable_Cmd_ETCS	Packet/ variable based variable
	OBU_VD1_C	Hard- wired signal

6.2.6.4   Parameters and Settings

6.2.6.4.1   The following parameters control the functionality of the **Vigilance Disable Order**:

P_VDO_ARCHITECTURE.

6.2.6.5   Functionality

6.2.6.5.1   The following table describes the mapping of the values in case P_VDO_ARCHITECTURE is set to VDO_data

P_EBI_ARCHITECTURE = VDO_data		
VIGIL_DISABLE_ORDER_ETCS	TR_O_ Vigil_Disable_Cmd_ETCS	Remark
0 False (do not disable the device)	0 False (do not disable the device)	Variable
1 True (disable the device)	1 True (disable the device)	

6.2.6.5.2   The following table describes the mapping of the values in case P_VDO_ARCHITECTURE is set to VDO_direct

P_EBI_ARCHITECTURE = VDO_direct		

VIGIL_DISABLE_ORDER_ETCS	OBU_VD1_C	Remark
0 False (do not disable the device)	0 False (do not disable the device)	Hard- Wired connection
1 True (disable the device)	1 True (disable the device)	

6.2.6.5.3   In case P_VDO_ARCHITECTURE is set to VDO_none, no signal shall be activated on the train interface.

6.2.6.6   Timing

6.2.6.6.1   The Vigilance Disable Order Command shall be sent by the ETCS at every computer cycle with the packet 0.

6.2.7   Track Conditions

6.2.7.1   General

6.2.7.1.1   The Track Conditions are sent by the ETCS through ETCS to TCMS packet number 1.

6.2.7.1.2   The packet may contain one or more track conditions.

6.2.7.2   ETCS Interface Packet

From ETCS	To ETCS	Remark
Packet 1		

6.2.7.3   TCMS Interface Variables

From TCMS	To TCMS	Remark
	OBU_TR_RBI_D_Entry	Regenerative Brake Inhibit
	OBU_TR_RBI_D_Exit	Regenerative Brake Inhibit
	OBU_TR_MGI_D_Entry	Magnetic Shoe Brake Inhibit
	OBU_TR_MGI_D_Exit	Magnetic Shoe Brake Inhibit
	OBU_TR_ECS_D_Entry	Eddy Current Brakes for Service Brake Inhibit
	OBU_TR_ECS_D_Exit	Eddy Current Brakes for Service Brake Inhibit
	OBU_TR_ECE_D_Entry	Eddy Current Brakes for Emergency Brake Inhibit
	OBU_TR_ECE_D_Exit	Eddy Current Brakes for Emergency Brake Inhibit
	OBU_TR_PG_D_Entry	Powerless Section with Pantograph to be Lowered
	OBU_TR_PG_D_Exit	Powerless Section with Pantograph to be Lowered
	OBU_TR_AT_D_Entry	Air Tightness Area
	OBU_TR_AT_D_Exit	Air Tightness Area
	OBU_TR_MPS_D_Entry	Powerless Section with Main Power Switch to be Switched Off
	OBU_TR_MPS_D_Exit	Powerless Section with Main Power Switch to be Switched Off

6.2.7.4 Parameters and Settings

6.2.7.4.1 No relevant parameters

6.2.7.5 Functionality

6.2.7.5.1 Packet 1 may contain one or more track conditions.

6.2.7.5.2 Packet 1 and Packet 2 (Odometric Data) shall be used in order to calculate the values for the required entry and exit points for the various track conditions

6.2.7.5.3 The beginning of each track condition described in Packet 1 is relative to a certain location on the track which is identified by the combination of identity number of the country or region where the reference balise group is located (NID_C_ETCS) and the identity number of a balise group or loop within the country or region defined by NID_C_ETCS (NID_BG_ETCS).

6.2.7.5.4 The end of each track condition described in Packet 1 is defined by a length, which shall be added to the location of the beginning.

6.2.7.5.5 The beginning of each track condition as sent to the TCMS as defined in [Subset-119] is relative to the relevant safe front end of the train.

6.2.7.5.6 The distances and lengths shall be calculated following the principles as described in [Subset-026]

6.2.7.5.7 The distances for "OBU_TR_XXx_D_Entry" shall be calculated as follows:

Used variables	Origin	Remark
Q_SCALE	From Packet 1 (Track conditions)	
D_TRACKCOND_ETCS	From Packet 1 (Track conditions)	
Q_SCALE	From Packet 2 (Odometric Data)	
D_MAX_SAFE_FRONT_END_ETCS	From Packet 2 (Odometric Data)	

Step 1: calculate the raw value for OBU_TR_XXX_D_Entry from the safe front end of the train:

OBU_TR_XXX_D_Entry = D_TRACKCOND_ETCS - D_MAX_SAFE_FRONT_END_ETCS

Note: D_TRACKCOND_ETCS and D_MAX_SAFE_FRONT_END_ETCS shall be scaled depending on the respective value of Q_SCALE.

Step 2: Apply the encoding as specified in Subset-119, Table 5-21.

6.2.7.5.8 Note: Above calculation assumes identical NID_C_ETCS and NID_BG_ETCS as reference for Packet 1 and Packet 2. The ETCS principles for calculation of train position apply.

6.2.7.5.9 The distances for "OBU_TR_XXx_D_Exit" shall be calculated as follows:

Used variables	Origin	Remark
Q_SCALE	From Packet 1 (Track conditions)	Scale for distance / length
D_TRACKCOND_ETCS	From Packet 1 (Track conditions)	Distance from the BG
L_TRACKCOND_ETCS	From Packet 1 (Track conditions)	Length of the track condition
Q_SCALE	From Packet 2 (Odometric Data)	Scale for distance / length
D_MIN_SAFE_FRONT_END_ETCS	From Packet 2 (Odometric Data)	Min safe front end of the train relative to the BG
L_MIN_SAFE_REAR_END_ETCS	From Packet 2 (Odometric Data)	Min safe rear end of the train relative to the BG

Step 1: calculate the raw value for OBU_TR_XXX_D_Entry from the safe front end of the train:

OBU_TR_XXX_D_Exit = D_TRACKCOND_ETCS + L_TRACKCOND_ETCS- (D_MIN_SAFE_FRONT_END_ETCS or L_MIN_SAFE_REAR_END_ETCS)

Note: D_TRACKCOND_ETCS, L_TRACKCOND_ETCS, D_MIN_SAFE_FRONT_END_ETCS and L_MIN_SAFE_REAR_END_ETCS shall be scaled depending on the respective value of Q_SCALE.

Note: Depending on the specific requirements of the track condition, either D_MIN_SAFE_FRONT_END_ETCS or L_MIN_SAFE_REAR_END_ETCS shall be used for the calculation of OBU_TR_XXx_D_Exit.

Step 2: Apply the encoding as specified in Subset-119, Table 5-21.
Due to the scaling as specified by Q_SCALE, OBU_TR_XXx_D_Entry and OBU_TR_XXx_D_Exit may be outside the transmissible range. In this case, the following table shall apply:

Raw OBU_TR_XXx_D_Entry or OBU_TR_XXx_D_Exit value	Encoded OBU_TR_XXx_D_Entry or OBU_TR_XXx_D_Exit value	Remark
<= Safe Front/ Rear end (as relevant)	8000h	Apply default / initial state value for the related track condition
>32766m	7FFFh	
<-32766m	8001h	

The default values for the track conditions are defined as follows:

TRACKCOND	Initial State
3 Powerless section – lower pantograph	Not set (not powerless section)
5 Air tightness	Not set (no request for air tightness)
6 Switch off regenerative brake	Not set (regenerative brake on)
7 Switch off eddy current brake for service brake	Not set (eddy current brake for service brake on)
8 Switch off magnetic shoe brake	Not set (magnetic shoe brake on)
9 Powerless section – switch off the main power switch	Not set (not powerless section)
10 Switch off eddy current brake for emergency brake	Not set (eddy current brake for emergency brake on)

6.2.7.5.10 Note: Above calculation assumes identical NID_C_ETCS and NID_BG_ETCS as reference for Packet 1 and Packet 2. The ETCS principles for calculation of train position apply.

6.2.7.5.11 When a Packet 1 is received, the matching OBU_TR_XXX_D_Entry and OBU_TR_XXX_D_Exit are sent to the TCMS. The following table specifies the rules:

If TRACKCOND =	Entry Variable Generated	Exit Variable Generated	Criterion for Exit Variable
3 Powerless section – lower pantograph	OBU_TR_PG_D_Entry	OBU_TR_PG_D_Exit	L_MIN_SAFE_REAR_END_ETCS
5 Air tightness	OBU_TR_AT_D_Entry	OBU_TR_AT_D_Exit	L_MIN_SAFE_REAR_END_ETCS
6 Switch off regenerative brake	OBU_TR_RBI_D_Entry	OBU_TR_RBI_D_Exit	L_MIN_SAFE_REAR_END_ETCS
7 Switch off eddy current brake for service brake	OBU_TR_ECS_D_Entry	OBU_TR_ECS_D_Exit	L_MIN_SAFE_REAR_END_ETCS
8 Switch off magnetic shoe brake	OBU_TR_MGI_D_Entry	OBU_TR_MGI_D_Exit	L_MIN_SAFE_REAR_END_ETCS
9 Powerless section – switch off the main power switch	OBU_TR_MPS_D_Entry	OBU_TR_MPS_D_Exit	L_MIN_SAFE_REAR_END_ETCS
10 Switch off eddy current brake for emergency brake	OBU_TR_ECE_D_Entry	OBU_TR_ECE_D_Exit	L_MIN_SAFE_REAR_END_ETCS

6.2.7.6   Timing

6.2.7.6.1   The ETCS sends Packet 1 sporadcially, whenever it is relevant.

6.2.8   Odometric Data

6.2.8.1   General

6.2.8.1.1   Subset-119 specifies no interface for transmission of odometric data. Some TCMS systems may use their own odometry implementation. However, management of track- dependent information relies on a precise train positition.

6.2.8.1.2   Odometric data packet is optional information sent to the train outside the scope of Subset-119, if implemented.

6.2.8.2   ETCS Interface Packet

From ETCS	To ETCS	Remark
Packet 2		

6.2.8.3   TCMS Interface Packet

From TCMS	To TCMS	Remark
	Packet 21	

6.2.8.3.1   Note: since all variables shall be forwarded, only the complete packets are mentioned here. All variables are forwarded without any alteration.

6.2.8.4   Parameters and Settings

The following parameters control the functionality of the Odometric Data Transmission: P_ODO_ARCHITECTURE.

6.2.8.5   Functionality

6.2.8.5.1   The following table describes the mapping of the values in case P_ODO_ARCHITECTURE is set to ODO_present:

P_ODO_ARCHITECTURE = ODO_present		
Packet 2	Packet 42	Remark
All Data	All Data	

6.2.8.5.2   The following table describes the mapping of the values in case P_ODO_ARCHITECTURE is set to ODO_not_present:

P_ODO_ARCHITECTURE = ODO_not_present		
Packet 2	Packet 42	Remark

The data are received and may be used for various calculation purposes	No Data are transmitted	

6.2.8.6   Timing

6.2.8.6.1   The ETCS sends Packet 2 at each computer cycle.

6.2.8.6.2   Packet 42 is sent to the vehicle at each computer cycle.

6.2.9   Mode and Level information

6.2.9.1   General

6.2.9.1.1   Subset-119 specifies no interface for transmission of mode and level information. Some TCMS systems may require these data.

6.2.9.1.2   Mode and level data packet are optional information sent to the train outside the scope of Subset-119, if implemented.

6.2.9.2   ETCS Interface Packet

From ETCS	To ETCS	Remark
Packet 3		

6.2.9.3   TCMS Interface Packet

From TCMS	To TCMS	Remark
	Packet 43	

6.2.9.3.1   Note: since all variables shall be forwarded, only the complete packets are mentioned here. All variables are forwarded without any alteration.

6.2.9.4   Parameters and Settings

The following parameters control the functionality of the Odometric Data Transmission: P_ML_ARCHITECTURE.

6.2.9.5   Functionality

6.2.9.5.1   The following table describes the mapping of the values in case P_ML_ARCHITECTURE is set to ML_present:

P_ML_ARCHITECTURE = ML_present		
Packet 3	Packet 43	Remark
All Data	All Data	

6.2.9.5.2 The following table describes the mapping of the values in case P_ML_ARCHITECTURE is set to ML_not_present:

P_ML_ARCHITECTURE = ML_not_present		
Packet 2	**Packet 43**	**Remark**
The data are received and may be used for various calculation purposes	No Data are transmitted	

6.2.9.6 Timing

6.2.9.6.1 The ETCS sends Packet 3 at each computer cycle.

6.2.9.6.2 Packet 43 is sent to the vehicle at each computer cycle.

6.2.10 Train Type

6.2.10.1 General

6.2.10.1.1 In case the TCMS is capable of sending traction/ brake model information to the ETCS, the train type data are used to select the appropriate models.

6.2.10.1.2 Train type data packet is optional information sent to the train outside the scope of Subset-119, if implemented.

6.2.10.2 ETCS Interface Packet

From ETCS	To ETCS	Remark
Packet 4		

6.2.10.3 TCMS Interface Packet

From TCMS	To TCMS	Remark
	Packet 44	
	TR_OBU_TrainType	

6.2.10.3.1 Note: since all variables shall be forwarded, only the complete packets are mentioned here. All variables are forwarded without any alteration.

6.2.10.4 Parameters and Settings

6.2.10.4.1 The following parameters control the functionality of the Odometric Data Transmission:

P_TTD_ARCHITECTURE.

6.2.10.5 Functionality

6.2.10.5.1 The following table describes the mapping of the values in case P_TTD_ARCHITECTURE is set to TTD_present:

P_TTD_ARCHITECTURE = TTD_present		
Packet 4	**Packet 44**	**Remark**
All Data	All Data	
TRAIN_TYPE_ETCS	**TR_OBU_TrainType**	
Value	Value	Data forwarded without change

6.2.10.5.2 The following table describes the mapping of the values in case P_TTD_ARCHITECTURE is set to TTD_not_present:

P_TTD_ARCHITECTURE = TTD_not_present		
Packet 4	**Packet 44**	**Remark**
The data are received and may be used for various calculation purposes	No Data are transmitted	
TRAIN_TYPE_ETCS	**TR_OBU_TrainType**	
Value	Value	Data forwarded without change

6.2.10.6 Timing

6.2.10.6.1 The ETCS sends Packet 4 at each computer cycle.

6.2.10.6.2 Packet 24 is sent to the vehicle at each computer cycle.

6.2.11 Track Condition Change of traction power

6.2.11.1 General

6.2.11.2 ETCS Interface

From ETCS	To ETCS	Remark
Packet 5		

6.2.11.3 TCMS Interface

From TCMS	To TCMS	Remark
	OBU_TR_CTS_D_Change	
	OBU_TR_CTS_NewId	
	OBU_TR_CTS_NewVoltage	

6.2.11.4 Parameters and Settings

6.2.11.4.1 None

6.2.11.5 Functionality

6.2.11.5.1 Packet 5 contains data related to track condition change of power.

6.2.11.5.2 Packet 5 and Packet 2 (Odometric Data) shall be used in order to calculate the values for the required entry and exit points for the various track conditions

6.2.11.5.3 The beginning of each track condition described in Packet 5 is relative to a certain location on the track which is identified by the combination of identity number of the country or region where the reference balise group is located (NID_C_ETCS) and the identity number of a balise group or loop within the country or region defined by NID_C_ETCS (NID_BG_ETCS).

6.2.11.5.4 The beginning of each track condition as sent to the TCMS as defined in [Subset-119] is relative to the relevant safe front end of the train.

6.2.11.5.5 The distances shall be calculated following the principles as described in [Subset-026]

6.2.11.5.6 The distances shall be calculated as follows:

Used variables	Origin	Remark
Q_SCALE	From Packet 5 (Track Condition Change of traction power)	
D_TRACTION_MAX_ETCS		
D_TRACTION_MIN_ETCS		
Q_SCALE	From Packet 2 (Odometric Data)	
D_MAX_SAFE_FRONT_END_ETCS	From Packet 2 (Odometric Data)	

Step 1: calculate the raw value for OBU_TR_CTS_D_Change from the safe front end of the train:

OBU_TR_CTS_D_Change = D_TRACTION_MAX_ETCS - D_MAX_SAFE_FRONT_END_ETCS

Note: D_TRACTION_MAX_ETCS and D_MAX_SAFE_FRONT_END_ETCS shall be scaled depending on the respective value of Q_SCALE.

Step 2: Apply the encoding as specified in Subset-119, Table 5-21.
Due to the scaling as specified by Q_SCALE, OBU_TR_CTS_D_Change may be outside the transmissible range. In this case, the following table shall apply:

Raw OBU_TR_CTS_D_Change value	Encoded OBU_TR_CTS_D_Change value	Remark
<= Safe Front/ Rear end (as relevant)	8000h	Apply default / initial state value for the related track condition
>32766m	7FFFh	
<-32766m	8001h	

6.2.11.5.7 Note: Above calculation assumes identical NID_C_ETCS and NID_BG_ETCS as reference for Packet 2 and Packet 5. The ETCS principles for calculation of train position apply.

Step 3: calculate the raw value for the next OBU_TR_CTS_D_Change from the safe rear end of the train:

OBU_TR_CTS_D_Change = D_TRACTION_MIN_ETCS - CCPU_L_MAX_SAFE_REAR_END

Note: D_TRACTION_MIN_ETCS and CCPU_L_MAX_SAFE_REAR_END shall be scaled depending on the respective value of Q_SCALE.

Step 4: Apply the encoding as specified in Subset-119, Table 5-21.
Due to the scaling as specified by Q_SCALE, OBU_TR_CTS_D_Change may be outside the transmissible range. In this case, the following table shall apply:

Raw OBU_TR_CTS_D_Change value	Encoded OBU_TR_CTS_D_Change value	Remark
<= Safe Front/ Rear end (as relevant)	8000h	Apply default / initial state value for the related track condition
>32766m	7FFFh	
<-32766m	8001h	

6.2.11.5.8 Note: Above calculation assumes identical NID_C_ETCS and NID_BG_ETCS as reference for Packet 5 and Packet 2. The ETCS principles for calculation of train position apply.

6.2.11.5.9 Note: In practice, this means that two traction changes may be sent based on one Packet 5. Subset-119 specifies that OBU_TR_CTS_NewVoltage and OBU_TR_CTS_NewId shall be ignored if OBU_TR_CTS_D_Change is encoded with a special value.

6.2.11.5.10 The mapping of the functional ETCS and TCMS variables is defined as follows:

From ETCS	To TCMS	Remark
M_VOLTAGE_ETCS	OBU_TR_CTS_NewVoltage	Data forwarded unchanged. The same coding is used.
NID_CTRACTION_ETCS	OBU_TR_CTS_NewId	

6.2.12   Location reference update

6.2.12.1   General

6.2.12.1.1 Subset-119 specifies no interface for transmission of odometric data and location reference update.

6.2.12.1.2 Location reference update data packet is optional information sent to the train outside the scope of Subset-119, if implemented.

6.2.12.2   ETCS Interface Packet

From ETCS	To ETCS	Remark
Packet 6		

6.2.12.3   TCMS Interface Packet

From TCMS	To TCMS	Remark
	Packet 46	

6.2.12.3.1 Note: since all variables shall be forwarded, only the complete packets are mentioned here. All variables are forwarded without any alteration.

6.2.12.4   Parameters and Settings

The following parameters control the functionality of the Odometric Data Transmission:
P_LRU_ARCHITECTURE.

6.2.12.5 Functionality

6.2.12.5.1 The following table describes the mapping of the values in case P_LRU_ARCHITECTURE is set to LRU_present:

P_LRU_ARCHITECTURE = LRU_present		
Packet 6	**Packet 46**	**Remark**
All Data	All Data	

6.2.12.5.2 The following table describes the mapping of the values in case P_LRU_ARCHITECTURE is set to LRU_not_present:

P_LRU_ARCHITECTURE = LRU_not_present		
Packet 6	**Packet 46**	**Remark**
The data are received and may be used for various calculation purposes	No Data are transmitted	

6.2.12.6 Timing

6.2.12.6.1 The ETCS sends Packet 6 sporadically (sending triggered by event).

6.2.13 Request Brake Tests

6.2.13.1 General

6.2.13.1.1 Subset-119 specifies no interface for requesting a brake test.

6.2.13.1.2 Location reference update data packet is optional information sent to the train outside the scope of Subset-119, if implemented.

6.2.13.2 ETCS Interface

From ETCS	To ETCS	Remark
START_EB_TESTS_ON_DEMAND_ETCS		

6.2.13.3 TCMS Interface

From TCMS	To TCMS	Remark
	TR_O_BT_Cmd_ETCS	Optional

6.2.13.4 Parameters and Settings

The following parameters control the functionality of the Odometric Data Transmission: P_BT_ARCHITECTURE.

6.2.13.5 Functionality

6.2.13.5.1 The following table describes the mapping of the values in case P_LRU_ARCHITECTURE is set to LRU_present:

P_BT_ARCHITECTURE = BT_present		
TART_EB_TESTS_ON_DEMAND_ETCS	TR_O_BT_Cmd_ETCS	Remark
0 NO_TEST: do not start brake tests (but do not stop them if already started)	0 NO_TEST: do not start brake tests (but do not stop them if already started)	
1 Start EB tests	1 Start EB tests	
2 Start SB tests	2 Start SB tests	
3 Spare	3 Spare	

6.2.13.5.2 The following table describes the mapping of the values in case P_LRU_ARCHITECTURE is set to LRU_not_present:

P_BT_ARCHITECTURE = BT_not_present		
Packet 6	Packet 26	Remark
Ignored	No Data are transmitted	

6.2.13.6 Timing

6.2.13.6.1 The ETCS sends START_EB_TESTS_ON_DEMAND_ETCS sporadically (sending triggered by event).

6.2.14 Order to reset the external driver vigilance device.

6.2.14.1 General

6.2.14.1.1 When the driver touches the MMI, this can be considered as a vigilance action by the external driver vigilance device. Subbset-119 specifies no interface for requesting a brake test.

6.2.14.1.2 Order to reset the external driver vigilance device is optional information sent to the train outside the scope of Subset-119, if implemented.

6.2.14.2 ETCS Interface

From ETCS	To ETCS	Remark
VIGIL_RESET_ORDER_ETCS		

6.2.14.3 TCMS Interface

From TCMS	To TCMS	Remark
	TR_O_VRO_Cmd_ETCS	Optional

6.2.14.4 Parameters and Settings

The following parameters control the functionality of the Request Brake Tests:
P_VRO_ARCHITECTURE.

6.2.14.5 Functionality

6.2.14.5.1 The following table describes the mapping of the values in case P_VRO_ARCHITECTURE is set to VRO_present:

P_VRO_ARCHITECTURE = VRO_present		
CCPU_VIGIL_RESET_ORDER	**TR_O_VRO_Cmd_ETCS**	**Remark**
0 False (do not reset)	0 False (do not reset)	
1 True (reset)	1 True (reset)	

6.2.14.5.2 The following table describes the mapping of the values in case P_LRU_ARCHITECTURE is set to LRU_not_present:

P_VRO_ARCHITECTURE = VRO_not_present		
CCPU_VIGIL_RESET_ORDER	**TR_O_VRO_Cmd_ETCS**	**Remark**
Ignored	No Data are transmitted	

6.2.14.6 Timing

6.2.14.6.1 The ETCS sends VIGIL_RESET_ORDER_ETCS sporadically (sending triggered by event).

6.2.15 Service Brake Monitoring State

6.2.15.1 General

6.2.15.1.1 The ETCS Core may have a function to monitor the service brake. In this case, the TCMS may need to know the health state of this function.

6.2.15.1.2 Service Brake Monitoring State is optional information sent to the train outside the scope of Subset-119, if implemented.

6.2.15.2 ETCS Interface

From ETCS	To ETCS	Remark
SB_MONITORING_STATE_ETCS		

6.2.15.3 TCMS Interface

From TCMS	To TCMS	Remark
	TR_O_SBM_State_ETCS	Optional

6.2.15.4 Parameters and Settings

The following parameters control the functionality of the Request Brake Tests:
P_SBM_ARCHITECTURE.

6.2.15.5　Functionality

6.2.15.5.1 The following table describes the mapping of the values in case P_SBM_ARCHITECTURE is set to SBM_present:

P_SBM_ARCHITECTURE = SBM_present		
SB_MONITORING_STATE_ETCS	TR_O_SBM_State_ETCS	Remark
0 NOT_RELEVANT (no monitoring running or running in order)	0 NOT_RELEVANT (no monitoring running or running in order)	
1 FAILED (monitoring running and failed)	1 FAILED (monitoring running and failed)	

6.2.15.5.2 The following table describes the mapping of the values in case P_LRU_ARCHITECTURE is set to LRU_not_present:

P_SBM_ARCHITECTURE = SBM_not_present		
CCPU_VIGIL_RESET_ORDER	TR_O_VRO_Cmd_ETCS	Remark
Ignored	No Data are transmitted	

6.2.15.6　Timing

6.2.15.6.1 The ETCS sends SB_MONITORING_STATE_ETCS sporadically (sending triggered by event).

6.2.16　STM States

6.2.16.1　Note: STM handling is out of scope of this document

6.2.17　Train Information

6.2.17.1　General

6.2.17.1.1 The ETCS Core may send train information to the TCMS

6.2.17.1.2 Train Information data are ioptional information sent to the train outside the scope of Subset-119, if implemented.

6.2.17.2　ETCS Interface

From ETCS	To ETCS	Remark
Packet 9		

6.2.17.3　TCMS Interface

From TCMS	To TCMS	Remark
	Packet 49	Optional

6.2.17.4　Parameters and Settings

The following parameters control the functionality of the Request Brake Tests:
P_TI_ARCHITECTURE.

6.2.17.5 Functionality

6.2.17.5.1 The following table describes the mapping of the values in case P_TI_ARCHITECTURE is set to TI_present:

P_TI_ARCHITECTURE = TI_present		
Packet 9	**Packet 49**	**Remark**
Received	Forwarded as-is	

6.2.17.5.2 The following table describes the mapping of the values in case P_TI_ARCHITECTURE is set to TI_not_present:

P_TI_ARCHITECTURE = TI_not_present		
Packet 9	**Packet 19**	**Remark**
Received	No Data are transmitted	

6.2.17.6 Timing

6.2.17.6.1 The ETCS sends Packet 9 sporadically (sending triggered by event).

6.2.18 Door Control

6.2.18.1 General

6.2.18.1.1 Door Control is handled by the ETCS

6.2.18.1.2 The ETCS shall use Packet 10 to send the door control information.

6.2.18.2 ETCS Interface Packet

From ETCS	To ETCS	Remark
Packet 10		

6.2.18.3 TCMS Interface Variables

From TCMS	To TCMS	Remark
	OBU_TR_SP_D_Entry1	Remaining distance from the max safe front end to the start location of the platform 1
	OBU_TR_SP_D_Exit1	Remaining distance from the min safe front end to the end location of the platform 1
	OBU_TR_SP_Height1_Bit0	Height of the platform 1
	OBU_TR_SP_Height1_Bit1	Height of the platform 1
	OBU_TR_SP_Height1_Bit2	Height of the platform 1
	OBU_TR_SP_Height1_Bit3	Height of the platform 1
	OBU_TR_SP_Right1	Side the platform 1 is on.
	OBU_TR_SP_Left1	Side the platform 1 is on.

From TCMS	To TCMS	Remark
	OBU_TR_SP_D_Entry2	Remaining distance from the max safe front end to the start location of the platform 2
	OBU_TR_SP_D_Exit2	Remaining distance from the min safe front end to the end location of the platform 2
	OBU_TR_SP_Height2_Bit0	Height of the platform 2
	OBU_TR_SP_Height2_Bit1	Height of the platform 2
	OBU_TR_SP_Height2_Bit2	Height of the platform 2
	OBU_TR_SP_Height2_Bit3	Height of the platform 2
	OBU_TR_SP_Right2	Side the platform 2 is on
	OBU_TR_SP_Left2	Side the platform 2 is on
	OBU_TR_SP_D_Entry3	Remaining distance from the max safe front end to the start location of the platform 3
	OBU_TR_SP_D_Exit3	Remaining distance from the min safe front end to the end location of the platform 3
	OBU_TR_SP_Height3_Bit0	Height of the platform 3
	OBU_TR_SP_Height3_Bit1	Height of the platform 3
	OBU_TR_SP_Heigh31_Bit2	Height of the platform 3
	OBU_TR_SP_Heigh31_Bit3	Height of the platform 3
	OBU_TR_SP_Right3	Side the platform 3 is on.
	OBU_TR_SP_Left3	Side the platform 3 is on.
	OBU_TR_SP_D_Entry4	Remaining distance from the max safe front end to the start location of the platform 4
	OBU_TR_SP_D_Exit4	Remaining distance from the min safe front end to the end location of the platform 4
	OBU_TR_SP_Height4_Bit0	Height of the platform 4
	OBU_TR_SP_Height4_Bit1	Height of the platform 4
	OBU_TR_SP_Height4_Bit2	Height of the platform 4
	OBU_TR_SP_Height4_Bit3	Height of the platform 4
	OBU_TR_SP_Right4	Side the platform 4 is on
	OBU_TR_SP_Left4	Side the platform 4 is on
	OBU_TR_SP_D_Entry5	Remaining distance from the max safe front end to the start location of the platform 5
	OBU_TR_SP_D_Exit5	Remaining distance from the min safe front end to the end location of the platform 5
	OBU_TR_SP_Height5_Bit0	Height of the platform 5
	OBU_TR_SP_Height5_Bit1	Height of the platform 5
	OBU_TR_SP_Height5_Bit2	Height of the platform 5
	OBU_TR_SP_Height5_Bit3	Height of the platform 5
	OBU_TR_SP_Right5	Side the platform 5 is on
	OBU_TR_SP_Left5	Side the platform 5 is on

6.2.18.4 Parameters and Settings

6.2.18.4.1 No relevant parameters

6.2.18.5 Functionality

6.2.18.5.1 Packet 10 may contain one or more door control data sets.

6.2.18.5.2 Packet 10 and Packet 2 (Odometric Data) shall be used in order to calculate the values for the required entry and exit points for the various track conditions

6.2.18.5.3 The beginning of each door control section described in Packet 10 is relative to a certain location on the track which is identified by the combination of identity number of the country or region where the reference balise group is located (NID_C_ETCS) and the identity number of a balise group or loop within the country or region defined by NID_C_ETCS (NID_BG_ETCS).

6.2.18.5.4 The beginning of each door control section as sent to the TCMS as defined in [Subset-119] is relative to the maximum safe front end of the train.

6.2.18.5.5 The end of each door control section as sent to the TCMS as defined in [Subset-119] is relative to the minimum safe front end of the train.

6.2.18.5.6

6.2.18.5.7 The distances and lengths shall be calculated following the principles as described in [Subset-026]

6.2.18.5.8 The distances for "OBU_TR_SP_D_EntryX" shall be calculated as follows:

Used variables	Origin	Remark
Q_SCALE	From Packet 10 (Door control)	
D_TRACKCOND_ETCS	From Packet 10 (Door control)	
Q_SCALE	From Packet 2 (Odometric Data)	
D_MAX_SAFE_FRONT_END_ETCS	From Packet 2 (Odometric Data)	

Step 1: calculate the raw value for OBU_TR_SP_D_EntryX from the safe front end of the train:

OBU_TR_SP_D_EntryX = D_TRACKCOND_ETCS - D_MAX_SAFE_FRONT_END_ETCS

Note: D_TRACKCOND_ETCS and D_MAX_SAFE_FRONT_END_ETCS shall be scaled depending on the respective value of Q_SCALE.

Step 2: Apply the encoding as specified in Subset-119, Table 5-21.

6.2.18.5.9 Note: Above calculation assumes identical NID_C_ETCS and NID_BG_ETCS as reference for Packet 2 and Packet 10. The ETCS principles for calculation of train position apply.

6.2.18.5.10 The distances for "OBU_TR_SP_D_ExitX" shall be calculated as follows:

Used variables	Origin	Remark
Q_SCALE	From Packet 10 (Door control)	Scale for distance / length
D_TRACKCOND_ETCS	From Packet 10 (Door control)	
L_TRACKCOND_ETCS	From Packet 10 (Door control)	
Q_SCALE	From Packet 2 (Odometric Data)	Length of the track condition
D_MIN_SAFE_FRONT_END_ETCS	From Packet 2 (Odometric Data)	Min safe front end of the train relative to the BG

Step 1: calculate the raw value for OBU_TR_SP_D_EntryX from the safe front end of the train:

OBU_TR_SP_D_ExitX = (D_TRACKCOND_ETCS + L_TRACKCOND_ETCS) - D_MIN_SAFE_FRONT_END_ETCS

Note: D_TRACKCOND_ETCS, L_TRACKCOND_ETCS, and D_MIN_SAFE_FRONT_END_ETCS shall be scaled depending on the respective value of Q_SCALE.

Step 2: Apply the encoding as specified in Subset-119, Table 5-22.
Due to the scaling as specified by Q_SCALE, OBU_TR_SP_D_EntryX and OBU_TR_SP_D_ExitX may be outside the transmissible range. In this case, the following table shall apply:

Raw OBU_TR_SP_D_EntryX or OBU_TR_SP_D_ExitX value	Encoded OBU_TR_SP_D_EntryX or OBU_TR_SP_D_ExitX value	Remark
<= Safe Front end (as relevant)	8000h	
>32766m	7FFFh	
<-32766m	8001h	

6.2.18.5.11 Note: Above calculation assumes identical NID_C_ETCS and NID_BG_ETCS as reference for Packet 2 and Packet 10. The ETCS principles for calculation of train position apply.

6.2.18.5.12 Packet 10 contains a list of 1-5 door information datasets, identifiable through the index variable N_ITER.

The variables are mapped to the TCMS variables according to the index.

6.2.18.5.13 Transcoding of the functional values:

Q_PLATFORM_ETCS (N_ITER)	OBU_TR_SP_LeftX	Remark
0	True	Index of N_ITER starting at 0, Index as defined in Subset-119 starting at 1
1	False	
2	True	
Q_PLATFORM_ETCS (N_ITER)	OBU_TR_SP_RightX	Remark
0	False	Index of N_ITER starting at 0, Index as defined in Subset-119 starting at 1
1	True	
2	True	
M_PLATFORM_ETCS (N_ITER) Bit 0	**OBU_TR_SP_HeightX_Bit1**	Remark
False	False	Index of N_ITER starting at 0, Index as defined in Subset-119 starting at 1
True	True	
M_PLATFORM_ETCS (N_ITER) Bit 1	**OBU_TR_SP_HeightX_Bit2**	Remark
False	False	Index of N_ITER starting at 0, Index as defined in Subset-119 starting at 1
True	True	
M_PLATFORM_ETCS (N_ITER) Bit 2	**OBU_TR_SP_HeightX_Bit3**	Remark
False	False	Index of N_ITER starting at 0, Index as defined in Subset-119 starting at 1
True	True	
M_PLATFORM_ETCS (N_ITER) Bit 3	**OBU_TR_SP_HeightX_Bit4**	Remark
False	False	Index of N_ITER starting at 0, Index as defined in Subset-119 starting at 1
True	True	

6.2.18.6 Timing

6.2.18.6.1 The ETCS sends Packet 10 sporadcially, whenever it is relevant.

6.2.19 Track description deletion

6.2.19.1 General

6.2.19.1.1 The ETCS may send track description deletion information to the TCMS

6.2.19.1.2 Track description deletion data are optional information sent to the train outside the scope of Subset-119, if implemented.

6.2.19.2 Interface

From	To	Remark
Packet 11		

6.2.19.3 TCMS Interface

From TCMS	To TCMS	Remark
	Packet 51	Optional

6.2.19.4 Parameters and Settings

The following parameters control the functionality of the Request Brake Tests:
P_TRDEL_ARCHITECTURE.

6.2.19.5 Functionality

6.2.19.5.1 The following table describes the mapping of the values in case P_ TRDEL _ARCHITECTURE is set to SBM_present:

P_TRDEL _ARCHITECTURE = TRDEL _present		
Packet 11	Packet 51	Remark
Received	Forwarded as-is	

6.2.19.5.2 The following table describes the mapping of the values in case P_LRU_ARCHITECTURE is set to LRU_not_present:

P_TRDEL_ARCHITECTURE =TRDEL_not_present		
Packet 11	Packet 51	Remark
Received	No Data are transmitted	

6.2.19.6 Timing

6.2.19.6.1 The ETCS sends Packet 11 sporadically (sending triggered by event).

6.2.20 Gradients

6.2.20.1 General

6.2.20.1.1 The ETCS Core may send gradient information to the TCMS

6.2.20.1.2 Gradient Information data are iptional information sent to the train outside the scope of Subset-119, if implemented.

6.2.20.2 ETCS Interface

From ETCS	To ETCS	Remark
Packet 14		

6.2.20.3 TCMS Interface

From TCMS	To TCMS	Remark
	Packet 54	Optional

6.2.20.4 Parameters and Settings

The following parameters control the functionality of the Request Brake Tests:
P_GRD_ARCHITECTURE.

6.2.20.5 Functionality

6.2.20.5.1 The following table describes the mapping of the values in case P_GRD_ARCHITECTURE is set to SBM_present:

P_GRD_ARCHITECTURE = GRD_present		
Packet 14	**Packet 54**	**Remark**
Received	Data forwarded as-is	

6.2.20.5.2 The following table describes the mapping of the values in case P_GRD_ARCHITECTURE is set to LRU_not_present:

P_GRD_ARCHITECTURE = GRD_not_present		
Packet 14	**Packet 54**	**Remark**
Received	No Data are transmitted	

6.2.20.6 Timing

6.2.20.6.1 The ETCS sends Packet 14 sporadically (sending triggered by event).

6.2.21 Train Status Data

6.2.21.1 General

6.2.21.2 ETCS Interface

From ETCS	To ETCS	Remark
	Packet 30	Variables listed are contained in Packet 30
	CIRCUIT_BREAKER_COHERENCY_TCMS	
	PANTOGRAPH_COHERENCY_TCMS	
	V_COLD_MOVE_STATE_TCMS	
	V_COLD_MOVE_STATE_TCMS_FILTERED	
	V_COMMANDING_EB_TCMS	
	V_COMMANDING_SB_TCMS	
	V_DESKS_STATE_TCMS	
	V_DESKS_STATE_TCMS_FILTERED	
	V_DIRCONT_STATE_TCMS	

	V_DIRCONT_STATE_TCMS_FILTERED	
	V_DRIVEREM_STATE_TCMS	
	V_DRIVEREM_STATE_TCMS_FILTERED	
	V_EB_STATE_TCMS	
	V_EB_STATE_TCMS_FILTERED	
	V_INTEGRITY_STATE_TCMS	
	V_INTEGRITY_STATE_TCMS_FILTERED	
	V_ISOLATION_STATE_TCMS	
	V_ISOLATION_STATE_TCMS_FILTERED	
	V_SB_STATE_TCMS	
	V_SB_STATE_TCMS_FILTERED	
	V_SLEEPING_STATE_TCMS	
	V_SLEEPING_STATE_TCMS_FILTERED	
	V__TILTING_STATE_TCMS	
	V__TILTING_STATE_TCMS_FILTERED	
	V_TRACTION_CUT_OFF_STATE_TCMS	
	V_TRACTION_CUT_OFF_STATE_TCMS_FILTERED	
	V_TRACTION_STATUS_TCMS	
	V_VIGIL_ACTION_STATE_TCMS	
	V_VIGIL_ACTION_STATE_TCMS_FILTERED	
	V_VIGIL_DISABLE_STATE_TCMS	
	V_VIGIL_DISABLE_STATE_TCMS_FILTERED	

6.2.21.3   TCMS Interface

From TCMS	To TCMS	Remark
TR_OBU_Brake_Status		Variable
TR_OBU_BrakePressure		Variable
TR_OBU_CabStatusA		Variable
TR_OBU_CabStatusB		Variable
TR_OBU_DirectionBW		Variable
TR_OBU_DirectionFW		Variable
TR_OBU_NTCIsolated		Variable
TR_OBU_PassiveShunting		Variable
TR_OBU_TiltingHealthStatus		Variable
TR_OBU_TiltingHealthStatus_Not		Variable
TR_OBU_Traction_Status		Variable
TR_OBU_TrainComposition		Variable
TR_OBU_TrainSleep		Variable
TR_OBU_TrainSleep_Not		Variable
T_CS_A		Hardwired
T_CS_B		Hardwired
T_FW_S		Hardwired
T_BW_S		Hardwired
T_PS_E		Hardwired
T_TH_S_N		Hardwired
T_TH_S_I		Hardwired
T_TR_S		Hardwired
T_SL_E_N		Hardwired
T_SL_E_I		Hardwired

6.2.21.4   Optional Vehicle Interface

From Optional Vehicle Interface	To Optional Vehicle Interface	Remark
Packet 60		Variables listed are contained in Packet 40
O_CIRCUIT_BREAKER_COHERENCY_TCMS		
O_PANTOGRAPH_COHERENCY_TCMS		
O_V_COLD_MOVE_STATE_TCMS		
O_V_COLD_MOVE_STATE_TCMS_FILTERED		

O_V_COMMANDING_EB_TCMS		
O_V_COMMANDING_SB_TCMS		
O_V_DESKS_STATE_TCMS		
O_V_DESKS_STATE_TCMS_FILTERED		
O_V_DIRCONT_STATE_TCMS		
O_V_DIRCONT_STATE_TCMS_FILTERED		
O_V_DRIVEREM_STATE_TCMS		
O_V_DRIVEREM_STATE_TCMS_FILTERED		
O_V_EB_STATE_TCMS		
O_V_EB_STATE_TCMS_FILTERED		
O_V_INTEGRITY_STATE_TCMS		
O_V_INTEGRITY_STATE_TCMS_FILTERED		
O_V_ISOLATION_STATE_TCMS		
O_V_ISOLATION_STATE_TCMS_FILTERED		
O_V_SB_STATE_TCMS		
O_V_SB_STATE_TCMS_FILTERED		
O_V_SLEEPING_STATE_TCMS		
O_V_SLEEPING_STATE_TCMS_FILTERED		
O_V__TILTING_STATE_TCMS		
O_V__TILTING_STATE_TCMS_FILTERED		
O_V_TRACTION_CUT_OFF_STATE_TCMS		
O_V_TRACTION_CUT_OFF_STATE_TCMS_FILTERED		
O_V_TRACTION_STATUS_TCMS		
O_V_VIGIL_ACTION_STATE_TCMS		
O_V_VIGIL_ACTION_STATE_TCMS_FILTERED		
O_V_VIGIL_DISABLE_STATE_TCMS		
O_V_VIGIL_DISABLE_STATE_TCMS_FILTERED		

6.2.21.5 Emergency Brake Status

6.2.21.5.1 The following table describes the mapping of the values in case P_V_EB_STATE_TCMS_FILTERED is set to EB_S_F_not_present:

P_V_EB_STATE_TCMS_FILTERED = EB_S_F_not_present		
	V_EB_STATE_TCMS_FILTERED	Remark
	3 Information_not_available	

6.2.21.5.2 The following table describes the mapping of the values in case P_V_EB_STATE_TCMS_FILTERED is set to EB_S_F_EXT:

P_V_EB_STATE_TCMS_FILTERED = EB_S_F_EXT		
O_ V_EB_STATE_TCMS_FILTERED	V_EB_STATE_TCMS_FILTERED	Remark
0 EB_not_applied	0 EB_not_applied	
1 EB_applied	1 EB_applied	
2 Fail_state (of the sensor)	2 Fail_state (of the sensor)	
3 Information_not_available	3 Information_not_available	

6.2.21.5.3 The following table describes the mapping of the values in case P_V_EB_STATE_TCMS is set to EB_S_ not_present:

P_V_EB_STATE_TCMS = EB_S_ not_presen		
	V_EB_STATE_TCMS	Remark
	3 Information_not_available	

6.2.21.5.4 The following table describes the mapping of the values in case
P_V_EB_STATE_TCMS_FILTERED is set to EB_S_F_EXT:

P_V_EB_STATE_TCMS = EB_S_F_EXT		
O_ V_EB_STATE_TCMS	V_EB_STATE_TCMS	Remark
0 EB_not_applied	0 EB_not_applied	
1 EB_applied	1 EB_applied	
2 Fail_state (of the sensor)	2 Fail_state (of the sensor)	
3 Information_not_available	3 Information_not_available	

6.2.21.5.5 The SB status is sent at each computer cycle.

6.2.21.6 Service Brake Status

6.2.21.6.1 The following table describes the mapping of the values in case
P_V_SB_STATE_TCMS_FILTERED is set to SB_S_F_not_present:

P_V_SB_STATE_TCMS_FILTERED = SB_S_F_not_present		
	V_SB_STATE_TCMS_FILTERED	Remark
	3 Information_not_available	

6.2.21.6.2 The following table describes the mapping of the values in case
P_V_SB_STATE_TCMS_FILTERED is set to SB_S_F_EXT:

P_V_SB_STATE_TCMS_FILTERED = SB_S_F_EXT		
O_ V_SB_STATE_TCMS_FILTERED	V_SB_STATE_TCMS_FILTERED	Remark
0 EB_not_applied	0 EB_not_applied	
1 EB_applied	1 EB_applied	
2 Fail_state (of the sensor)	2 Fail_state (of the sensor)	
3 Information_not_available	3 Information_not_available	

6.2.21.6.3 The following table describes the mapping of the values in case P_V_SB_STATE_TCMS is set to
SB_S_ not_present:

P_V_EB_STATE_TCMS = SB_S_ not_present		
	V_SB_STATE_TCMS	Remark
	3 Information_not_available	

6.2.21.6.4 The following table describes the mapping of the values in case
P_V_SB_STATE_TCMS_FILTERED is set to SB_S_F_EXT:

P_V_SB_STATE_TCMS = SB_S_F_EXT		
O_ V_SB_STATE_TCMS	V_SB_STATE_TCMS	Remark
0 EB_not_applied	0 EB_not_applied	
1 EB_applied	1 EB_applied	
2 Fail_state (of the sensor)	2 Fail_state (of the sensor)	
3 Information_not_available	3 Information_not_available	

6.2.21.6.5 The SB status is sent at each computer cycle.

6.2.21.7 Traction Cut Off State

6.2.21.7.1 The following table describes the mapping of the values in case P_V_TRACTION_CUT_OFF_STATE_TCMS_FILTERED is set to TCO_S_F_not_present:

P_V_TRACTION_CUT_OFF_STATE_TCMS_FILTERED = TCO_S_F_not_present		
	V_TRACTION_CUT_OFF_STATE_TCMS_FILTERED	Remark
	3 Information_not_available	

6.2.21.7.2 The following table describes the mapping of the values in case P_V_SB_STATE_TCMS_FILTERED is set to TCO_S_F_EXT:

P_V_SB_STATE_TCMS_FILTERED = SB_S_F_EXT		
O_ V_TRACTION_CUT_OFF_STATE_TCMS_FILTERED	V_TRACTION_CUT_OFF_STATE_TCMS_FILTERED	Remark
0 Traction cut off is disabled	0 Traction cut off is disabled	
1 Traction cut off is enabled	1 Traction cut off is enabled	
2 Fail_state (of the sensor)	2 Fail_state (of the sensor)	
3 Information_not_available	3 Information_not_available	

6.2.21.7.3 The following table describes the mapping of the values in case P_V_TRACTION_CUT_OFF_STATE_TCMS is set to TCO_S_ not_present:

P_V_TRACTION_CUT_OFF_STATE_TCMS = TCO_S_not_present		
	V_TRACTION_CUT_OFF_STATE_TCMS	Remark
	3 Information_not_available	

6.2.21.7.4 The following table describes the mapping of the values in case P_V_SB_STATE_TCMS_FILTERED is set to TCO_S_F_EXT:

P_V_SB_STATE_TCMS_FILTERED = SB_S_F_EXT		
O_ V_TRACTION_CUT_OFF_STATE_TCMS	V_TRACTION_CUT_OFF_STATE_TCMS	Remark
0 Traction cut off is disabled	0 Traction cut off is disabled	
1 Traction cut off is enabled	1 Traction cut off is enabled	
2 Fail_state (of the sensor)	2 Fail_state (of the sensor)	
3 Information_not_available	3 Information_not_available	

6.2.21.7.5 The traction cut off status is sent at each computer cycle.

6.2.21.8 Isolation State

6.2.21.8.1 The following table describes the mapping of the values in case P_V_ISOLATION_STATE_TCMS_FILTERED is set to TCO_S_F_not_present:

P_V_ISOLATION_STATE_TCMS_FILTERED = I_S_F_not_present:		
	V_TRACTION_CUT_OFF_STATE_TCMS_FILTERED	Remark
	3 Information_not_available	

6.2.21.8.2 The following table describes the mapping of the values in case P_V_ISOLATION_STATE_TCMS_FILTERED is set to TCO_S_F_EXT:

P_V_ISOLATION_STATE_TCMS_FILTERED = I_S_F_EXT:		
O_ V_ISOLATION_STATE_TCMS_FILTERED	V_ISOLATION_STATE_TCMS_FILTERED	Remark

0 Isolated	0 Isolated	
1 Not_isolated	1 Not_isolated	
2 Fail_state (of the sensor)	2 Fail_state (of the sensor)	
3 Information_not_available	3 Information_not_available	

6.2.21.8.3 The following table describes the mapping of the values in case
P_V_ISOLATION_STATE_TCMS is set to TCO_S_ not_present:

P_V_ISOLATION_STATE_TCMS = I_S _not_present:		
	V_TRACTION_CUT_OFF_STATE_TCMS	Remark
	3 Information_not_available	

6.2.21.8.4 The following table describes the mapping of the values in case
P_V_ISOLATION_STATE_TCMS_FILTERED is set to TCO_S_F_EXT:

P_V_ISOLATION_STATE_TCMS = I_S_ EXT:		
O_ V_ISOLATION_STATE_TCMS	V_ISOLATION_STATE_TCMS	Remark
0 Isolated	0 Isolated	
1 Not_isolated	1 Not_isolated	
2 Fail_state (of the sensor)	2 Fail_state (of the sensor)	
3 Information_not_available	3 Information_not_available	

6.2.21.8.5 The isolation status is sent at each computer cycle.

6.2.21.9 Sleeping State

6.2.21.9.1 The following table describes the mapping of the values in case
P_V_SLEEPING_STATE_TCMS_FILTERED is set to SL_S_F_not_present:

P_V_SLEEPING_STATE_TCMS_FILTERED is set to SL_S_F_not_present:		
	V_SLEEPING_STATE_TCMS_FILTERED	Remark
	3 Information_not_available	

6.2.21.9.2 The following table describes the mapping of the values in case
P_V_SLEEPING_STATE_TCMS_FILTERED is set to SL_S_F_TCMS:

P_V_SLEEPING_STATE_TCMS_FILTERED = SL_S_F_TCMS			
TR_OBU_TrainSleep	TR_OBU_TrainSleep_Not	V_SLEEPING_STATE_TCMS_FILTERED	Remark
0	0	2 Fail_state (of the sensor)	
0	1	1 Do not go to sleeping	
1	0	0 Go to sleepinng	
1	1	2 Fail_state (of the sensor)	

6.2.21.9.3 The following table describes the mapping of the values in case
P_V_SLEEPING_STATE_TCMS_FILTERED is set to TCO_S_F_EXT:

P_V_SLEEPING_STATE_TCMS_FILTERED = SL_S_F_EXT		
O_V_SLEEPING_STATE_TCMS_FILTERED	V_SLEEPING_STATE_TCMS_FILTERED	Remark
0 Go to sleepinng	0 Go to sleepinng	
1 Do not go to sleeping	1 Do not go to sleeping	
2 Fail_state (of the sensor)	2 Fail_state (of the sensor)	
3 Information_not_available	3 Information_not_available	

6.2.21.9.4 The following table describes the mapping of the values in case
P_V_SLEEPING_STATE_TCMS_FILTERED is set to SL_S_F_HW:

P_V_SLEEPING_STATE_TCMS_FILTERED = SL_S_F_HW			
T_SL_E_N	T_SL_E_I	V_SLEEPING_STATE_TCMS_FILTERED	Remark
0	0	2 Fail_state (of the sensor)	
0	1	1 Do not go to sleeping	
1	0	0 Go to sleepinng	
1	1	2 Fail_state (of the sensor)	

6.2.21.9.5 The following table describes the mapping of the values in case P_V_SLEEPING_STATE_TCMS
is set to SL_S_not_present:

P_V_SLEEPING_STATE_TCMS is set to SL_S_not_present:		
	V_SLEEPING_STATE_TCMS	Remark
	3 Information_not_available	

6.2.21.9.6 The following table describes the mapping of the values in case P_V_SLEEPING_STATE_TCMS
is set to SL_S_TCMS:

P_V_SLEEPING_STATE_TCMS = SL_S_TCMS			
TR_OBU_TrainSleep	TR_OBU_TrainSleep_Not	V_SLEEPING_STATE_TCMS	Remark
0	0	2 Fail_state (of the sensor)	
0	1	1 Do not go to sleeping	
1	0	0 Go to sleeping	
1	1	2 Fail_state (of the sensor)	

6.2.21.9.7 The following table describes the mapping of the values in case P_V_SLEEPING_STATE_TCMS
is set to SL_S_EXT:

P_V_SLEEPING_STATE_TCMS = SL_S_EXT		
O_V_SLEEPING_STATE_TCMS	V_SLEEPING_STATE_TCMS	Remark
0 Go to sleepinng	0 Go to sleepinng	
1 Do not go to sleeping	1 Do not go to sleeping	
2 Fail_state (of the sensor)	2 Fail_state (of the sensor)	
3 Information_not_available	3 Information_not_available	

6.2.21.9.8 The following table describes the mapping of the values in case
P_V_SLEEPING_STATE_TCMS_FILTERED is set to SL_S_F_HW:

P_V_SLEEPING_STATE_TCMS = SL_S_HW			
T_SL_E_N	T_SL_E_I	V_SLEEPING_STATE_TCMS	Remark
0	0	2 Fail_state (of the sensor)	
0	1	1 Do not go to sleeping	
1	0	0 Go to sleepinng	
1	1	2 Fail_state (of the sensor)	

6.2.21.10 Tilting State

6.2.21.10.1 The following table describes the mapping of the values in case
P_V__TILTING_STATE_TCMS_FILTERED is set to TLT_S_F_not_present:

P_V__TILTING_STATE_TCMS_FILTERED = TLT_S_F_not_present:		
	V__TILTING_STATE_TCMS_FILTERED	Remark
	3 Information_not_available	

6.2.21.10.2 The following table describes the mapping of the values in case P_V__TILTING_STATE_TCMS_FILTERED is set to TLT_S_F_TCMS:

P_V__TILTING_STATE_TCMS_FILTERED = TLT_S_F_TCMS			
TR_OBU_TiltingHealthStatus	TR_OBU_TiltingHealthStatus_Not	V__TILTING_STATE_TCMS_FILTERED	Remark
0	0	2 Fail_state (of the sensor)	
0	1	1 Tilting_system_is_passive	
1	0	0 Tilting_system_is_active	
1	1	2 Fail_state (of the sensor)	

6.2.21.10.3 The following table describes the mapping of the values in case P_V__TILTING_STATE_TCMS_FILTERED is set to TLT_S_F_EXT:

P_V__TILTING_STATE_TCMS_FILTERED = TLT_S_F_EXT		
O_ V__TILTING_STATE_TCMS_FILTERED	V__TILTING_STATE_TCMS_FILTERED	Remark
0 Tilting_system_is_active	0 Tilting_system_is_active	
1 Tilting_system_is_passive	1 Tilting_system_is_passive	
2 Fail_state (of the sensor)	2 Fail_state (of the sensor)	
3 Information_not_available	3 Information_not_available	

6.2.21.10.4 The following table describes the mapping of the values in case P_V__TILTING_STATE_TCMS_FILTERED is set to SL_S_F_HW:

P_V__TILTING_STATE_TCMS_FILTERED = TLT_S_F_HW			
T_TH_S_N	T_TH_S_I	V__TILTING_STATE_TCMS_FILTERED	Remark
0	0	2 Fail_state (of the sensor)	
0	1	1 Tilting_system_is_passive	
1	0	0 Tilting_system_is_active	
1	1	2 Fail_state (of the sensor)	

6.2.21.10.5 The following table describes the mapping of the values in case P_V__TILTING_STATE_TCMS is set to TLT_S_not_present:

P_V__TILTING_STATE_TCMS = TLT_S_not_present:		
	V__TILTING_STATE_TCMS	Remark
	3 Information_not_available	

6.2.21.10.6 The following table describes the mapping of the values in case P_V__TILTING_STATE_TCMS_FILTERED is set to TLT_S_F_TCMS:

P_V__TILTING_STATE_TCMS = TLT_S_ TCMS			
TR_OBU_TiltingHealthStatus	TR_OBU_TiltingHealthStatus_Not	V__TILTING_STATE_TCMS	Remark
0	0	2 Fail_state (of the sensor)	
0	1	1 Tilting_system_is_passive	
1	0	0 Tilting_system_is_active	
1	1	2 Fail_state (of the sensor)	

6.2.21.10.7 The following table describes the mapping of the values in case P_V__TILTING_STATE_TCMS is set to TLT_S_ EXT

P_V__TILTING_STATE_TCMS = TLT_EXT		
O_ V__TILTING_STATE_TCMS	V__TILTING_STATE_TCMS	Remark
0 Tilting_system_is_active	0 Tilting_system_is_active	
1 Tilting_system_is_passive	1 Tilting_system_is_passive	
2 Fail_state (of the sensor)	2 Fail_state (of the sensor)	
3 Information_not_available	3 Information_not_available	

6.2.21.10.8 The following table describes the mapping of the values in case P_V__TILTING_STATE_TCMS is set to SL_S_ HW:

P_V__TILTING_STATE_TCMS = TLT_S_F_HW			
T_TH_S_N	T_TH_S_I	V__TILTING_STATE_TCMS	Remark
0	0	2 Fail_state (of the sensor)	
0	1	1 Tilting_system_is_passive	
1	0	0 Tilting_system_is_active	
1	1	2 Fail_state (of the sensor)	

6.2.21.11   Direction Controller State

6.2.21.11.1 The following table describes the mapping of the values in case P_V_DIRCONT_STATE_TCMS_FILTERED is set to DIR_S_F_not_present:

P_V_DIRCONT_STATE_TCMS_FILTERED = DIR_S_F_not_present:		
	V_DIRCONT_STATE_TCMS_FILTERED	Remark
	7 Information_not_available	

6.2.21.11.2 The following table describes the mapping of the values in case P_V_DIRCONT_STATE_TCMS_FILTERED is set to DIR_S_F_TCMS:

P_V_DIRCONT_STATE_TCMS_FILTERED = DIR_S_F_TCMS			
TR_OBU_DirectionFW	TR_OBU_DirectionBW	V_DIRCONT_STATE_TCMS_FILTERED	Remark
0	0	0 Neutral	
1	0	1 Forward	
0	1	2 Backward	
1	1	6 Fail_state (of the sensor)	

6.2.21.11.3 The following table describes the mapping of the values in case P_V_DIRCONT_STATE_TCMS_FILTERED is set to DIR_S_F_EXT:

P_V_DIRCONT_STATE_TCMS_FILTERED = DIR_S_F_EXT		
O_ V_DIRCONT_STATE_TCMS_FILTERED	V_DIRCONT_STATE_TCMS_FILTERED	Remark
0 Neutral	0 Neutral	
1 Forward	1 Forward	
2 Backward	2 Backward	
3 Spare	3 Spare	
4 Spare	4 Spare	
5 Spare	5 Spare	
6 Fail_state (of the sensor)	6 Fail_state (of the sensor)	
7 Information_not_available	7 Information_not_available	

6.2.21.11.4 The following table describes the mapping of the values in case P_V_DIRCONT_STATE_TCMS_FILTERED is set to DIR_S_F_HW:

P_V_DIRCONT_STATE_TCMS_FILTERED = DIR_S_F_HW			
T_FW_S	T_BW_S	V_DIRCONT_STATE_TCMS_FILTERED	Remark
0	0	0 Neutral	
1	0	1 Forward	
0	1	2 Backward	
1	1	6 Fail_state (of the sensor)	

6.2.21.11.5 The following table describes the mapping of the values in case P_V_DIRCONT_STATE_TCMS is set to DIR_S_not_present:

P_V_DIRCONT_STATE_TCMS = DIR_S_ not_present:		
	V_DIRCONT_STATE_TCMS	**Remark**
	7 Information_not_available	

6.2.21.11.6 The following table describes the mapping of the values in case P_V_DIRCONT_STATE_TCMS_FILTERED is set to DIR_S_F_TCMS:

P_V_DIRCONT_STATE_TCMS = DIR_S_TCMS			
TR_OBU_DirectionFW	**TR_OBU_DirectionBW**	**V_DIRCONT_STATE_TCMS**	**Remark**
0	0	0 Neutral	
1	0	1 Forward	
0	1	2 Backward	
1	1	6 Fail_state (of the sensor)	

6.2.21.11.7 The following table describes the mapping of the values in case P_V_DIRCONT_STATE_TCMS is set to DIR_S_ EXT:

P_V_DIRCONT_STATE_TCMS_FILTERED = DIR_S_EXT		
O_ V_DIRCONT_STATE_TCMS	**V_DIRCONT_STATE_TCMS**	**Remark**
0 Neutral	0 Neutral	
1 Forward	1 Forward	
2 Backward	2 Backward	
3 Spare	3 Spare	
4 Spare	4 Spare	
5 Spare	5 Spare	
6 Fail_state (of the sensor)	6 Fail_state (of the sensor)	
7 Information_not_available	7 Information_not_available	

6.2.21.11.8 The following table describes the mapping of the values in case P_V_DIRCONT_STATE_TCMS is set to DIR_S_HW:

P_V_DIRCONT_STATE_TCMS = DIR_S_HW			
T_FW_S	**T_BW_S**	**V_DIRCONT_STATE_TCMS**	**Remark**
0	0	0 Neutral	
1	0	1 Forward	
0	1	2 Backward	
1	1	6 Fail_state (of the sensor)	

6.2.21.11.9 Direction Controller Data are sent at every computer cycle

6.2.21.12 Desks

6.2.21.12.1 The following table describes the mapping of the values in case P_V_DESKS_STATE_TCMS_FILTERED is set to DSK_S_F_not_present:

P_V_DESKS_STATE_TCMS_FILTERED = DSK _S_F_not_present:		
	V_DESKS_STATE_TCMS_FILTERED	**Remark**
	7 Information_not_available	

6.2.21.12.2 The following table describes the mapping of the values in case P_V_DESKS_STATE_TCMS_FILTERED is set to DSK_S_F_TCMS:

P_V_DESKS_STATE_TCMS_FILTERED = DSK_S_F_TCMS			
TR_OBU_DirectionFW	**TR_OBU_DirectionBW**	**V_DESKS_STATE_TCMS_FILTERED**	**Remark**
0	0	3 No_desk_open	

1	0	0 Desk_A_open_only	
0	1	1 Desk_B_open_only	
1	1	6 Fail_state (of the sensor)	

6.2.21.12.3 The following table describes the mapping of the values in case
P_V_DESKS_STATE_TCMS_FILTERED is set to DSK_S_F_EXT:

P_V_DESKS_STATE_TCMS_FILTERED = DSK_S_F_EXT		
O_V_DESKS_STATE_TCMS_FILTERED	V_DESKS_STATE_TCMS_FILTERED	Remark
0 Desk_A_open_only	0 Desk_A_open_only	
1 Desk_B_open_only	1 Desk_B_open_only	
2 Desk_A_and_desk_B_open	2 Desk_A_and_desk_B_open	
3 No_desk_open	3 No_desk_open	
4 Spare	4 Spare	
5 Spare	5 Spare	
6 Fail_state (of the sensor)	6 Fail_state (of the sensor)	
7 Information_not_available	7 Information_not_available	

6.2.21.12.4 The following table describes the mapping of the values in case
P_V_DESKS_STATE_TCMS_FILTERED is set to DSK_S_F_HW:

P_V_DESKS_STATE_TCMS_FILTERED = DSK_S_F_HW			
T_CS_A	T_CS_B	V_DESKS_STATE_TCMS_FILTERED	Remark
0	0	3 No_desk_open	
1	0	0 Desk_A_open_only	
0	1	1 Desk_B_open_only	
1	1	6 Fail_state (of the sensor)	

6.2.21.12.5 The following table describes the mapping of the values in case P_V_DESKS_STATE_TCMS is
set to DSK_S_ not_present:

P_V_DESKS_STATE_TCMS = DSK _S_ not_present:		
	V_DESKS_STATE_TCMS	Remark
	7 Information_not_available	

6.2.21.12.6 The following table describes the mapping of the values in case P_V_DESKS_STATE_TCMS is
set to DSK_S_TCMS:

P_V_DESKS_STATE_TCMS = DSK_S_TCMS			
TR_OBU_DirectionFW	TR_OBU_DirectionBW	V_DESKS_STATE_TCMS	Remark
0	0	3 No_desk_open	
1	0	0 Desk_A_open_only	
0	1	1 Desk_B_open_only	
1	1	6 Fail_state (of the sensor)	

6.2.21.12.7 The following table describes the mapping of the values in case P_V_DESKS_STATE_TCMS is
set to DSK_S_EXT:

P_V_DESKS_STATE_TCMS = DSK_S_EXT		
O_V_DESKS_STATE_TCMS	V_DESKS_STATE_TCMS	Remark
0 Desk_A_open_only	0 Desk_A_open_only	
1 Desk_B_open_only	1 Desk_B_open_only	
2 Desk_A_and_desk_B_open	2 Desk_A_and_desk_B_open	
3 No_desk_open	3 No_desk_open	
4 Spare	4 Spare	
5 Spare	5 Spare	
6 Fail_state (of the sensor)	6 Fail_state (of the sensor)	

7 Information_not_available	7 Information_not_available	

6.2.21.12.8 The following table describes the mapping of the values in case P_V_DESKS_STATE_TCMS is set to DSK_S_HW:

P_V_DESKS_STATE_TCMS = DSK_S_HW			
T_CS_A	**T_CS_B**	**V_DESKS_STATE_TCMS**	**Remark**
0	0	3 No_desk_open	
1	0	0 Desk_A_open_only	
0	1	1 Desk_B_open_only	
1	1	6 Fail_state (of the sensor)	

6.2.21.12.9 Desk status data is sent at every computer cycle

6.2.21.13 Train Integrity

6.2.21.13.1 The following table describes the mapping of the values in case P_V_INTEGRITY_STATE_TCMS_FILTERED is set to TINT_S_F_not_present:

P_V_INTEGRITY_STATE_TCMS_FILTERED = TINT _S_ not_present:		
	V_INTEGRITY_STATE_TCMS_FILTERED	**Remark**
	3 Information_not_available	

6.2.21.13.2 The following table describes the mapping of the values in case P_V_INTEGRITY_STATE_TCMS_FILTERED is set to TINT_S_F_EXT:

P_V_INTEGRITY_STATE_TCMS_FILTERED = TINT_S_EXT		
O_ V_INTEGRITY_STATE_TCMS_FILTERED	**V_INTEGRITY_STATE_TCMS_FILTERED**	**Remark**
0 Train_integrity_not_OK	0 Train_integrity_not_OK	
1 Train_integrity_OK	1 Train_integrity_OK	
2 Fail_state (of the sensor)	2 Fail_state (of the sensor)	
3 Information_not_available	3 Information_not_available	

6.2.21.13.3 The following table describes the mapping of the values in case P_V_INTEGRITY_STATE_TCMS is set to TINT_S_not_present:

P_V_INTEGRITY_STATE_TCMS = TINT _S_ not_present:		
	V_INTEGRITY_STATE_TCMS	**Remark**
	3 Information_not_available	

6.2.21.13.4 The following table describes the mapping of the values in case P_V_INTEGRITY_STATE_TCMS_FILTERED is set to TINT_S_F_EXT:

P_V_INTEGRITY_STATE_TCMS = TINT_S_EXT		
O_ V_INTEGRITY_STATE_TCMS	**V_INTEGRITY_STATE_TCMS**	**Remark**
0 Train_integrity_not_OK	0 Train_integrity_not_OK	
1 Train_integrity_OK	1 Train_integrity_OK	
2 Fail_state (of the sensor)	2 Fail_state (of the sensor)	
3 Information_not_available	3 Information_not_available	

6.2.21.13.5 Train integrity data is sent at every computer cycle

6.2.21.14 Driver emergency button

6.2.21.14.1 The following table describes the mapping of the values in case
P_V_DRIVEREM_STATE_TCMS_FILTERED is set to DEM_S_F_not_present:

P_V_DRIVEREM_STATE_TCMS_FILTERED = DEM_S_F_not_present:		
	V_DRIVEREM_STATE_TCMS_FILTERED	Remark
	3 Information_not_available	

6.2.21.14.2 The following table describes the mapping of the values in case
P_V_DRIVEREM_STATE_TCMS_FILTERED is set to DEM_S_F_EXT:

P_V_DRIVEREM_STATE_TCMS_FILTERED = DEM_S_F_EXT		
O_V_DRIVEREM_STATE_TCMS_FILTERED	V_DRIVEREM_STATE_TCMS_FILTERED	Remark
0 Emergency_button_pushed	0 Emergency_button_pushed	
1 Emergency_button_released	1 Emergency_button_released	
2 Fail_state (of the sensor)	2 Fail_state (of the sensor)	
3 Information_not_available	3 Information_not_available	

6.2.21.14.3 The following table describes the mapping of the values in case
P_V_DRIVEREM_STATE_TCMS is set to DEM_S_not_present:

P_V_DRIVEREM_STATE_TCMS = DEM_S_not_present:		
	V_DRIVEREM_STATE_TCMS	Remark
	3 Information_not_available	

6.2.21.14.4 The following table describes the mapping of the values in case
P_V_DRIVEREM_STATE_TCMS_FILTERED is set to DEM_S_F_EXT:

P_V_DRIVEREM_STATE_TCMS_FILTERED = DEM_S_EXT		
O_V_DRIVEREM_STATE_TCMS	V_DRIVEREM_STATE_TCMS	Remark
0 Emergency_button_pushed	0 Emergency_button_pushed	
1 Emergency_button_released	1 Emergency_button_released	
2 Fail_state (of the sensor)	2 Fail_state (of the sensor)	
3 Information_not_available	3 Information_not_available	

6.2.21.14.5 Driver emergency button data is sent at every computer cycle

6.2.21.15 Driver vigilance sensor

6.2.21.15.1 The following table describes the mapping of the values in case
P_V_VIGIL_ACTION_STATE_TCMS_FILTERED is set to VA_S_F_not_present:

P_V_VIGIL_ACTION_STATE_TCMS_FILTERED = VA_S_F_not_present:		
	V_VIGIL_ACTION_STATE_TCMS_FILTERED	Remark
	3 Information_not_available	

6.2.21.15.2 The following table describes the mapping of the values in case P_V_VIGIL_ACTION_STATE_TCMS_FILTERED is set to VA_S_F_EXT:

P_V_VIGIL_ACTION_STATE_TCMS_FILTERED = VA_S_F_EXT		
O_V_VIGIL_ACTION_STATE_TCMS_FILTERED	V_VIGIL_ACTION_STATE_TCMS_FILTERED	Remark
0 Driver_reaction	0 Driver_reaction	
1 No_driver_reaction	1 No_driver_reaction	
2 Fail_state (of the sensor)	2 Fail_state (of the sensor)	
3 Information_not_available	3 Information_not_available	

6.2.21.15.3 The following table describes the mapping of the values in case P_V_VIGIL_ACTION_STATE_TCMS is set to VA_S_ not_present:

P_V_VIGIL_ACTION_STATE_TCMS = VA_S_ not_present:		
	V_VIGIL_ACTION_STATE_TCMS	Remark
	3 Information_not_available	

6.2.21.15.4 The following table describes the mapping of the values in case P_V_VIGIL_ACTION_STATE_TCMS_FILTERED is set to VA_S_F_EXT:

P_V_VIGIL_ACTION_STATE_TCMS = VA_S_EXT		
O_V_VIGIL_ACTION_STATE_TCMS	V_VIGIL_ACTION_STATE_TCMS	Remark
0 Driver_reaction	0 Driver_reaction	
1 No_driver_reaction	1 No_driver_reaction	
2 Fail_state (of the sensor)	2 Fail_state (of the sensor)	
3 Information_not_available	3 Information_not_available	

6.2.21.15.5 Driver vigilance sensor data is sent at every computer cycle

6.2.21.16 State of the external vigilance system

6.2.21.16.1 The following table describes the mapping of the values in case P_V_VIGIL_DISABLE_STATE_TCMS_FILTERED is set to VDS_S_F_not_present:

P_V_VIGIL_DISABLE_STATE_TCMS_FILTERED = VDS_S_F_not_present:		
	V_VIGIL_DISABLE_STATE_TCMS_FILTERED	Remark
	3 Information_not_available	

6.2.21.16.2 The following table describes the mapping of the values in case P_V_VIGIL_DISABLE_STATE_TCMS_FILTERED is set to VDS_S_F_EXT:

P_V_VIGIL_DISABLE_STATE_TCMS_FILTERED = VDS_S_F_EXT		
O_V_VIGIL_DISABLE_STATE_TCMS_FILTERED	V_VIGIL_DISABLE_STATE_TCMS_FILTERED	Remark
0 External vigilance system active	0 External vigilance system active	
1 External vigilance system not active	1 External vigilance system not active	
2 Fail_state (of the sensor)	2 Fail_state (of the sensor)	
3 Information_not_available	3 Information_not_available	

6.2.21.16.3 The following table describes the mapping of the values in case
P_V_VIGIL_DISABLE_STATE_TCMS is set to VDS_S_not_present:

P_V_VIGIL_DISABLE_STATE_TCMS = VDS_S_not_present:		
	V_VIGIL_DISABLE_STATE_TCMS	**Remark**
	3 Information_not_available	

6.2.21.16.4 The following table describes the mapping of the values in case
P_V_VIGIL_DISABLE_STATE_TCMS_FILTERED is set to VDS_S_F_EXT:

P_V_VIGIL_DISABLE_STATE_TCMS = VDS_S_ EXT		
O_V_VIGIL_DISABLE_STATE_TCMS	**V_VIGIL_DISABLE_STATE_TCMS**	**Remark**
0 External vigilance system active	0 External vigilance system active	
1 External vigilance system not active	1 External vigilance system not active	
2 Fail_state (of the sensor)	2 Fail_state (of the sensor)	
3 Information_not_available	3 Information_not_available	

6.2.21.16.5 Driver vigilance sensor data is sent at every computer cycle

6.2.21.17 Train movement used when the onboard is powered off

6.2.21.17.1 The following table describes the mapping of the values in case
P_V_COLD_MOVE_STATE_TCMS_FILTERED is set to CM_S_F_not_present:

P_V_COLD_MOVE_STATE_TCMS_FILTERED = CM_S_F_not_present:		
	V_COLD_MOVE_STATE_TCMS_FILTERED	**Remark**
	3 Information_not_available	

6.2.21.17.2 The following table describes the mapping of the values in case
P_V_COLD_MOVE_STATE_TCMS_FILTERED is set to CM_S_F_EXT:

P_V_COLD_MOVE_STATE_TCMS_FILTERED = CM_S_F_EXT		
O_V_COLD_MOVE_STATE_TCMS_FILTERED	**V_COLD_MOVE_STATE_TCMS_FILTERED**	**Remark**
0 No movement	0 No movement	
1 Detected movement	1 Detected movement	
2 Fail_state (of the sensor)	2 Fail_state (of the sensor)	
3 Information_not_available	3 Information_not_available	

6.2.21.17.3 The following table describes the mapping of the values in case
P_V_COLD_MOVE_STATE_TCMS is set to CM_S_not_present:

P_V_COLD_MOVE_STATE_TCMS = CM_S_ not_present:		
	V_COLD_MOVE_STATE_TCMS	**Remark**
	3 Information_not_available	

6.2.21.17.4 The following table describes the mapping of the values in case
P_V_COLD_MOVE_STATE_TCMS is set to CM_S_ EXT:

P_V_COLD_MOVE_STATE_TCMS = CM_S_ EXT		
O_V_COLD_MOVE_STATE_TCMS	V_COLD_MOVE_STATE_TCMS	Remark
0 No movement	0 No movement	
1 Detected movement	1 Detected movement	
2 Fail_state (of the sensor)	2 Fail_state (of the sensor)	
3 Information_not_available	Information_not_available	

6.2.21.17.5 Train movement used when the onboard is powered off data is sent at every computer cycle

6.2.21.18 Information from the sensor of the circuit breaker state.

6.2.21.18.1 The following table describes the mapping of the values in case P_CIRCUIT_BREAKER_COHERENCY_TCMS_TCMS is set to CBC_S_not_present:

P_CIRCUIT_BREAKER_COHERENCY_TCMS_TCMS = CBC_S_ not_present:		
	CIRCUIT_BREAKER_COHERENCY_TCMS	Remark
	5 Information_not_available	

6.2.21.18.2 The following table describes the mapping of the values in case P_CIRCUIT_BREAKER_COHERENCY_TCMS_TCMS is set to CBC_S_ EXT:

P_CIRCUIT_BREAKER_COHERENCY_TCMS_TCMS = CBC_S_ EXT		
O_CIRCUIT_BREAKER_COHERENCY_TCMS	CIRCUIT_BREAKER_COHERENCY_TCMS	Remark
0 CIRCUIT_BREAKER_CLOSED_OK	0 CIRCUIT_BREAKER_CLOSED_OK	
1 CIRCUIT_BREAKER_CLOSED_NOT_OK	1 CIRCUIT_BREAKER_CLOSED_NOT_OK	
2 CIRCUIT_BREAKER_OPEN_OK	2 CIRCUIT_BREAKER_OPEN_OK	
3 CIRCUIT_BREAKER_OPEN_NOT_OK	3 CIRCUIT_BREAKER_OPEN_NOT_OK	
4 FAIL_STATE	4 FAIL_STATE	
5 INFORMATION_NOT_AVAILABLE	5 INFORMATION_NOT_AVAILABLE	

6.2.21.18.3 Information from the sensor of the circuit breaker state data is sent at every computer cycle

6.2.21.19 Coherency of the pantograph state according to currently expected state

6.2.21.19.1 The following table describes the mapping of the values in case P_PANTOGRAPH_COHERENCY_TCMS is set to PGC_S_not_present:

P_PANTOGRAPH_COHERENCY_TCMS = PGC_S_ not_present:		
	PANTOGRAPH_COHERENCY_TCMS	Remark
	4 Information_not_available	

6.2.21.19.2 The following table describes the mapping of the values in case P_PANTOGRAPH_COHERENCY_TCMS is set to PGC_S_EXT:

P_PANTOGRAPH_COHERENCY_TCMS = PGC_S_EXT		
O_PANTOGRAPH_COHERENCY_TCMS	PANTOGRAPH_COHERENCY_TCMS	Remark
0 PANTO_UP_OK	0 PANTO_UP_OK	

1 PANTO_UP_NOT_OK	1 PANTO_UP_NOT_OK	
2 PANTO_DOWN_OK	2 PANTO_DOWN_OK	
3 PANTO_DOWN_NOT_OK	3 PANTO_DOWN_NOT_OK	
4 INFORMATION_NOT_AVAILABLE	4 INFORMATION_NOT_AVAILABLE	

6.2.21.19.3 Coherency of the pantograph state data is sent at every computer cycle

6.2.21.20   TCMS informs the Core that TCMS is commanding EB

6.2.21.20.1 The following table describes the mapping of the values in case P_V_COMMANDING_EB_TCMS is set to CEB_S_not_present:

P_V_COMMANDING_EB_TCMS = CEB_S_ not_present:		
	V_COMMANDING_EB_TCMS	Remark
	0 EB not applied	

6.2.21.20.2 The following table describes the mapping of the values in case P_V_COMMANDING_EB_TCMS is set to CEB_S_EXT:

P_V_COMMANDING_EB_TCMS = CEB_S_EXT		
O_V_COMMANDING_EB_TCMS	V_COMMANDING_EB_TCMS	Remark
0 EB not applied	0 EB not applied	
1 EB applied	1 EB applied	

6.2.21.20.3 TCMS informs the Core that TCMS is commanding EB data is sent at every computer cycle

6.2.21.21   TCMS informs the Core that TCMS is commanding SB

6.2.21.21.1 The following table describes the mapping of the values in case P_V_COMMANDING_SB_TCMS is set to CSB_S_not_present:

P_V_COMMANDING_SB_TCMS = CSB_S_ not_present:		
	V_COMMANDING_SB_TCMS	Remark
	0 SB not applied	

6.2.21.21.2 The following table describes the mapping of the values in case P_V_COMMANDING_SB_TCMS is set to CSB_S_EXT:

P_V_COMMANDING_SB_TCMS = CSB_S_EXT		
O_V_COMMANDING_SB_TCMS	V_COMMANDING_SB_TCMS	Remark
0 SB not applied	0 SB not applied	
1 SB applied	1 SB applied	

6.2.21.21.3 TCMS informs the Core that TCMS is commanding SB data is sent at every computer cycle

6.2.21.22　Traction Status

6.2.21.22.1 The following table describes the mapping of the values in case P_V_TRACTION_STATUS_TCMS is set to TRS_S_F_not_present:

P_V_TRACTION_STATUS_TCMS = TRS _S_F_not_present:		
	V_TRACTION_STATUS_TCMS	**Remark**
	5 Information_not_available	

6.2.21.22.2 The following table describes the mapping of the values in case P_V_TRACTION_STATUS_TCMS is set to TRS_S_F_TCMS:

TR_OBU_Traction_Status	V_TRACTION_STATUS_TCMS	Remark
0	0 Null	
1	3 Not_null	

6.2.21.22.3 The following table describes the mapping of the values in case P_V_TRACTION_STATUS_TCMS is set to TRS_S_F_EXT:

P_V_TRACTION_STATUS_TCMS = TRS_S_F_EXT		
O_V_TRACTION_STATUS_TCMS	V_TRACTION_STATUS_TCMS	Remark
0 Null	0 Null	
1 Positive	1 Positive	
2 Negative	2 Negative	
3 Not_null	3 Not_null	
4 Fail_state	4 Fail_state	
5 Information_not_available	5 Information_not_available	
6 Spare	6 Spare	
7 Spare	7 Spare	

6.2.21.22.4 The following table describes the mapping of the values in case P_V_TRACTION_STATUS_TCMS is set to TRS_S_F_HW:

T_TR_S	V_TRACTION_STATUS_TCMS	Remark
0	0 Null	
1	Not_null	

6.2.21.22.5 Traction Status is sent at every computer cycle

6.2.22　Plain Text Message from TCMS to ETCS

6.2.22.1　ETCS Interface

From ETCS	To ETCS	Remark
	Packet 31	
	NID_PACKET	
	L_PACKET	
	Q_TEXTCLASS_TCMS	
	Q_TEXTDISPLAY_TCMS	
	L_TEXTDISPLAY_TCMS	
	T_TEXTDISPLAY_TCMS	
	Q_TEXTCONFIRM_TCMS	

	L_TEXT_TCMS	
	X_TEXT_TCMS (L_TEXT_TCMS)	

6.2.22.2 TCMS Interface

From TCMS	To TCMS	Remark
Packet 61		Optional
NID_PACKET		
L_PACKET		
Q_TEXTCLASS_TCMS		
Q_TEXTDISPLAY_TCMS		
L_TEXTDISPLAY_TCMS		
T_TEXTDISPLAY_TCMS		
Q_TEXTCONFIRM_TCMS		
L_TEXT_TCMS		
X_TEXT_TCMS (L_TEXT_TCMS)		

6.2.22.3 Parameters and Settings

The following parameters control the functionality of the Plain Text Message:
P_PLAIN_TEXT.

6.2.22.4 Functionality

6.2.22.4.1 The following table describes the mapping of the values in case P_PLAIN_TEXT is set to PT_not_present:

P_PLAIN_TEXT = PT_not_present		
	Packet 31	**Remark**
	No data sent	

6.2.22.4.2 The following table describes the mapping of the values in case P_PLAIN_TEXT is set to PT_EXT:

P_PLAIN_TEXT = PT_EXT		
Packet 61	**Packet 31**	**Remark**
Received	All fields copied from Packet 61	Identical Data Structure

6.2.22.4.3 Plain text message is sent sporadically (sending triggered by event)

6.2.23 Fixed Text Message from TCMS to ETCS

6.2.23.1 ETCS Interface

From ETCS	To ETCS	Remark
	Packet 32	
	NID_PACKET	
	L_PACKET	

	Q_TEXTCLASS_TCMS	
	Q_TEXTDISPLAY_TCMS	
	L_TEXTDISPLAY_TCMS	
	T_TEXTDISPLAY_TCMS	
	Q_TEXTCONFIRM_TCMS	
	Q_TEXT_TCMS	

6.2.23.2 TCMS Interface

From TCMS	To TCMS	Remark
Packet 62		Optional
NID_PACKET		
L_PACKET		
Q_TEXTCLASS_TCMS		
Q_TEXTDISPLAY_TCMS		
L_TEXTDISPLAY_TCMS		
T_TEXTDISPLAY_TCMS		
Q_TEXTCONFIRM_TCMS		
Q_TEXT_TCMS		

6.2.23.3 Parameters and Settings

The following parameters control the functionality of the Plain Text Message:
P_FIXED_TEXT.

6.2.23.4 Functionality

6.2.23.4.1 The following table describes the mapping of the values in case P_FIXED_TEXT is set to FT_not_present:

P_FIXED_TEXT = FT_not_present		
	Packet 32	**Remark**
	No data sent	

6.2.23.4.2 The following table describes the mapping of the values in case P_FIXED_TEXT is set to FT_EXT:

P_FIXED_TEXT = FT_EXT		
Packet 62	**Packet 32**	**Remark**
Received	All fields copied from Packet 42	Identical Data Structure

6.2.23.5 Fixed text message is sent sporadically (sending triggered by event)

6.2.24 Brake Models

6.2.24.1 It shall be possible to provide Brake Models to the ETCS. These Brake Models may form the basis for braking curve calculation. The brake models shall be sent to the ETCS upon reception of packet 24 (Train Type) from the ETCS.

6.2.24.2 It shall be possible to receive brake models from the TCMS

6.2.24.3 It shall be possible to store up to 10 braking models in the onboard. These braking models shall be provided to the ETCS. Selection of the appropriate brake model is based on the contents of the packet 24 (Train Type)

6.2.24.4 ETCS Interface

From ETCS	To ETCS	Remark
	Packet 33	
	NID_PACKET	
	L_PACKET	
	Q_BRAKE_MODEL_TCMS	
	MODEL_BEGIN_BRAKE_TCMS	
	MODEL_FULL_BRAKE_TCMS	
	N_ITER	
	MODEL_SPEED_TCMS(k)	
	MODEL_DECELER_TCMS(k)	
	CUT_TRACT_DELAY_TCMS	
	TRAIN_MAX_ACC_TCMS	
	ACC_COEF_SB_UNUSED_TCMS	
	ACC_COEF_SB_USED_TCMS	
	Q_SB_MODEL_PRESENT_TCMS	
	MODEL_BEGIN_BRAKE_TCMS	
	MODEL_FULL_BRAKE_TCMS	
	N_ITER	
	MODEL_SPEED_TCMS(k)	
	MODEL_DECELER_TCMS(k)	
	MIN_ROT_MASS_PERCENT_TCMS	
	NOM_ROT_MASS_PERCENT_TCMS	
	MAX_ROT_MASS_PERCENT_TCMS	
	T_W _TCMS	
	T_P_TCMS	
	T_I_P_TCMS	
	T_RSMA_TCMS	

6.2.24.5 TCMS Interface

From TCMS	To TCMS	Remark
Packet 63		Optional
NID_PACKET		
L_PACKET		
MODEL_BEGIN_BRAKE_TCMS		
MODEL_FULL_BRAKE_TCMS		
N_ITER		
MODEL_SPEED_TCMS(k)		
MODEL_DECELER_TCMS(k)		
CUT_TRACT_DELAY_TCMS		
TRAIN_MAX_ACC_TCMS		
ACC_COEF_SB_UNUSED_TCMS		

ACC_COEF_SB_USED_TCMS		
Q_SB_MODEL_PRESENT_TCMS		
MODEL_BEGIN_BRAKE_TCMS		
MODEL_FULL_BRAKE_TCMS		
N_ITER		
MODEL_SPEED_TCMS(k)		
MODEL_DECELER_TCMS(k)		
MIN_ROT_MASS_PERCENT_TCMS		
NOM_ROT_MASS_PERCENT_TCMS		
MAX_ROT_MASS_PERCENT_TCMS		
T_W_TCMS		
T_P_TCMS		
T_I_P_TCMS		
T_RSMA_TCMS		

6.2.24.6   Parameters and Settings

The following parameters control the functionality of the Brake Models transmission:
P_Q_BRAKE_MODELS and P_BRAKE_MODELS.

6.2.24.7   Functionality

6.2.24.7.1 The following table describes the mapping of the values in case P_Q_BRAKE_MODELS is set to FT_not_present:

P_Q_BRAKE_MODELS = BM_not_present			
	Packet 33		**Remark**
	NID_PACKET	3	
	L_PACKET	17	
	Q_BRAKE_MODEL_TCMS	0	

6.2.24.7.2 In case P_Q_BRAKE_MODELS is set to FT_Fixed, the following applies:

6.2.24.7.3 The parameter structure P_BRAKE_MODELS shall be evaluated by iterating through the available data sets

6.2.24.7.4 If DECELERATION_CLASS_ID_ETCSand BRAKE_DELAY_CLASS_ID_ETCS in one of the data sets equal DECELERATION_CLASS_ID_ETCSand BRAKE_DELAY_CLASS_ID_ETCS as received from the ETCS via Packet 24 (Train Type), then the follwing table applies for the response:

(P_Q_BRAKE_MODELS = BM_Fixed) and correct DECELERATION_CLASS_ID_ETCSand BRAKE_DELAY_CLASS_ID_ETCS			
P_BRAKE_MODELS*	**Packet 33**		**Remark**
	NID_PACKET	3	
	L_PACKET		calculated
	Q_BRAKE_MODEL_TCMS	1	
DECELERATION_CLASS_ID_ETCS	DECELERATION_CLASS_ID_ETCS		
BRAKE_DELAY_CLASS_ID_ETCS	BRAKE_DELAY_CLASS_ID_ETCS		
MODEL_BEGIN_BRAKE_TCMS	MODEL_BEGIN_BRAKE_TCMS		
MODEL_FULL_BRAKE_TCMS	MODEL_FULL_BRAKE_TCMS		
N_ITER	N_ITER		
MODEL_SPEED_TCMS(k)	MODEL_SPEED_TCMS(k)		
MODEL_DECELER_TCMS(k)	MODEL_DECELER_TCMS(k)		

CUT_TRACT_DELAY_TCMS	CUT_TRACT_DELAY_TCMS		
TRAIN_MAX_ACC_TCMS	TRAIN_MAX_ACC_TCMS		
ACC_COEF_SB_UNUSED_TCMS	ACC_COEF_SB_UNUSED_TCMS		
ACC_COEF_SB_USED_TCMS	ACC_COEF_SB_USED_TCMS		
Q_SB_MODEL_PRESENT_TCMS	Q_SB_MODEL_PRESENT_TCMS		
MODEL_BEGIN_BRAKE_TCMS	MODEL_BEGIN_BRAKE_TCMS		
MODEL_FULL_BRAKE_TCMS	MODEL_FULL_BRAKE_TCMS		
N_ITER	N_ITER		
MODEL_SPEED_TCMS(k)	MODEL_SPEED_TCMS(k)		
MODEL_DECELER_TCMS(k)	MODEL_DECELER_TCMS(k)		
MIN_ROT_MASS_PERCENT_TCMS	MIN_ROT_MASS_PERCENT_TCMS		
NOM_ROT_MASS_PERCENT_TCMS	NOM_ROT_MASS_PERCENT_TCMS		
MAX_ROT_MASS_PERCENT_TCMS	MAX_ROT_MASS_PERCENT_TCMS		
T_W_TCMS	T_W_TCMS		
T_P_TCMS	T_P_TCMS		
T_I_P_TCMS	T_I_P_TCMS		
T_RSMA_TCMS	T_RSMA_TCMS		

*the data from the iteration with the matching values of DECELERATION_CLASS_ID_ETCSand BRAKE_DELAY_CLASS_ID_ETCS shall be selected

6.2.24.7.5 If DECELERATION_CLASS_ID_ETCSand BRAKE_DELAY_CLASS_ID_ETCS in one of the data sets do not DECELERATION_CLASS_ID_ETCSand BRAKE_DELAY_CLASS_ID_ETCS as received from the ETCS via Packet 24 (Train Type), then the follwing table applies for the response:

(P_Q_BRAKE_MODELS = BM_Fixed) and not correct DECELERATION_CLASS_ID_ETCSand BRAKE_DELAY_CLASS_ID_ETCS			
P_BRAKE_MODELS*	Packet 33		Remark
	NID_PACKET	3	
	L_PACKET	33	
	Q_BRAKE_MODEL_TCMS	0	
DECELERATION_CLASS_ID_ETCS	DECELERATION_CLASS_ID_ETCS	8	
BRAKE_DELAY_CLASS_ID_ETCS	BRAKE_DELAY_CLASS_ID_ETCS	8	

6.2.24.7.6 In case P_Q_BRAKE_MODELS is set to FT_Ext, the following applies:

6.2.24.7.7 DECELERATION_CLASS_ID_ETCSand BRAKE_DELAY_CLASS_ID_ETCS as received from the ETCS via Packet 24 (Train Type) are forwarded to the TCMS. (See 6.2.10).

6.2.24.7.8 It is the responsibility of the TCMS to provide brake model data as requested by the ETCS.

6.2.24.7.9 The following table describes the mapping of the data:

(P_Q_BRAKE_MODELS = BM_Ext) and correct DECELERATION_CLASS_ID_ETCSand BRAKE_DELAY_CLASS_ID_ETCS			
Packet 63	Packet 33		Remark
	Q_BRAKE_MODEL_TCMS	1	
MODEL_BEGIN_BRAKE_TCMS	MODEL_BEGIN_BRAKE_TCMS		
MODEL_FULL_BRAKE_TCMS	MODEL_FULL_BRAKE_TCMS		
N_ITER	N_ITER		
MODEL_SPEED_TCMS(k)	MODEL_SPEED_TCMS(k)		
MODEL_DECELER_TCMS(k)	MODEL_DECELER_TCMS(k)		
CUT_TRACT_DELAY_TCMS	CUT_TRACT_DELAY_TCMS		
TRAIN_MAX_ACC_TCMS	TRAIN_MAX_ACC_TCMS		

ACC_COEF_SB_UNUSED_TCMS	ACC_COEF_SB_UNUSED_TCMS		
ACC_COEF_SB_USED_TCMS	ACC_COEF_SB_USED_TCMS		
Q_SB_MODEL_PRESENT_TCMS	Q_SB_MODEL_PRESENT_TCMS		
MODEL_BEGIN_BRAKE_TCMS	MODEL_BEGIN_BRAKE_TCMS		
MODEL_FULL_BRAKE_TCMS	MODEL_FULL_BRAKE_TCMS		
N_ITER	N_ITER		
MODEL_SPEED_TCMS(k)	MODEL_SPEED_TCMS(k)		
MODEL_DECELER_TCMS(k)	MODEL_DECELER_TCMS(k)		
MIN_ROT_MASS_PERCENT_TCMS	MIN_ROT_MASS_PERCENT_TCMS		
NOM_ROT_MASS_PERCENT_TCMS	NOM_ROT_MASS_PERCENT_TCMS		
MAX_ROT_MASS_PERCENT_TCMS	MAX_ROT_MASS_PERCENT_TCMS		
T_W_TCMS	T_W_TCMS		
T_P_TCMS	T_P_TCMS		
T_I_P_TCMS	T_I_P_TCMS		
T_RSMA_TCMS	T_RSMA_TCMS		
Packet 24			
DECELERATION_CLASS_ID_ETCS	DECELERATION_CLASS_ID_ETCS		
BRAKE_DELAY_CLASS_ID_ETCS	BRAKE_DELAY_CLASS_ID_ETCS		

6.2.24.7.10Brake model data is sent sporadically (sending triggered by event)

6.2.25 Test and failure detection

6.2.25.1 ETCS Interface

From ETCS	To ETCS	Remark
	Packet 34	

6.2.25.2 TCMS Interface

From TCMS	To TCMS	Remark
Packet 64		Optional

6.2.25.3 Parameters and Settings

The following parameters control the functionality of the Test and failure detection:
P_TEST_FAILURE_DETECTION.

6.2.25.4 Functionality

6.2.25.4.1 The test and failure detection packet is triggered by the packet 27, and in particular by the variable START_EB_TESTS_ON_DEMAND_ETCS .

6.2.25.4.2 The following table describes the mapping of the values in case P_TEST_FAILURE_DETECTION is set to TFD_not_present:

P_TEST_FAILURE_DETECTION = TFD_not_present		
	EB_TESTS_ON_DEMAND_RESULT_TCMS	Remark
	4 EB tests on demand aborted	
	SAFETYFAIL_DETECT_TCMS	Remark
	2 Irrelevant: no diagnostic to be expected (diagnostic function is inhibited)	

6.2.25.4.3 The following table describes the mapping of the values in case P_TEST_FAILURE_DETECTION is set to TFD_EXT:

P_TEST_FAILURE_DETECTION = TFD_EXT		
Packet 64	**Packet 34**	**Remark**
EB_TESTS_ON_DEMAND_RESULT_TCMS	EB_TESTS_ON_DEMAND_RESULT_TCMS	Forwarded as-is
SAFETYFAIL_DETECT_TCMS	SAFETYFAIL_DETECT_TCMS	Forwarded as-is

6.2.25.5 Timing

6.2.25.5.1 The ETCS receives Packet 6 sporadically (sending triggered by event).

6.2.26 STMs specific behaviour

6.2.26.1 STMs are out of scope of this document

6.2.26.2 Diagnostic

6.2.26.3 ETCS Interface

From ETCS	**To ETCS**	**Remark**
	Packet 12	

6.2.26.4 TCMS Interface

From TCMS	**To TCMS**	**Remark**
Packet 52		Optional

6.2.26.5 Parameters and Settings

The following parameters control the functionality of the Diagnostic Data procedure: P_DIAGNOSTIC.

6.2.26.6 Functionality

6.2.26.6.1 The following table describes the mapping of the values in case P_DIAGNOSTIC is set to DIAG_not_present:

P_DIAGNOSTIC = DIAG_not_present			
	Packet 12		**Remark**
	N_ITER	0	

6.2.26.6.2 The following table describes the mapping of the values in case P_DIAGNOSTIC is set to DIAG_EXT:

P_DIAGNOSTIC = DIAG_EXT		
Packet 52	**Packet 12**	**Remark**
Received	All fields forwarded as-is	

6.2.26.7   Timing

6.2.26.7.1 The ETCS receives Packet 12 sporadically (sending triggered by event).

6.2.27   Train Data

6.2.27.1   ETCS Interface

From ETCS	To ETCS	Remark
	Packet 13	
	NID_PACKET	
	L_PACKET	
	Q_ NC_CDTRAIN_TCMS	
	NC_CDTRAIN_TCMS	
	Q_L_TRAIN_TCMS	
	TRAIN_LENGTH_TCMS	
	BRAKE_PERCENTAGE	
	BRAKE_POSITION_TCMS	
	Q_NC_TRAIN_TCMS	
	NC_TRAIN_TCMS	
	M_LINEGAUGE_TCMS	
	M_AXLELOADCAT_TCMS	
	NID_CTRACTION_ETCS	
	M_VOLTAGE_ETCS	
	M_AIRTIGHT_TCMS	
	CCPU_NTC_ISOLATED	
	TRAIN_TYPE_TCMS	
	L_TRAIN	

6.2.27.2   TCMS Interface

From TCMS	To TCMS	Remark
TR_OBU_TrainType		
TR_OBU_TrainCatCantDef		
TR_OBU_TrainLength		
TR_OBU_BrakePercentage		
TR_OBU_BrakePosition1		
TR_OBU_BrakePosition1_Not		
TR_OBU_BrakePosition2		
TR_OBU_BrakePosition2_Not		
TR_OBU_LoadingGauge		
TR_OBU_AxleLoadCat		
TR_OBU_NID_CTRACTION_ETCS		
TR_OBU_TS_M_VOLTAGE_ETCS		
TR_OBU_AirTightFitted		
TR_OBU_NTCIsolated		
TR_OBU_TrainLength		

6.2.27.3   Parameters and Settings

P_TRAIN_DATA

6.2.27.4 Functionality

6.2.27.4.1 Train Cant Deiciency Class. The following table describes the mapping of variables.

TR_OBU_TrainCatCantDef	NC_CDTRAIN_TCMS	Remark
0 Cant Deficiency 80 mm	0 Cant Deficiency 80 mm	
1 Cant Deficiency 100 mm	1 Cant Deficiency 100 mm	
2 Cant Deficiency 130 mm	2 Cant Deficiency 130 mm	
3 Cant Deficiency 150 mm	3 Cant Deficiency 150 mm	
4 Cant Deficiency 165 mm	4 Cant Deficiency 165 mm	
5 Cant Deficiency 180 mm	5 Cant Deficiency 180 mm	
6 Cant Deficiency 210 mm	6 Cant Deficiency 210 mm	
7 Cant Deficiency 225 mm	7 Cant Deficiency 225 mm	
8 Cant Deficiency 245 mm	8 Cant Deficiency 245 mm	
9 Cant Deficiency 275 mm	9 Cant Deficiency 275 mm	
10 Cant Deficiency 300 mm	10 Cant Deficiency 300 mm	
11-15 Spare	11-15 Spare	

6.2.27.4.2 The ETCS receives Train Cant Deficiency Class sporadically (sending triggered by event).

6.2.27.4.3 Train Length

TR_OBU_TrainLength	Q_L_TRAIN	Remark
Input	0 if TR_OBU_TrainLength = 4095, 1 in all other cases	Special Value
TR_OBU_TrainLength	**L_TRAIN**	**Remark**
Input	TR_OBU_TrainLenght if Q_L_TRAIN_TCMS = 1 0 if Q_L_TRAIN_TCMS = 0	Range 0-4094 m

6.2.27.4.4 The ETCS receives train Length sporadically (sending triggered by event).

6.2.27.4.5 Brake percentage. The following table describes the mapping of variables.

TR_OBU_BrakePercentage	TCMS_BRAKE_PERCENTAGE	Remark
Input	= Input value	

6.2.27.4.6 Brake Position

6.2.27.4.7 The following applies if P_BRAKE_POSITION is set to BPOS_TCMS. The following table describes the mapping of variables.

TR_OBU_BrakePosition1	TR_OBU_BrakePosition1_Not	TR_OBU_BrakePosition1	TR_OBU_BrakePosition1_Not	BRAKE_POSITION_TCMS	Remark
0	0	0	0	4 Invalid	
0	0	0	1	4 Invalid	
0	0	1	0	4 Invalid	
0	0	1	1	4 Invalid	
0	1	0	0	4 Invalid	
0	1	0	1	4 Invalid	

0	1	1	0	0 Passenger Train in P	
0	1	1	1	4 Invalid	
1	0	0	0	4 Invalid	
1	0	0	1	1 Freight Train in P	
1	0	1	0	1 Freight Train in G	
1	0	1	1	4 Invalid	
1	1	0	0	4 Invalid	
1	1	0	1	4 Invalid	
1	1	1	0	4 Invalid	
1	1	1	1	4 Invalid	

6.2.27.4.8 The following applies if P_BRAKE_POSITION is set to BPOS_HW. The following table describes the mapping of variables.

T_BP_S1_N	T_BP_S1_I	T_BP_S2_N	T_BP_S2_I	BRAKE_POSITION_TCMS	Remark
0	0	0	0	4 Invalid	
0	0	0	1	4 Invalid	
0	0	1	0	4 Invalid	
0	0	1	1	4 Invalid	
0	1	0	0	4 Invalid	
0	1	0	1	4 Invalid	
0	1	1	0	0 Passenger Train in P	
0	1	1	1	4 Invalid	
1	0	0	0	4 Invalid	
1	0	0	1	1 Freight Train in P	
1	0	1	0	1 Freight Train in G	
1	0	1	1	4 Invalid	
1	1	0	0	4 Invalid	
1	1	0	1	4 Invalid	
1	1	1	0	4 Invalid	
1	1	1	1	4 Invalid	

6.2.27.4.9 The following applies if P_BRAKE_POSITION is set to BPOS_ETCS. The following table describes the mapping of variables.

	BRAKE_POSITION_TCMS	Remark
	3 Unknown	

6.2.27.4.10 Train Type. The following table describes the mapping of variables.

TR_OBU_TrainType	TRAIN_TYPE_TCMS	Remark
Input	= TR_OBU_Train_Type	

6.2.27.4.11 Loading Gauge. The following table describes the mapping of variables

TR_OBU_LoadingGauge	TCMS_LOADING_GAUGE	Remark
0 The train does not fit to any of the interoperable loading gauge profiles	0 The train does not fit to any of the interoperable loading gauge profiles	
1 G1	1 G1	
2 GA	2 GA	
3 GB	3 GB	
4 GC	4 GC	
5-255 Spare	5-255 Spare	

6.2.27.4.12 Axle Load Category. The following table describes the mapping of variables.

TR_OBU_AxleLoadCat	M_AXLELOADCAT_TCMS	Remark
0 A	0 A	
1 HS17	1 HS17	
2 B1	2 B1	
3 B2	3 B2	
4 C2	4 C2	
5 C3	5 C3	
6 C4	6 C4	
7 D2	7 D2	
8 D3	8 D3	
9 D4	9 D4	
10 D4XL	10 D4XL	
11 E4	11 E4	
12 E5	12 E5	
13-127	13-127	

6.2.27.5 Traction system

Country identifier of the traction system. The following table describes the mapping of variables:

TR_OBU_NID_CTRACTION_ETCS	NID_CTRACTION_ETCS	Remark
input	= TR_OBU_NID_CTRACTION_ETCS	See [Subset-026] 7.5.1.86.1

6.2.27.6 Voltage

6.2.27.6.1 The following table describes the mapping of variables.

TR_OBU_TS_M_VOLTAGE_ETCS	M_VOLTAGE_ETCS	Remark
0 Line not fitted with any traction system	0 Line not fitted with any traction system	
1 AC25kV50Hz	1 AC25kV50Hz	
2 AC15kV16.7Hz	2 AC15kV16.7Hz	
3 DC3kV	3 DC3kV	
4 DC 1.5 kV	4 DC 1.5 kV	
5 DC 600/750 V	5 DC 600/750 V	
6-15 Spare	6-15 Spare	

6.2.27.7 Airtight Fitted

6.2.27.7.1 The following applies if P_AIRTIGHT_FITTED is set to ATF_TCMS. The following table describes the mapping of variables.

TR_OBU_AirTightFitted	M_AIRTIGHT_TCMS	Remark
0 Train not fitted with airtight system.	0 Train not fitted with airtight system.	
1 Train fitted with airtight system.	1 Train fitted with airtight system.	

6.2.27.7.2 The following applies if P_AIRTIGHT_FITTED is set to ATF_HW. The following table describes the mapping of variables.

T_FAT_S	M_AIRTIGHT_TCMS	Remark
0 Train not fitted with airtight system.	0 Train not fitted with airtight system.	
1 Train fitted with airtight system.	1 Train fitted with airtight system.	

6.2.27.7.3 The following applies if P_AIRTIGHT_FITTED is set to ATF_ETCS. The following table describes the mapping of variables.

	M_AIRTIGHT_TCMS	Remark
	0 Train not fitted with airtight system.	

6.2.27.8   NTC System Isolated

6.2.27.8.1 STM/ NTC is out of the scope of this document

7   Appendix: Illustrative Examples

7.1   Scope and purpose of this section

7.1.1.1   The examples in this chapter are purely illustrative. Their only purpose is to illustrate possible situations and give a high-level view on which parts of this specification might be used in the different basic situations.

7.1.2 Example new vehicle with full Subset-119 compatible TCMS

7.1.2.1   This example assumes a standard newly built vehicle where ETCS and TCMS both fully support Subset-119 without any changes or additions.

7.1.2.2   The examples are based on real-life use cases but are not directly transferrable to other situations.

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┌ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┐
            ETCS Core
└ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┘
┌───────────────────────────────┐
│        ETCS Core Interface     │  ─── Scope of this document
│                                │
│ Interface to TCMS – Subset 119 │
│          TCMS FFFIS            │
├───────────────────────────────┤
│     Subset 119 TCMS FFFIS      │  ─── Scope of Subset-119
└───────────────────────────────┘
┌ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┐
              TCMS
└ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┘
```
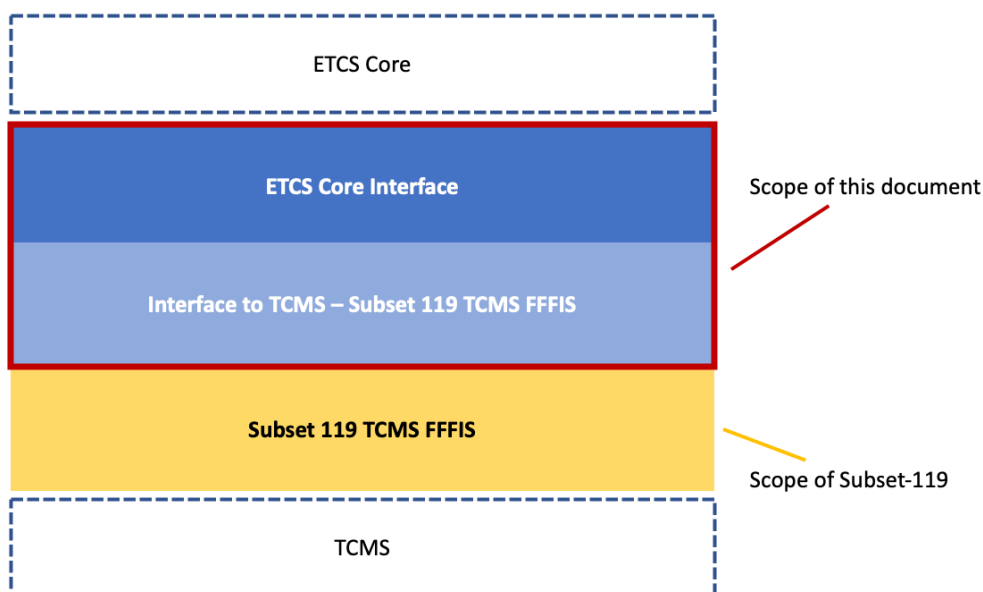
Figure 3: Architecture for vehicle with fully Subset-119- compliant TCMS System

7.1.3   Example vehicle with full Subset-119 compatibility and additional data

7.1.3.1   This example is based on an HST EMU with advanced and extended TCMS features. In this case, extended features of the FVA are used, without the need for an additional gateway.

7.1.3.1.1   In this case, the TCMS sends braking models to the ETCS

7.1.3.1.2   In this case, the TCMS is receiving Odometry information from the ETCS
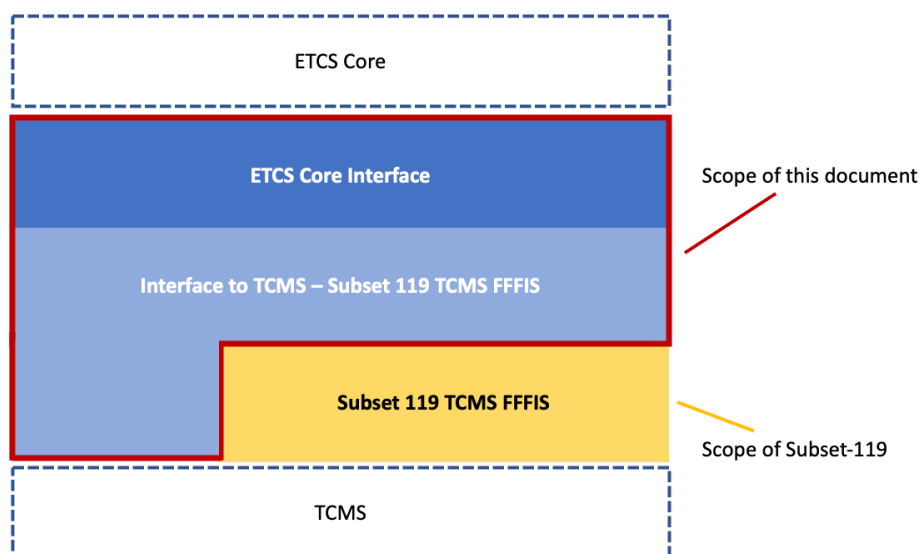
Figure 4: Example architecture for vehicle with additional data and direct support for this specification

7.1.4 Legacy vehicle with limited TCMS and separate vehicle interface unit.

7.1.4.1 This example is based on a vehicle with only partial Subset-119 Support.

7.1.4.2 In such a case, an external gateway may be required in order to make sure that the mandatory data can be exchanged between ETCS und TCMS.
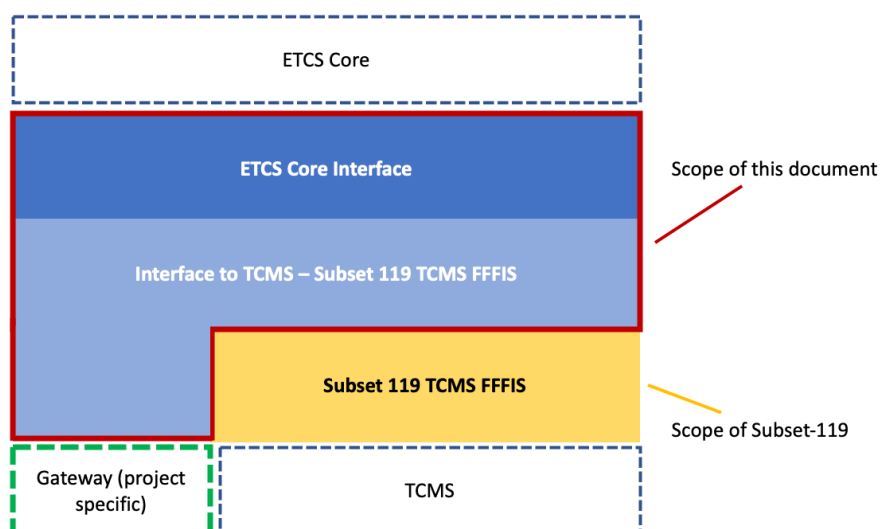

Figure 5: Example architecture for vehicle with limited TCMS and separate gateway unit

7.1.4.3   Note: the gateway unit is out of scope of this documentation.

7.1.5   Legacy vehicle with no TCMS

7.1.5.1   In case no TCMS is available, a Gateway must be developed that covers all mandatory variables and packets. In this case, the situation will reassemble the case 7.1.4: Legacy vehicle with limited TCMS and separate vehicle interface unit.

7.1.5.2   In this case, the Gateway would have to cover the complete set of requirements related to [18].