OCORA

Open CCS On-board Reference Architecture

Generic Vehicle Adapter

Requirement Specification

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Revision History

Version	Change Description	Initials	Date of change
1.0	First official version, published in OCORA R6		31.01.2025

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References

Reader's note: please be aware that the document ids in square brackets, e.g. [OCORA-BWS01-010], as per the list of referenced documents below, are 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.

[OCORA-BWS01-010] – Release Notes

[OCORA-BWS01-020] – Glossary

[OCORA-BWS01-040] – Feedback Form

[OCORA-BWS03-010] - Introduction to OCORA

[OCORA-TWS01-030] – System Architecture

[OCORA-TWS01-035] – CCS-On-Board Architecture

[OCORA-TWS02-030] – OCORA Addendum to SUBSET-147

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

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

[OCORA-TWS04-012] - TCMS - Standard Communication Interface Specification

[OCORA-TWS04-015] - Addendum to SUBSET-119

[OCORA-TWS04-016] - Addendum to SUBSET-139

[SUBSET-041] – ERTMS/ETCCS – PERFORMANCE REQUIREMENTS FOR INTEROPERABILITY

[SUBSET-119] – ERTMS/ETCS – Train Interface FFFIS

[SUBSET-139] - ERTMS/ATO - ATO-OB / ROLLING STOCK FFFIS APPLICATION LAYER

[SUBSET-147] – ERTMS Data Applications – FFFIS part: CCS Consist Network Communication Layers

[RFC 5905] - Network Time Protocol

[EN 50126-1:2017-10] – Railway Applications – The Specification and Demonstration of Reliability, Availability, Maintainability and Safety (RAMS) - Part 1: Generic RAMS Process

[EN 50126-2:2017-10] – Railway Applications – The Specification and Demonstration of Reliability, Availability, Maintainability and Safety (RAMS) - Part 2: Systems Approach to Safety

[EN 50128:2011-06] – Railway Applications – Communication, signalling and processing systems - Software for railway control and protection systems

[EN 50129:2018-11] – Railway applications - Communication, signalling and processing systems - Safety related electronic systems for signalling

[EN 50159:2010-09] – Railway applications - Communication, signaling and processing systems - Safety-related communication in transmission systems

[EN 50657:2017-08] - Railways Applications - Rolling stock applications - Software on Board Rolling Stock

1 Introduction

1.1 Purpose of the document

The purpose of this document is to define requirements for a Generic Vehicle Adapter (GVA) product, with the intention to procure such a product. The document is based on content elaborated in former phases of the OCORA collaboration, most content originates from the OCORA-TWS04-011 documen t.

This OCORA document is intended to be used in tenders for CCS on-board systems or one of its building blocks, typically as enhancement or replacement in existing legacy vehicles. This document is based on the architecture described in the CCS On-Board Architecture document [OCORA-TWS01-035] .

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. Feedback to this document and to any other OCORA documentation can be given by using the feedback form [OCORA-BWS01-040].

1.2 Applicability of the document

This document is applicable for integration of ETCS on-board into legacy vehicles where the TCMS is not compliant to [SUBSET-119]. In this case, the vehicle (TCMS) shall implement a solution based on Generic Vehicle Adapter (GVA), including necessary wired I/O interface, to communicate with the [SU BSET-119] compliant ETCS on-board.

Furthermore, the document is applicable for integration of ATO on-board into legacy vehicles that do not include a [SUBSET-139] compliant TCMS. In this case, the vehicle (TCMS) shall communicate through the Generic Vehicle Adapter (GVA) with the ATO on-board to comply with the [SUBSET-139] compliant ATO on-board system.

For this solution, refer also to the document OCORA-TWS04-010. Furthermore, the GVA might act as protocol converter gateway for the lower OSI layers.

1.3 Context of the document

This document is published as part of an OCORA Release, together with the documents listed in the Release

Notes [OCORA-BWS01-010]. All abbreviations and terms used are defined in the Glossary [OCORA-BWS01-020].

2 Requirements

2.1 Functional Requirements

OCORA-10539, D-Level - Interface to CCS on-board applications

The Generic Vehicle Adapter (GVA) shall implement the unified and standardised communication interface SCI-TCMS ([SUBSET-119] / [SUBSET-139]) to the CCS on-board applications.

Note: the standardised communication interface SCI-TMCS is defined in the OCORA architecture [OCORA-TWS01-035].

Status	✔ Approved
Classification	Requirement
Rationale	• Reuse of the same CCS on-board applications, independently from the vehicle type, is key regarding life-cycle management and certification efforts. • CCS on-board applications using the GVA unified and standardised interface are easily integrated on all different vehicle types by means of the GVA. • The same CCS on-board applications are reused on different vehicle types without software modification of the CCS on-board applications, only by adapting the provided configuration parameters of the CCS on-board applications.
Remark	The GVA of course can also have configuration parameters. GVA also implements the interfaces to the vehicle CI-TCMS, CI-WIOC (typically TCMS and / or wired connections), see separate requirement OCORA-10544 for the vehicle side.
Acceptance Method	Test

OCORA-10585, D-Level - Support addendum specifications for the interface to CCS on-board applications

The Generic Vehicle Adapter (GVA) shall implement the addendum specifications for the unified and standardised interface SCI-TCMS ([OCORA-TWS04-015] - Addendum to SUBSET-119 / [OCORA-TWS04-016] - Addendum to SUBSET-139) to the CCS on-board applications.

Note: the standardised communication interface SCI-TMCS is defined in the OCORA architecture [OCORA-TWS01-035].

Status	✔ Approved
Classification	Requirement

Rationale	• The interface to the CCS on-board applications shall be implemented with the complete functional scope.
Remark	Depending on the specific project, the variables for ATO ([SUBSET-139]) can be disabled, if no ATO is present.
Acceptance Method	Test

OCORA-10623, D-Level - Provide information about GVA itself

When processing the diagnostic information for ETCS / ATO, the Generic Vehicle Adapter (GVA) shall also provide its own diagnostic information (status, versions, etc.) to the TCMS.

Status	✓ Approved
Classification	Requirement
Rationale	• When vehicle is in operation, for the driver it is helpful to see the status of the GVA in the central diagnostic of the TCMS, particularly in case of failures. • For technicians it is helpful to see the status and the versions of the GVA in the central diagnostic of the TCMS.
Remark	The benefit if this functionality depends on the capability of the TCMS to handle and display diagnostic information of different components.
Acceptance Method	Test

OCORA-10567, D-Level - Compliance with Ethernet CCS Consist Network (CCN)

The computation unit of the Generic Vehicle Adapter (GVA) is connected to the Ethernet CCS Consist Network (CCN), the interface shall comply with the correspondent specification for the Ethernet CCS Consist Network (CCN - [SUBSET-147]).

Status	✓ Approved
Classification	Requirement
Rationale	• The GVA and its environment comply with the OCORA architecture and the TSI CCS.
Remark	This is the new [SUBSET-147].
Acceptance Method	Test

OCORA-10586, D-Level - Support addendum specification for the CCS consist network

The Generic Vehicle Adapter (GVA) shall implement the addendum specification for the CCS consist network ("Addendum to SUBSET-147" [OCORA-TWS02-030]).

Status	✔ Approved
Classification	Requirement
Rationale	• The interface to the CCS on-board applications shall include all required features.
Remark	It is assumed that the additional features out of the addendum document will be incorporated in a future version of [SUBSET-147].
Acceptance Method	Test

OCORA-10541, D-Level - CCS on-board side client support

The Generic Vehicle Adapter (GVA) shall support more than one client simultaneously on the CCS on-board side.

Status	✔ Approved
Classification	Requirement
Rationale	• There might be more than one CCS on-board application interacting with the vehicle through the GVA (e.g. ETCS on-board, 'ATO vehicle', etc.). All applications are supported that need interaction with the vehicle.
Remark	
Acceptance Method	Test

OCORA-10544, D-Level - Interface to vehicle

The Generic Vehicle Adapter (GVA) shall implement the (serial) interface CI-TCMS to the TCMS, or the interface CI-WSA to the ‘Wired Sensors & Actors’ peripheral, or both.

Note: the communication interface CI-TMCS and CI-WSA are defined in the OCORA architecture [OCORA-TWS01-035].

Status	✔ Approved
Classification	Requirement

Rationale	• The (serial) interface to the TCMS is needed by the GVA to exchange data with the vehicle. • The use of 'I/O Ports' allows the GVA to interface with the vehicle by means of wired I/O connections.
Remark	It needs to be decided within the specific project which vehicle interface the GVA has to implement / use. Interface CI-TCMS is to a certain extent defined by [SUBSET-119] and [SUBSET-139]. However, from the GVA concept it is not required that TCMS provides a [SUBSET-119] and [SUBSET-139] compliant interface.
Acceptance Method	Test

OCORA-10588, D-Level - Support different technologies for the interface to the TCMS (vehicle)
The Generic Vehicle Adapter (GVA) shall support different technologies for the interface to the TCMS (vehicle): CAN, MVB (both EMD and ESD), Ethernet with TRDP.

Status	✔ Approved
Classification	Requirement
Rationale	• The GVA is used in retrofit projects for the integration in vehicles equipped with different technologies. The GVA shall at least support the most common technologies.
Remark	The GVA for the different projects will be equipped differently, depending on the project specific needs.
Acceptance Method	Design Review

OCORA-10589, D-Level - Modular design of the interface to the TCMS (vehicle)
The Generic Vehicle Adapter (GVA) shall implement a modular design that provides the capability to adapt the technology of the interface to the TCMS according to the need of the specific project. This with the goal to equip the device only with the interface technology needed in a specific project.

Status	✔ Approved
Classification	Requirement

Rationale	• The GVA comes only with the needed interfaces, no need to have a device equipped with all possible interface technologies. • The technology of the GVA interface to the TCMS (vehicle) can be customised to the needs of the a specific project.
Remark	For the interface to the TCMS (vehicle), different projects might need different technologies.
Acceptance Method	Design Review

OCORA-10587, D-Level - Modular design for wired input / output

The Generic Vehicle Adapter (GVA) shall implement a modular design that provides the capability to adapt the wired input / output depending on the need of the specific project.

Status	✓ Approved
Classification	Requirement
Rationale	• The wired input / output of the GVA can be customised to the needs of the different specific projects.
Remark	For the interface to the vehicle side, some projects might need more wired input / output, other projects need less.
Acceptance Method	Demonstration

OCORA-10553, D-Level - Vehicle side client support

The Generic Vehicle Adapter (GVA) shall support more than one client simultaneously on the vehicle side.

Status	✓ Approved
Classification	Requirement
Rationale	• There can be more than one client system interacting with the GVA on the vehicle side: e.g. one non-SIL TCMS, one SIL2 TCMS, interface CI-WIOC, passenger information system. All systems are supported that need interaction with the CCS on-board applications.
Remark	
Acceptance Method	Test

OCORA-10568, D-Level - Adaptation to cycle times of the connected domains

The computation unit of the Generic Vehicle Adapter (GVA) shall adapt to the different bus/network cycle times to which it is connected. These buses / networks are in CCS on-board and TCMS domains.

Status	✓ Approved
Classification	Requirement
Rationale	• The computation unit of the GVA is connected to the different domains CCS on-board and TCMS that potentially have different bus cycle times. The different connections to these domains adapt to the different cycle times of the busses / networks so that GVA can properly communicate with the different domains.
Remark	
Acceptance Method	Test

OCORA-10540, D-Level - Variable mapping / configuration

The Generic Vehicle Adapter (GVA) shall implement the variable mapping / configuration between the two interfaces (refer to OCORA-10539 - Interface to CCS on-board applications and the vehicle interface OCORA-10544).

Status	✓ Approved
Classification	Requirement
Rationale	• This is to easily integrate CCS on-board applications into a vehicle by means of the GVA (specifics of the vehicle). • The variable mapping in the GVA allows to use the same CCS on-board applications in different vehicle types.
Remark	GVA is parametrised according to the specific mapping / configuration needs, depending on the vehicle and its TCMS capabilities. Likewise, the GVA can be used to integrate into the vehicle through wired connections, see OCORA-10544.
Acceptance Method	Test

OCORA-10526, D-Level - Parameters of Generic Vehicle Adapter adjustable

The variable mapping parameters (configuration) of the Generic Vehicle Adapter (GVA) shall be adjustable by the organisation purchasing the product. For the organisation it shall be possible to

parametrise the variables and mathematical mapping functions that are needed by the GVA to accomplish its functions.

Status	✔ Approved
Classification	Requirement
Rationale	• The main scope of the organisation purchasing the GVA is to be able to customise it to the needs of the different projects. Customisation can be down by the organisation on its own, without the involvement of the supplier.
Remark	Typically the interface to the TCMS needs to be configured for the project specific solution. The parametrisation of the GVA will be done based on an agreed project specific version of the document template "OCORA-TWS04-021_GVA Mapping Table".
Acceptance Method	Test

OCORA-10542, D-Level - FIFO data processing

The Generic Vehicle Adapter (GVA) shall use a data processing mechanism which ensures data computation in the order as the data is received (first in first out - FIFO). The data shall be processed based on the sequence order in the global queue of incoming data (first in first out - FIFO).

Status	✔ Approved
Classification	Requirement
Rationale	• This is to ensure that the data and commands are received by the external sink system in the same order as they have been forwarded by the external sending system. Basically the order is not changed within the GVA. • FIFO concept: when multiple data packets from the same client are received, these data packets are processed in the same sequence order as these data packets were sent. • A global queue handles all data packets from the different clients. The data packets in the global queue are in the same sequence order as they have been received.
Remark	Ensure no retroactive effects in the processing of safety relevant data, see OCORA-10563 - Handling of safety relevant data. Mitigation can be achieved by implementing the OCORA-10543 - Priority processing for safety relevant data functionality.
Acceptance Method	Test

OCORA-10543, D-Level - Priority processing for safety relevant data

The Generic Vehicle Adapter (GVA) shall support a priority handling mechanism for safety relevant data in order to fulfil OCORA-10563.

Status	✓ Approved
Classification	Optional Requirement
Rationale	• Function is needed in case the GVA has to manage safety relevant data (OCORA-10563). • Provide a priority channel for different clients or message types depending on the safety relevance of the transmitted data. • This to ensure a higher availability by reducing the number of incidents due to failsafe impact.
Remark	• Dependency to OCORA-10542 - FIFO data processing and OCORA-10563 - Handling of safety relevant data. • Compulsory to OCORA-10563. If the GVA manages safety relevant data, priority handling for safety relevant data shall be introduced. This independently from the GVA transforming the variables involved in a safety relevant function, or the GVA just acting as a gateway between the TCMS and the ETCS on-board for data enriched with a safety layer. • Reminder - For MVB there is no priority handling.
Acceptance Method	Test

OCORA-10554, D-Level - Diagnostic and monitoring

The Generic Vehicle Adapter (GVA) shall provide monitoring and diagnostics information about the GVA itself through a dedicated interface. The dedicated interface allows to access the monitoring and diagnostic information locally or from remote

Note: the remote access to the monitoring and diagnostic information is dependent from integration and technical solution at vehicle level.

Status	✓ Approved
Classification	Requirement

Rationale	• In order to analyse the GVA behaviour and performance during development, test and operation, a diagnostic and monitoring interface is vital. • When commissioning or updating a vehicle, the diagnostic and monitoring information simplifies the test activities. • The diagnostic data includes the information that is needed to verify that the correct version of software, parametrisation, etc. is installed.
Remark	• The diagnostic and monitoring information can be used on-board (on-board access point) or remotely (from off-board). • The diagnostic and monitoring information includes the version of software, parametrisation, etc. • The operating status of the GVA shall be processed together with the status of ETCS/ATO as information provided to the TCMS.
Acceptance Method	Test

OCORA-10555, D-Level - Publishing variable values

The Generic Vehicle Adapter (GVA) shall publish the status and the values of the different variables processed by the GVA.

As part of the diagnostic and monitoring function (OCORA-10554) the GVA shall provide the status and the values of the different variables processed by the GVA.

Status	✓ Approved
Classification	Optional Requirement
Rationale	• When commissioning or updating a vehicle, the variable value information simplifies the test activities. • This information allows to be more efficient when verifying vehicle functions or analysing issues.
Remark	The variable values information could be used on-board only (on-board access point).
Acceptance Method	Test

OCORA-10556, D-Level - Static update process

The Generic Vehicle Adapter (GVA) shall provide a static update process (when vehicle is out of operation) through a dedicated interface. The update process involves the installation of at least one new file.

Status	✓ Approved
Classification	Requirement
Rationale	• The ability of updating the GVA is essential for an efficient life cycle management. • The GVA update process to only occur when the vehicle is out of operation to prevent malfunctioning of the vehicle.
Remark	The update process via a dedicated interface can be used on-board (on-board access point) or remotely (from off-board).
Acceptance Method	Test

OCORA-10739, D-Level - Time synchronisation

The GVA shall synchronise its time exclusively with the Train-Time & Location Service (TTLS).

Status	✓ Approved
Classification	Requirement
Rationale	• To ensure a common time for all CCS on-board components. • According to architecture all different on-board components centrally synchronise their time with the TTLS.
Remark	In the on-board architecture it is foreseen to have a centralised Train-Time & Location Service (TTLS).
Acceptance Method	Test

OCORA-10738, D-Level - Implement NTP protocol according to RFC 5905

The GVA shall comply with the NTP protocol according to [RFC 5905] when synchronising its time via with the TTLS.

Status	✓ Approved
Classification	Requirement

Rationale	• The different on-board components centrally synchronise their time with the TTLS by means of NTP.
Remark	In the on-board architecture it is foreseen to have a centralised Train-Time & Location Service (TTLS).
Acceptance Method	Demonstration

OCORA-10557, D-Level - On-board variable value simulation for test purposes

For the system engineer the Generic Vehicle Adapter (GVA) shall support the simulation function (induce a specific variable value). The function shall be available on-board, when the system engineer is connected to the GVA on-board the vehicle.

Status	✓ Approved
Classification	Optional Requirement
Rationale	• When working on-board for commissioning or updating activities, the simulation function simplifies the test activities. • This function allows to be more efficient when verifying vehicle functions or analysing issues, for instance during commissioning.
Remark	Dependency to OCORA-10558 - Special state for simulation and OCORA-10559 - Cancellation of induced values.
Acceptance Method	Test

OCORA-10558, D-Level - Special state for simulation

The simulation function shall only be available in a special state of the Generic Vehicle Adapter (GVA).

Status	✓ Approved
Classification	Optional Requirement
Rationale	• To prevent malfunctioning of the vehicle due to simulation, this function is only available in a special state of the GVA.
Remark	Compulsory to OCORA-10557 - On-board variable value simulation for test purposes. To be evaluated how the GVA can assess if simulation (special state) is permitted. For instance, it could be activated through a special switch on-board.

Acceptance Method	Test

OCORA-10559, D-Level - Cancellation of induced values

When the simulation activity is terminated (system engineer is disconnected) the induced values shall be cancelled.

The Generic Vehicle Adapter (GVA) shall store the variable values when simulation starts. It then shall reuse the stored variable values, when simulation is terminated, and shall evaluate the variable values from the sources as parametrised.

Status	✓ Approved
Classification	Optional Requirement
Rationale	• When simulation activity is terminated the GVA no longer processes the induced values but uses the values coming from the real systems. • For data that is not updated periodically the original value is stored when simulation is started, so that is can be applied when simulation is terminated.
Remark	Compulsory to OCORA-10557 - On-board variable value simulation for test purposes and OCORA-10558 - Special state for simulation.
Acceptance Method	Test

2.2 Non-Functional Requirements

OCORA-10560, D-Level - Supported safety integrity level (SIL)

The Generic Vehicle Adapter (GVA) shall consist of two independent parts: a non-safe part and a safe part.

Status	✓ Approved
Classification	Requirement

Rationale	• The safe part shall only be activated when this is required in the specific project. • The non-safe part of GVA is a leaner and more flexible implementation. This means that it is easier to introduce modifications in case these are needed. • The independency allows introducing modifications in the non-safe part without affecting the safe part and its accreditation / documentation. • The safe part of GVA handles the variables that are involved in safety relevant functions. This in case there is no safety layer between CCS on-board and TCMS side, or the variables involved in a safety relevant function need to be transformed within the GVA, or the TCMS does not provide the functions in an adequate SIL (i.e. GVA needs to provide it by means of wired I/O connections).
Remark	The SIL allocation for the safe part has to be evaluated in the specific project based on the need for the specific vehicle. The objective is that the GVA does not provide functions higher than SIL2.
Acceptance Method	Design Review

OCORA-10561, D-Level - Development process

The Generic Vehicle Adapter (GVA) shall be implemented according to the development process defined in EN 50126, EN 50129, EN 50128 and EN 50657 (EN 50716).

Status	✔ Approved
Classification	Requirement
Rationale	• The GVA is deployed on-board railway vehicles. It is ensured that functional completeness and prevention of systematic failures are achieved by the development process to the required level. • It is a requirement that the software components installed in a CCS on-board system is implemented according to the development process defined in the CENELEC standards [EN 50126-1:2017-10], [EN 50126-2:2017-10], [EN 50128:2011-06] and [EN 50657:2017-08]. • It is a requirement that the hardware components installed in a CCS on-board system is implemented according to the development process defined in the CENELEC standards [EN 50126-1:2017-10] and [EN50129:2018-11].

Remark	
Acceptance Method	Process Review

OCORA-10562, D-Level - Performance / execution, processing latency

The Generic Vehicle Adapter (GVA) data processing cycle time shall be as fast as the fastest bus cycle time to which it is connected.

Generally, the maximum allowed transfer delay time in the GVA (including the time for computation logic) shall be 100 ms. Time period measured from the moment the data is received on one interface (e.g. SCI-TCMS) until it is processed and sent on the other interface (e.g. CI-TCMS).

Note: the standardised communication interface SCI-TMCS and communication interface CI-TCMS are defined in the OCORA architecture [OCORA-TWS01-035].

Status	✔ Approved
Classification	Requirement
Rationale	• The data processing cycle time guarantees a maximum data processing delay between the different interfaces that in the worst case is 3 times the fastest bus cycle time ([1]see 'Remark' section for explanation). • The different vehicle functions need to rely on a maximum data exchange time between the CCS on-board and the vehicle (typically the TCMS). The actual time a data exchange needs, may vary, but the system must be able to react in case data is not exchanged within a known maximum exchange time. • Deterministic computing time is key for the GVA implementation. This is used when it is imperative that an event be reacted to within a strict deadline.
Remark	[SUBSET-041] for ETCS on-board requires: < 1 sec. delay between receiving of a balise message and applying the emergency brake. In SS-119 the maximum cycle time for the fastest signals is defined with 100 ms (for ECN). Furthermore, in 4.2.3.6 the additional transfer delay introduced due the implementation of a gateway shall be below 200ms (worst case). From a CCS on-board application perspective there is a need to rely on a maximum reaction time. [1]First cycle elapses if GVA finishes reading just before clients writes. Second cycle elapses for the data processing. Third cycle elapses if GVA writes just after client finishes reading.

Acceptance Method	Test

OCORA-10563, D-Level - Handling of safety relevant data

The Generic Vehicle Adapter (GVA) implementation shall ensure processing of safety relevant data (e.g. Sleeping Mode or Train Integrity) without retroactive effects.

Status	✓ Approved
Classification	Requirement
Rationale	• Safety relevant data shall be processed without being affected by the treatment of not safety relevant or less time sensitive data. • It shall be avoided that safety relevant data is delayed what causes a failsafe impact (typically activation of Emergency Brake and Traction Cut-Off).
Remark	
Acceptance Method	Certification

OCORA-10571, D-Level - Expandability to support future extensions / modifications

The design of the Generic Vehicle Adapter (GVA) shall allow implementing modifications or adding further functions in the GVA non-safe part with reasonable effort (impact on costs).

This means that certification of the GVA safe part shall not be affected.

Status	✓ Approved
Classification	Requirement
Rationale	• To handle the lifecycle of a whole vehicle it is essential that extensions / modifications can be introduced with reasonable effort impact. • To deploy innovation, it is essential that extension / modifications can be introduced with reasonable effort impact.
Remark	Costs for the extension shall be in about the same proportion to the original overall costs as the number of modified or added functions relative to the total number of implemented functions.
Acceptance Method	Demonstration

OCORA-10569, D-Level - Reliability

The Generic Vehicle Adapter (GVA) shall comply with the following reliability (related to hardware failures):

- Minor failure: MTBF < 8’000 hours.
- Reduced service failure: MTBF < 300’000 hours.
- Immobility failure: MTBF < 2’700’000 hours.

The mission profile for these values is defined in document 02S126 version 6 (ERA informative specification).

Status	✔ Approved
Classification	Requirement
Rationale	• A minor failure of the GVA hardware could lead to a warning information requiring service intervention within a failure specific period to prevent reduced performance. • A failure of the GVA hardware could lead to a reduced service with the consequence of a reduced performance. • A failure of the GVA hardware could lead to immobility, for instance in case of a transition of the ETCS on-board into the system failure (SF) mode.
Remark	The GVA hardware reliability to be coherent with the reliability of the CCS on-board functions (e.g. ETCS on-board). Values taken from document 02S126 version 6 (ERA informative specification).
Acceptance Method	Design Review

OCORA-10570, D-Level - Cyber security

The Generic Vehicle Adapter (GVA) shall fulfil the foundational requirements (FR) specified in IEC 62443-3-3 according to the following security level (SL) vector definition:

1. Identification and authentication (IAC): at least SL 2.
2. Use control (UC): at least SL 2.
3. System integrity (SI): at least SL 2.
4. Data confidentiality (DC): at least SL 2.
5. Restricted data flow (RDF): at least SL 2.
6. Timely response to events (TRE): at least SL 2.
7. Resource availability (RA): at least SL 2.

Status	✔ Approved
Classification	Requirement
Rationale	• The data handled in the GVA can be sensitive regarding the vehicle behaviour. It has therefore to be prevented that it can be deliberately manipulated by unauthorised people.
Remark	For the different activities that involve the GVA, cyber security issues at CCS on-board and / or vehicle level need to be considered and prevented.
Acceptance Method	Design Review

OCORA-10584, D-Level - Tools required for operation of GVA

The supplier shall provide the following tools that are needed to operate the Generic Vehicle Adapter (GVA): parametrisation tool, maintenance tool (installable on maintenance device), remote maintenance application (RMA).

Status	✔ Approved
Classification	Requirement
Rationale	• For the GVA no standardised maintenance and parametrisation interfaces are defined, the customer cannot develop his own tools. With the product the proprietary tools have to be supplied.
Remark	For efficient maintenance and parametrisation activities tools are required.
Acceptance Method	Inspection

OCORA-10590, D-Level - Mechanical requirements for GVA device body

The mechanical body of the Generic Vehicle Adapter (GVA) device shall comply with the following requirements:

- Width: compatible to 19' rack (IEC 60297-3, 482.6 mm series) with its own fastening points.
- Height: maximum 3U (IEC 60297-3, 482.6 mm series).
- Depth: maximum 210 mm.
- Weight: maximum 10 kg.
- Housing classification: IP20.
- Connectors (including power connector): on the front plane, directly accessible when standing in front of the rack.

Status	✓ Approved
Classification	Requirement
Rationale	• The 19' rack is often used for device mounting in vehicles.
Remark	The mechanical requirements have been dimensioned based on experience with other devices already operational in vehicles.
Acceptance Method	Test

OCORA-10706, D-Level - Compliance with EN 50155

The Generic Vehicle Adapter (GVA) shall comply with the EN 50155.

Status	✓ Approved
Classification	Requirement
Rationale	• EN 50155 is applicable to all on-board components. The GVA is an on-board component.
Remark	General standard applicable to on-board components.
Acceptance Method	Certification

OCORA-10603, D-Level - Applicable environmental operating conditions

The Generic Vehicle Adapter (GVA) device shall comply with the following requirements:

- Generally: conditions not specifically mentioned here are valid as defined in EN 50155.
- Altitude: A3 (up to 1'200 m).
- Operating temperature: OT3 (-25°C to +70°C).
- Method of cooling: cooling by natural air circulation.
- Switch-on extended operating temperature: ST1.
- Rapid temperature variations: H1.
- Shock and vibration: EN 61373, category 1, class B.
- Pollution degree conformance: EN 50124-1, PD2.

Status	✓ Approved
Classification	Requirement

Rationale	• Environmental operating condition requirements are defined to ensure that the device can be integrated into different vehicles that are already in operation.
Remark	The environmental operating condition requirements have been defined based on experience with other devices already operational in vehicles.
Acceptance Method	Design Review

OCORA-10602, D-Level - Electrical requirements

The Generic Vehicle Adapter (GVA) device shall comply with the following electrical requirements:

- Power supply nominal voltage: 24 .. 100 V DC (EN 50155), the device shall fulfil all different nominal values indicated in EN 50155.
- Maximum power consumption: 80 W.
- Maximum making current (inrush): 8 A.

Status	✓ Approved
Classification	Requirement
Rationale	• Electrical requirements are defined to ensure compatibility of the device to vehicles that are already in operation. • All different nominal voltage values have to be fulfilled as the different vehicles have different battery systems.
Remark	The electrical requirements have been defined based on experience with other devices already operational in vehicles.
Acceptance Method	Design Review

OCORA-10605, D-Level - Documentation

Together with the Generic Vehicle Adapter (GVA) product also the relevant documentation shall be provided. The documentation to include at least the following:

- Operating instructions (maintenance manual).
- Parametrisation guideline.

Status	✓ Approved
Classification	Requirement

Rationale	• The integrator and operator of the GVA requires a certain level of information that allows him to efficiently use the system.
Remark	Listed are the typical documents that are also provided for other systems.
Acceptance Method	Inspection