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1 Scope of the Document

This document specifies system requirements of the Diagnostic Manager. It is meant to be independent of any particular implementation and it contains foundation requirements, common to AUTOSAR classical and adaptive platform, as well as requirements specific to the AUTOSAR classic and Adaptive Platform .

In the Classic Platform chapter the handling of the legislated OBD and enhanced Diagnostics shall be achieved. As far as possible the set of diagnostic basic software elements should consist of already existing elements of modules of automotive software. Only in case of good reasons valid elements of basic software should be part of the set. If such the definition of these valid elements is not part of this work package. Nevertheless the information about basic software elements additionally required shall be given to related work groups.

In the Adaptive Platform chapter, some constraints should be notify related to the Adaptive environment : - only support for Ethernet as physical communication infrastructure will be provided, and no other typical bus communication is planned for release 1.0; on these grounds, all classical SRS Diagnostics requirements referring to standards (i.e. J1939) considering other bus protocols (i.e. FlexRay, CAN ..) were not considered in this specification

- due to insufficient information about the car domains where the AUTOSAR Adaptive Platform will apply, OBD protocol (standardized as ISO 15031) is also not subject of this specification

- Release 1.0 of AUTOSAR Adaptive Platform is planned to be a learning environment for future development as a consequence its interfaces are described with ICC1 (Interface Conformance Class) granularity level, meaning that no internal DM interfaces are to be specified

2 Acronyms and Abbreviations

Abbreviation / Acronym:	Description:
CAN	Controller Area Network (communication bus)
Dem	Diagnostic Event Manager
DID	Diagnostic Identifier
DM	Diagnostic Management
DoIP	Diagnostic over IP - transport protocol for diagnostic services standardized as ISO 13400

DTC	Diagnostic Trouble Code
ECU	Electronic Control Unit
IDL	Interface Description Language
OBD	On-board Diagnostic (standardized as ISO 15031)
RTE	Runtime Environment
SA	Source Address (diagnostics address of the tester)
SID	Service Identifier (hexa number to uniquely identify UDS services) 0x22 for Read Data by Identifier service 0x2E for Write to Non-Volatile memory service
SWC	Software Component (could refer either to classical Autosar SW-C or to dynamic SW-C)
TA	Target Address (diagnostic address of the ECU)
UDS	Unified Diagnostic Specification standardized as ISO 14229

Table 2.1: table:acronyms

3 Conventions to be used

In requirements, the following specific semantics are used :

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY" and "OPTIONAL" in this document are to be interpreted . Note that the requirement level of the document in which they are used modifies the force of these words.

- **SHALL:** This word means that the definition is an absolute requirement of the specification.
- **SHALL NOT:** This phrase means that the definition is an absolute prohibition of the specification.
- **MUST:** This word, or the terms "REQUIRED" or "SHALL", mean that the definition is an absolute requirement of the specification.
- **MUST NOT:** This phrase, or the phrase "SHALL NOT", means that the definition is an absolute prohibition of the specification.
- **SHOULD:** This word, or the adjective "RECOMMENDED", mean that there may exist valid reasons in particular circumstances to ignore a particular item, but the

full implications must be understood and carefully weighed before choosing a different course.

- **SHOULD NOT:** This phrase, or the phrase "NOT RECOMMENDED" mean that there may exist valid reasons in particular circumstances when the particular behavior is acceptable or even useful, but the full implications should be understood and the case carefully weighed before implementing any behavior described with this label.
- **MAY:** This word, or the adjective "OPTIONAL", means that an item is truly optional. One vendor may choose to include the item because a particular marketplace requires it or because the vendor feels that it enhances the product while another vendor may omit the same item. An implementation, which does not include a particular option, **MUST** be prepared to inter operate with another implementation, which does include the option, though perhaps with reduced functionality. In the same vein an implementation, which does include a particular option, **MUST** be prepared to inter operate with another implementation, which does not include the option (except, of course, for the feature the option provides).

4 Requirements Specification

4.1 Common Diagnostic requirements for classic and adaptive platform

[SRS_Diag_04200] The Diagnostic Management shall support combined DTCs [

Type:	Valid
Description:	The DM shall allow for combining several individual events to a single DTC.
Rationale:	Advanced fault analysis
Applies to:	CP, AP
Dependencies:	–
Use Case:	Improved clustering and judging of events/faults. Several internal hardware faults of an electronic control unit can be mapped onto a single "ECU internal" failure to reduce the number of Diagnostic Trouble Codes shown to the technician in the service workshop.

]([RS_Main_00260](#))

[SRS_Diag_04179] The Diagnostic Management shall provide interfaces for diagnostic monitors. [

Type:	Valid
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Description:	The Diagnostic Management shall provide interfaces for diagnostic monitors. A diagnostic event shall be used for that. It is an atomic unit that can be handled by the DM. The status of a diagnostic event represents the result of a diagnostic monitor. Events shall be identified uniquely by dedicated event identifiers (EventId).
Rationale:	For each monitoring path the DM needs a uniquely identifiable entity which can be handled internally.
Applies to:	CP, AP
Dependencies:	–
Use Case:	The result of a diagnostic monitor is reported to the Diagnostic Management which triggers the change of status information related to the corresponding event.

](RS_Main_00260)

[SRS_Diag_04178] The Diagnostic Management shall support operation cycles according to ISO 14229-1 [

Type:	Valid
Description:	The DM module shall provide a set of system cycles that may qualify the event in an additional manner.
Rationale:	Operation cycles are essential for event status management.
Applies to:	CP, AP
Dependencies:	–
Use Case:	Starting of an operation cycle triggers many types of system reactions.
Supporting Material:	ISO 14229-1 v.2013 and ISO 15031-5

](RS_Main_00260)

[SRS_Diag_04201] The Diagnostic Management shall support a configuration to assign specific events to a customer specific DTC [

Type:	Valid
Description:	Assignment of events to customer specific or standardized DTCs.
Rationale:	Events are used DM internally only. An external scan tool requests a DTC number which was assigned to one or multiple events/monitors.
Applies to:	CP, AP
Dependencies:	–
Use Case:	Internal monitor results (e.g. driver can be experienced) are observable via a scan tool enabling external fault analysis.

](RS_Main_00260)

[SRS_Diag_04180] The Diagnostic Management shall process all UDS Services related to diagnostic fault memory of ISO 14229-1 internally [

Type:	Valid
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Description:	Service implementation of all UDS services, which are related to fault memory (ClearDiagnosticInformation and ReadDTCInformation from 'Stored Data Transmission functional unit'), shall be implemented internally within DM without delegating the processing/part of the processing to external modules. The MirrorMemory is not supported, wherefore the services for MirrorMemory shall be excluded (0x19 10 and 0x19 11).
Rationale:	Since DM is also responsible for management of error memory (Dem in Classic AUTOSAR) error memory/fault memory related UDS services (0x85, 0x14, 0x19) have to be processed internally.
Applies to:	CP, AP
Dependencies:	–
Use Case:	General diagnostic protocol processing.
Supporting Material:	ISO 14229-1

](RS_Main_00260)

[SRS_Diag_04181] The Diagnostic Management shall provide an interface via <middleware/RTE> to monitoring <application/SWCs> for reporting diagnostic test results [

Type:	Valid
Description:	The Diagnostic Management shall provide an interface via <middleware/RTE> to monitoring <application/SWCs> for reporting and processing diagnostic results. Monitoring <application/SWCs> report diagnostic results as soon as valid results are available.
Rationale:	Test results reported by monitoring <application/SWCs> are handled DM internally. The interaction between DM and the <application/SWCs> is realized using a dedicated interface via <middleware/RTE>.
Applies to:	CP, AP
Dependencies:	–
Use Case:	Monitoring <application/SWC> reports test results to DM using the interface.

](RS_Main_00060)

[SRS_Diag_04182] The Diagnostic Management shall provide an interface via <middleware/RTE> to <application/SWCs> for changing the state of operation cycles [

Type:	Valid
Description:	Operation cycles handled by the DM can be started, stopped or restarted by <application/SWCs> via <middleware/RTE>.
Rationale:	Operation cycle state transitions are trigger conditions for event status management according to ISO 14229-1.
Applies to:	CP, AP
Dependencies:	SRS_Diag_04178
Use Case:	Monitoring <application/SWC> starts an operation cycle. This triggers some status changes for the relevant events.

](RS_Main_00060)

[SRS_Diag_04183] The Diagnostic Management shall notify interested parties about event status changes via <middleware/RTE> [

Type:	Valid
Description:	Event status change report shall be available via <middleware/RTE> for <application/SWCs> subscribing for the notification.
Rationale:	Event specific status information is handled DM internally, the change of the status might be relevant for monitoring or other <application/SWCs>.
Applies to:	CP, AP
Dependencies:	–
Use Case:	The <application/SWC> gets informed about relevant event status change via <middleware/RTE>.

](RS_Main_00060)

[SRS_Diag_04184] The Diagnostic Management shall notify interested parties about event related data changes via <middleware/RTE> [

Type:	Valid
Description:	Event related data change report shall be available via <middleware/RTE> for <application/SWCs> subscribing for the notification.
Rationale:	Event specific data is collected by the DM, the change of this data might be relevant for monitoring or other <application/SWCs>.
Applies to:	CP, AP
Dependencies:	–
Use Case:	The <application/SWC> gets informed about relevant data change via <middleware/RTE>.

](RS_Main_00060)

[SRS_Diag_04185] The Diagnostic Management shall notify interested parties via <middleware/RTE> about the clearing of an event [

Type:	Valid
Description:	Interested monitoring <application/SWCs> shall be informed about the clearing of event status information and event related data via <middleware/RTE>.
Rationale:	Monitor reinitialization can be triggered by the clear notification.
Applies to:	CP, AP
Dependencies:	–
Use Case:	After the event status is cleared DM informs the relevant monitoring <application/SWC> which can be reinitialized.

](RS_Main_00060)

[SRS_Diag_04186] The Diagnostic Management shall notify interested parties via <middleware/RTE> about the start or restart of an operation cycle [

Type:	Valid
Description:	Interested monitoring <application/SWCs> shall be informed about the start or restart of operation cycles via <middleware/RTE>.
Rationale:	Monitor reinitialization can be triggered by the start of an operation cycle.
Applies to:	CP, AP
Dependencies:	–
Use Case:	A monitor <application/SWC> gets initialized after DM informs it about the start of a relevant operation cycle.

]([RS_Main_00060](#))

[SRS_Diag_04204] The Diagnostic Management shall provide the current status of each warning indicator via <middleware/RTE> [

Type:	Valid
Description:	The Diagnostic Management shall derive the current warning indicator status from the assigned events according to ISO 14229-1. The warningIndicatorRequested bit shall be set according to ISO 14229-1.
Rationale:	The warning indicator status is used to activate or deactivate indicators like lamps, text message or a beep. The state is calculated in DM wherefore the information needs to be distribution to the <application/SWCs>.
Applies to:	CP, AP
Dependencies:	–
Use Case:	Indications of certain malfunctions to the driver (e.g. Malfunction Indicator Lamp (MIL)).

]([RS_Main_00060](#), [RS_Main_00420](#))

[SRS_Diag_04187] Diagnostic Management shall provide an interface to set/reset a latched fail-safe strategy [

Type:	Valid
Description:	The DM shall provide an interface via <middleware/RTE> to set and reset a DTC specific latched fail-safe strategy. In case the latched fail-safe strategy is set, the WarningIndicatorRequested bit and its associated warning indicator are set, too. This latched fail-safe strategy and the WarningIndicatorRequested bit cannot be reset by ClearDTC command. Only this API or a restart will reset this latched fail-safe strategy.
Rationale:	Consistent fail-safe reaction independent of external ClearDTC commands.
Applies to:	CP, AP
Dependencies:	–
Use Case:	Some DTCs required to set a latched fail-safe strategy which keeps active until the conditions (e.g. successful test completion) for this latched fail-safe strategy is no longer active.

]([RS_Main_00260](#))

[SRS_Diag_04202] The Diagnostic Management shall report DTCs getting active to the error logging module/system [

Type:	Valid
Description:	The Diagnostic Management shall report DTCs getting active to the error logging module/system
Rationale:	To have an overview of all log, trace error messages and to set all of them in the correct context with the error events reported to the DM, it is important to have all this messages and events in one list (context). This makes an analysis of the reported errors more efficient and gives a correct picture of the ongoing sequences, which report an error.
Applies to:	CP, AP
Dependencies:	–
Use Case:	The <application/SWC> sets an event status DM forwards it to the logging system The logging system inserts the action to the log list

] ([RS_Main_00480](#))

[SRS_Diag_04205] The Diagnostic Management shall support SnapshotRecords [

Type:	Valid
Description:	The Diagnostic Management shall support SnapshotRecords according to ISO 14229-1. Each DTC can optionally have one or many SnapshotDataRecords. The record number shall be configurable. Only a atomic update of the whole record shall be supported. The storage trigger shall be configurable per SnapshotRecord number. The configurable trigger is based on the following DTC status bit transitions: TestFailed_Set; Confirmed_Set; Pending_Set FaultDetectionCounterThreshold_Reached. The environmental data shall be captured from external applications.
Rationale:	Advanced fault analysis.
Applies to:	CP, AP
Dependencies:	[SRS_Diag_04189]
Use Case:	Improved clustering and judging of events/faults.
Supporting Material:	ISO 14229-1

] ([RS_Main_00260](#), [RS_Main_00011](#))

[SRS_Diag_04206] The Diagnostic Management shall support Extended-DataRecords [

Type:	Valid
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Description:	The Diagnostic Management shall support ExtendedDataRecords according to ISO 14229-1. Each DTC can optionally have one or many ExtendedDataRecords. The record number shall be configurable. Only a atomic update of the whole record shall be supported. The storage trigger shall be configurable per Extended data number. The configurable trigger is based on the following DTC status bit transitions: TestFailed_Set; Confirmed_Set; Pending_Set FaultDetectionCounterThreshold_Reached.
Rationale:	Advanced fault analysis.
Applies to:	CP, AP
Dependencies:	[SRS_Diag_04189]
Use Case:	Improved clustering and judging of events/faults.
Supporting Material:	ISO 14229-1

](RS_Main_00260, RS_Main_00011)

[SRS_Diag_04188] The Diagnostic Management shall provide debounce algorithms [

Type:	Valid
Description:	DM shall support per diagnostic event an individual configurable debounce algorithm. The DM shall support counter based debouncing and time based debouncing. The counter based debouncing is according to ISO 14229-1 Appendix D. The time based debouncing use a configurable time instead of counter threshold. The time is reloaded and running after the last monitor result/event status is different to the previous. After the time is exceeded the event has qualified.
Rationale:	Advanced fault analysis. Event status processing is refined by DM internal debounce possibilities.
Applies to:	CP, AP
Dependencies:	–
Use Case:	All <application/SWCs> can report events to the DM. The diagnostic module processes all these events and is able to provide a central debounce behavior for event classification & status management.
Supporting Material:	ISO 14229-1

](RS_Main_00260)

[SRS_Diag_04189] The Diagnostic Management shall support a fine grained configuration of event related data (define SnapshotRecord and ExtendedDataRecords) [

Type:	Valid
Description:	DM shall be able to handle fine grained layout configurations for event related data. Data elements might be collected from different <application/SWCs> and merged to different DIDs or ExtendedDataRecords.
Rationale:	Advanced fault analysis.

Applies to:	CP, AP
Dependencies:	–
Use Case:	DM collects SnapshotRecord data from different <application/SWCs> and merges diagnostic information into one DID.

]([RS_Main_00260](#), [RS_Main_00011](#))

[SRS_Diag_04190] Snapshot- and ExtendedDataRecords shall be able to report DM internal data elements. [

Type:	Valid
Description:	It shall be possible to assign Diagnostic Management internal data elements like Operation Cycle Counter, Fault Detection Counter (FDC) and Occurrence Counter to Snapshot- and ExtendedDataRecords. While reading the Snapshot- or ExtendedDataRecord the current value of the Diagnostic Management internal data element shall be reported.
Rationale:	Some data objects that are internally generated by the DM can be retrieved by UDS service 0x19 ReadDTCInformation. SRS_Diag_04134
Applies to:	CP, AP
Dependencies:	SRS_Diag_04205
Use Case:	Reading Operation Cycle Counter, Fault Detection Counter and Occurrence Counter.

]([RS_Main_00260](#), [RS_Main_00011](#))

[SRS_Diag_04191] Control of event handling [

Type:	Valid
Description:	The DM shall provide locking functionality for dedicated DTCs. If this functionality is configured for an event, it shall be called before clearing this event from the event memory. Unless the functionality does not allow clearance, the event must not be cleared.
Rationale:	If the environmental conditions do not allow the clearance of an event, the application must have the opportunity to prohibit the deletion.
Applies to:	CP, AP
Dependencies:	–
Use Case:	Some dedicated events must never get cleared from event memory, while the ECU is in a special operation mode.

]([RS_Main_00260](#), [RS_Main_00011](#))

[SRS_Diag_04192] The Diagnostic Management shall provide the ability to handle event specific enable and storage conditions [

Type:	Valid
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Description:	The Diagnostic Management shall accept event status reporting if event-specific enable conditions are currently valid. Otherwise the reporting shall be rejected. In case the event-specific storage condition(s) are not fulfilled, the DTC will fail but not added to or updated in the fault memory (Pending and Confirmed are not set).
Rationale:	Support mechanisms to avoid reams of event memory entries in case of specific ECU conditions.
Applies to:	CP, AP
Dependencies:	–
Use Case:	Depending on environmental data or the current status of an ECU the Diagnostic Management considers a certain number of conditions/checks before the event get qualified. <ul style="list-style-type: none"> - Enable conditions affects the ability of a diagnostic monitor to report events - Storage conditions affects the qualification of the reported event before the event is stored in its configured event memory For specific fault groups (e.g. network faults) it is necessary to evaluate the current status of an ECU (e.g. under voltage) before the reported events are qualified by the DM.

]([RS_Main_00260](#), [RS_Main_00420](#))

[SRS_Diag_04193] The Diagnostic Management shall support component dependencies [

Type:	Valid
Description:	The actually monitored components like hardware parts (sensors, actuators) or monitored signals along with their inter-dependencies shall be representable in the diagnostic system. For each component the status information shall be provided for system degradation and the failure storage shall consider the dependencies for deciding upon storing failures.
Rationale:	Avoid irrelevant failure storage. Furthermore facilitate correct status calculation of components and system reconfiguration.
Applies to:	CP, AP
Dependencies:	–
Use Case:	For large systems it becomes difficult to consider all the dependencies and relations which are relevant for system reconfiguration and determination of failure root causes. This is improved by a hierarchical representation of component and their dependencies.

]([RS_Main_00260](#), [RS_Main_00011](#))

[SRS_Diag_04194] ClearDTC shall be accessible via <middleware/RTE> [

Type:	Valid
Description:	The service ClearDTC provided by the Diagnostic Management supports the functionality of clearing the DTCs of a specified memory origin. This service shall be available not only inside the DM, but also for the <application/SWCs> via <middleware/RTE>.

Rationale:	The UDS job 0x14 ClearDiagnosticInformation supports only the clearing of primary memory. Clearing of user defined memory origins is usually handled by the <application/SWCs>, that is why the ClearDTC service shall be provided via <middleware/RTE>
Applies to:	CP, AP
Dependencies:	–
Use Case:	A routine control UDS job activates <application/SWC>, which clears the DTCs of a user defined memory using the ClearDTC service in DM via <middleware/RTE>.

]([RS_Main_00260](#), [RS_Main_00060](#))

[SRS_Diag_04150] The Diagnostic Management shall support clearing recorded failure information [

Type:	Valid
Description:	The Diagnostic Management shall support different fault memories : primary, mirror and user defined. It shall be possible to clear the fault memories and to clear the event status information (ISO14229-1 status byte).
Rationale:	In several situations, it is necessary to clear fault memories.
Applies to:	CP, AP
Dependencies:	Production line, garage after reparation,...
Use Case:	Supporting the tester/scantool services.
Supporting Material:	–

]([RS_Main_00260](#))

[SRS_Diag_04195] The Diagnostic Management shall provide a chronological reporting order of the DTCs located in the configured event memory [

Type:	Valid
Description:	The Diagnostic Management shall be able to handle the order of event occurrences (e.g. represented by a time stamp or odometer value).
Rationale:	Advanced fault analysis.
Applies to:	CP, AP
Dependencies:	–
Use Case:	When processing 0x19 UDS job, DTCs are returned in the chronological order.

]([RS_Main_00260](#), [RS_Main_00011](#))

[SRS_Diag_04211] The Diagnostic Management shall support the persistent storage of DTC status and environmental data [

Type:	Valid
Description:	The Diagnostic Management shall support the non-volatile storage for event status and environmental data parameters required by ISO 14229-1.

Rationale:	According to the ISO 14229-1 UDS specification a set of status information and environmental data shall be stored non-volatile.
Applies to:	CP, AP
Dependencies:	–
Use Case:	Status information is stored non-volatile over power cycles.
Supporting Material:	ISO 14229-1 Appendix D

]([RS_Main_00011](#), [RS_Main_00440](#))

[SRS_Diag_04196] The Diagnostic Management shall implement UDS Service handling for all diagnostic services defined in ISO 14229-2 [

Type:	Valid
Description:	The Diagnostic Management shall implement the protocol handling for all UDS services defined in ISO 14229-2.
Rationale:	The Diagnostic Management shall be the central service handler for UDS diagnostics.
Applies to:	CP, AP
Dependencies:	–
Use Case:	Interaction with UDS compliant tester on Ethernet.
Supporting Material:	ISO 14229

]([RS_Main_00260](#))

[SRS_Diag_04203] The Diagnostic Management shall implement the common checks on all supported UDS Services Requests [

Type:	Valid
Description:	The following checks shall be implemented by DM on all supported UDS services: SID and sub-function format - Diagnostic session level - Diagnostic security level - Message length
Rationale:	The Diagnostic Management shall be UDS compliant and shall do general checks, which can be done on UDS protocol level centrally, independently whether the service is processed internally or externally by a SWC as service processor.
Applies to:	CP, AP
Dependencies:	–
Use Case:	General diagnostic protocol processing.
Supporting Material:	ISO 14229

]([RS_Main_00260](#))

[SRS_Diag_04197] The Diagnostic Management shall allow to clear the user defined fault memory [

Type:	Valid
Description:	The clearance of user defined fault memory shall be possible according to the ISO 14229 draft document: "02_ISO_14229-1_Comments-Summary_2016-09-13.docx" via diagnostic requests.
Rationale:	Provide a standardized way to clear user defined fault memory.
Applies to:	CP, AP
Dependencies:	–
Use Case:	OEM and TIER1 using the user defined fault memory need to clear the user defined memory. A standardized way make OEM or TIER1 specific solutions obsolete, which were incompatible to each.
Supporting Material:	ISO 14229-1

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[SRS_Diag_04198] The Diagnostic Management shall process all UDS Services related to session and security management of ISO 14229 internally [

Type:	Valid
Description:	Service implementation of all UDS services, which are related to session and security management (DiagnosticSessionControl, SecurityAccess and TesterPresent from 'Diagnostic and Communication Management functional unit'), shall be implemented internally within DM without delegating the processing/part of the processing to external modules. This does NOT exclude, that DM does callout to external <application/SWCs> (via <middleware/RTE>) for instance to get/check certain security keys. But the state machine/protocol is handled internally by DM.
Rationale:	Session and security management is an integral part of general UDS service handling and has therefore to be implemented internally.
Applies to:	CP, AP
Dependencies:	–
Use Case:	General diagnostic protocol processing.
Supporting Material:	ISO 14229

] ([RS_Main_00260](#), [RS_Main_00011](#))

[SRS_Diag_04199] The Diagnostic Management shall support a configurable mechanism, where <application/SWCs> can control during runtime, whether a UDS request shall be processed or not [

Type:	Valid
Description:	The Diagnostic Management shall support to query configured <applications/SWCs>, whether a received UDS service request shall be processed or rejected.

Rationale:	Infrastructural/OEM specific supervisor components decide about service execution on a basis of ECU/vehicle state.
Applies to:	CP, AP
Dependencies:	–
Use Case:	Control of service access centrally done in one SWC.

]([RS_Main_00260](#), [RS_Main_00011](#))

[SRS_Diag_04208] The Diagnostic Management shall inform the <application/SWCs> about diagnostic session and diagnostic security level changes on each tester connection. [

Type:	Valid
Description:	In case the currently active UDS session or security level change on a tester conversation, the Diagnostic Management shall provide a notification mechanism for the <application/SWCs>, to inform the <application/SWCs> about the new session or security level and the affected tester connection.
Rationale:	Session changes happen asynchronously to service processor implementations. But there exists functionality that needs to react on session changes.
Applies to:	CP, AP
Dependencies:	SRS_Diag_04169
Use Case:	Flexibility for service processor implementations.

]([RS_Main_00260](#), [RS_Main_00011](#))

4.2 Diagnostic requirements for the Classic platform

4.2.1 Functional Requirements

[SRS_Diag_04010] The DEM module and DCM module shall ensure interaction in order to fulfill ISO 14229-1 and ISO 15031-5 [

Type:	Valid
Description:	If the DCM shall respond diagnostic services of a tester/scan-tool (e.g. read DTC information), the DCM module shall use interfaces to collect the required data from the DCM module (e.g. setting the DTC status mask, get filtered DTCs and the corresponding event related data) and from SW-Cs (e.g. read current diagnostic values). The DEM module shall provide interfaces to process the storage of events and event related data.
Rationale:	ISO 14229-1 v.2013 and ISO 15031-5
Use Case:	Improved fault and event tracking, analysis for services, assembly line, OBD-SCAN-Tool
Applies to:	CP
Dependencies:	–

Supporting Material:	ISO 14229-1 v.2013 and ISO 15031-5
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]([RS_Main_00260](#))

[SRS_Diag_04082] The diagnostic modules DCM and DEM shall provide standardized interfaces to support OBD services as defined in ISO15031-5 and SAE J1979 [

Type:	Valid
Description:	The DCM and the DEM provide interface to support OBD services 01to0A to access Parameter Identifiers (PIDs), diagnostic test results and further OBDII specific data.
Rationale:	–
Use Case:	–
Applies to:	CP
Dependencies:	–
Supporting Material:	–

]([RS_Main_00420](#), [RS_Main_00260](#))

[SRS_Diag_04067] The DCM and DEM shall provide the diagnostic status information according to ISO 14229-1 [

Type:	Valid
Description:	The DCM and DEM shall provide the diagnostic status information according to the DTCSStatusMask, ISO 14229-1 v.2013 (refer to DTC status mask), Annex D5
Rationale:	Advanced fault analysis
Use Case:	Improved fault and event tracking and analysis
Applies to:	CP
Dependencies:	–
Supporting Material:	ISO 14229-1 v.2013

]([RS_Main_00420](#), [RS_Main_00260](#))

[SRS_Diag_04139] The DCM and DEM shall support subfunction 0x42 of UDS service 0x19 [

Type:	Valid
Description:	DCM and DEM shall support subfunction 0x42 of UDS service 0x19 to retrieve WWH-OBD-specific DTCs matching the requested DTC status mask and severity mask record.
Rationale:	Support of WWH-OBD
Use Case:	Improved fault and event tracking and analysis

Applies to:	CP
Dependencies:	–
Supporting Material:	Support of WWH-OBD

](RS_Main_00260)

[SRS_Diag_04141] The DCM and DEM shall support ISO27145 (WWH-OBD) [

Type:	Valid
Description:	EURO VI has diagnostic requirements defined in ISO27145 vehicles must comply to.
Rationale:	ISO 14229-1, -2, -5 and ISO 27145-2,-3
Use Case:	Fulfillment of legislative requirements, homologation
Applies to:	CP
Dependencies:	–
Supporting Material:	ISO 14229-1, -2, -5 and ISO 27145-2,-3

](RS_Main_00260)

[SRS_Diag_04129] The DCM and DEM shall provide OBD-specific configuration capabilities [

Type:	Valid
Description:	<p>The DCM and DEM shall provide the following configuration capabilities:</p> <ul style="list-style-type: none"> • OBD- ECU kind 1: ECU acts as OBD Master ECU (Master or Primary ECU) • OBD- ECU kind 2: ECU acts as OBD Slave ECU (Dependent / Secondary ECU) • OBD- ECU kind 3: ECU acts as non-OBD ECU <p>The DCM and the DEM shall both provide corresponding configuration parameters to switch on/switch off module-specific OBD functionality. Depending on the configured use case, the associated DCM and DEM port interfaces shall be provided to connect different OBD-ECU kinds on application level (via bus communication).</p>
Rationale:	UseCase-specific module configuration.
Use Case:	Optimization of RAM/ROM consumption.
Applies to:	CP
Dependencies:	–
Supporting Material:	–

](RS_Main_00260)

[SRS_Diag_04163] Parallel OBD and UDS processing [

Type:	Valid
Description:	Diagnostics shall support the parallel processing of OBD and UDS protocols.
Rationale:	Vehicles can be equipped with On-board testers which send diagnostic requests at any arbitrary point in time. Legislative OBD requests need to be processed independently from a UDS requests from On-board testers.
Use Case:	Parallel reception of diagnostic requests from multiple testers.
Applies to:	CP
Dependencies:	–
Supporting Material:	–

](RS_Main_00260)

[SRS_Diag_04161] Diagnostics shall consider ASMIP algorithm [

Type:	Valid
Description:	Diagnostics shall consider the ASMIP algorithm (Alternative Statistical MIL Illumination Protocol) according to the Californian Code of Regulation 13 CCR section 1968.2.
Rationale:	Supporting OBD use cases.
Use Case:	Dynamical threshold modification.
Applies to:	CP
Dependencies:	–
Supporting Material:	–

](RS_Main_00260)

[SRS_Diag_04097] Decentralized modular diagnostic configuration of SW-Cs [

Type:	Valid
Description:	Each SW-C provides additional diagnostic configuration information for other SW-Cs and for diagnostic modules. The DCM and the DEM module shall be able to generate ports to be connected between these modules in order to allow for diagnostic data to be accessible through the DCM (if requested by an external scan tool) and the DEM (for triggering event entries and collecting event related data).
Rationale:	Because of decentralized configuration and interface requirements each SW-C shall provide and implement diagnostic interfaces to allow code generation and port connection in the DCM (DSP).

Use Case:	<p>Use-case example:</p> <ul style="list-style-type: none"> As of today functions and associated diagnostics are developed by several parties. Thus for each function and its diagnostic monitors (e.g. torque management in an engine controller) the diagnostic capabilities are defined separately and will not necessarily be coordinated during development. System integration and combination of diagnostics for accessibility through DCM and DEM requires that the individual functions and diagnostic features are connected to be compiled as a complete diagnostic system (which is in case of OBD2 certification relevant). <p>Use-case summary:</p> <ol style="list-style-type: none"> develop decentralized modular software and its diagnostics without permanent interaction with other SW-Cs developers. Combine modules and extract module-specific diagnostic data. link diagnostic data from SW-Cs to DCM and DEM.
Applies to:	CP
Dependencies:	–
Supporting Material:	ISO 14229-1 v.2013

]([RS_Main_00420](#), [RS_Main_00260](#))

[SRS_Diag_04148] The diagnostic modules shall provide capabilities to inform SW-C about diagnostic data changes [

Type:	Valid
Description:	The diagnostic modules shall provide capabilities to inform SW-C about diagnostic data changes. The capabilities shall cover the provision of corresponding interfaces and configuration options for data elements and associated triggers.
Rationale:	SWC requires information from BSW module(s).
Use Case:	SWC needs to be informed about a status change of a DTC to be able to react on this DTC status.
Applies to:	CP
Dependencies:	–
Supporting Material:	–

]([RS_Main_00260](#))

4.2.2 Diagnostic Event Manager(DEM)

[SRS_Diag_04002] The Diagnostic event (fault) management shall be established as Basic SW Module [

Type:	Valid
Description:	The Diagnostic event (error) management shall be a Basic SW Module described in the Diagnostic WP. Diagnostic event (error) management is out of scope for Mode Management.
Rationale:	SW Architecture
Use Case:	Improved fault and event tracking and analysis for Service, assembly line, OBD-SCAN-Tool
Applies to:	CP
Dependencies:	–
Supporting Material:	–

](RS_Main_00260)

[SRS_Diag_04057] The DEM shall support a classification of events for series production, OBD and expert usage [

Type:	Valid
Description:	<p>The DEM shall support a classification of events for the following types of events:</p> <ul style="list-style-type: none"> • Events that are defined for error analysis in the service station shall be stored in the primary event memory. • Events that are defined for detailed error analysis by experts in the after sale department are stored in the secondary error memory. <p>Errors that occur during the development process shall be stored in the DET. Therefore, a special DET API shall be used which is not provided by the DEM.</p>
Rationale:	After sales analysis
Use Case:	Distinction between service station relevant and after sales relevant events.
Applies to:	CP
Dependencies:	–
Supporting Material:	–

](RS_Main_00011)

[SRS_Diag_04063] The DEM module shall process a dedicated event identifier (EventId) for each monitoring path to support an autonomous handling of different events/faults [

Type:	Valid
Description:	For the internal administration the DEM needs a unique identification of each monitoring path. This identification shall be handled via an Event ID value (Integer).
Rationale:	Introduce unique event identifiers (EventIds) in DEM.
Use Case:	Unique fault identification which can be used for enhanced debugging.
Applies to:	CP
Dependencies:	–

Supporting Material:	–
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](RS_Main_00011)

[SRS_Diag_04149] Diagnostics shall support clearing of DTCs status, events and failure memory entries [

Type:	Draft
Description:	Diagnostics shall support clearing of DTCs status, events and failure memory entries.
Rationale:	OEM and legal entity requirements.
Use Case:	Supporting the tester/scantool services.
Applies to:	CP
Dependencies:	–
Supporting Material:	–

](RS_Main_00260)

[SRS_Diag_04133] The DEM module shall support Aging [

Type:	Valid
Description:	The DEM module shall support Aging to remove event memory entries from the event memory which have not failed for a specific number of operating cycles.
Rationale:	Remove information from fault memory that is not relevant for a repair action.
Use Case:	Network timeout fault that has been detected, but is not in active state any more.
Applies to:	CP
Dependencies:	–
Supporting Material:	–

](RS_Main_00260)

[SRS_Diag_04140] Support of aging for UDS status bits "confirmedDTC" and "testFailedSinceLastClear" [

Type:	Valid
Description:	The DEM module shall provide the capability to age both the confirmedDTC bit and the testFailedSinceLastClear bit after a configurable number of aging cycles has been reached. The value at which each bit is aged may be different between the two.
Rationale:	–
Use Case:	–
Applies to:	CP
Dependencies:	–

Supporting Material:	–
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](RS_Main_00260)

[SRS_Diag_04136] Support of configurable "confirmed" threshold [

Type:	Valid
Description:	The DEM shall support a postbuild configurable "confirmed" threshold.
Rationale:	Flexible usage of local legislated requirements.
Use Case:	In different markets (US/EURO), the DEM needs to support different legislated requirements. For the US market the MIL and the ConfirmedDTC is activated after 2 DCY (Driving Cycles). For the EUR market the MIL and the ConfirmedDTC is activated after 3 DCY (Driving Cycles).
Applies to:	CP
Dependencies:	–
Supporting Material:	–

](RS_Main_00260)

[SRS_Diag_04068] The DEM module shall provide event specific debounce algorithms [

Type:	Valid
Description:	The DEM module shall support event specific debounce counters to improve signal quality internally. The configuration of the DEM module shall support the following types of debounce mechanisms: <ul style="list-style-type: none"> • counter based; • time based; • handling of external debouncing. <p>The DEM module shall provide the ability to configure the jump behavior including jump up and jump down threshold value of the debounce counter in case of pre-passed or pre-failed event reporting. If failure detection jitters (e.g. sporadically reported pre-passed events), failure detection must not be delayed or prevented. For example, a monitoring configuration does NOT use jumpdown to avoid losing an event reporting a pre-failed status.</p> <p>The provision of jumping behavior of the debounce counter shall ensure the failure detection time because debouncing always starts from a defined starting point.</p>
Rationale:	Advanced fault analysis
Use Case:	All SW-Cs and BSW modules can report events to the DEM module. The diagnostic module processes all these events and is able to provide a central de-bounce behavior for event classification and status management.
Applies to:	CP

Dependencies:	–
Supporting Material:	–

]([RS_Main_00260](#), [RS_Main_00420](#))

[SRS_Diag_04125] The behavior of the event debounce counter shall be configurable [

Type:	Valid
Description:	<p>It shall be configurable if the debounce counter shall be frozen or reset, when at least one enable condition for the event is set to "not fulfilled" or when ControlDTCSetting is set to "disabled".</p> <p>In case of switching the enable conditions to "fulfilled" the monitor needs to be informed to restart the event detection.</p> <p>In case of switching ControlDTCSetting to "re-enabled" the monitor needs to be informed to restart the event detection.</p>
Rationale:	Flexible usage of DEM internal debouncing
Use Case:	–
Applies to:	CP
Dependencies:	–
Supporting Material:	–

]([RS_Main_00420](#))

[SRS_Diag_04124] The DEM shall be able to store the current debounce counter value nonvolatile to over a powerdown cycle [

Type:	Valid
Description:	The DEM shall be able to store the current debounce counter value non-volatile to over a power-down cycle.
Rationale:	Support of DTC de-bouncing within several power cycles.
Use Case:	While the typical DTC operation cycle for a DTC is to start at power up and end at power down, there are different situations, when a particular DTC must define its operation cycle to span multiple ECU power up/down cycles. In this case, the FDC would need to be stored in NVM as it may never make it to 127 during a single power up.
Applies to:	CP
Dependencies:	–
Supporting Material:	–

]([RS_Main_00260](#), [RS_Main_00420](#))

[SRS_Diag_04118] The DEM shall optionally support event displacement [

Type:	Valid
Description:	The DEM shall optionally support event displacement. The following sequence of different displacement criteria shall be possible: <ol style="list-style-type: none"> 1. Priority; 2. Active/passive status (optional); 3. Occurrence.
Rationale:	Limited hardware (memory resources) in ECU.
Use Case:	Error memory is full and Valid event is reported to DEM.
Applies to:	CP
Dependencies:	–
Supporting Material:	–

](RS_Main_00260)

[SRS_Diag_04070] The DEM module shall process the order of the event occurrences in an appropriate and obvious manner [

Type:	Valid
Description:	The occurrence order shall be recognizable by e.g. time stamps or age. (storage of events shall be connected to age or timestamp) . Reoccurrence of events takes over the old position of the event.. Reoccurrence of healed events are handled as valid events.
Rationale:	Advanced fault analysis
Use Case:	Improved clustering and judging of events.
Applies to:	CP
Dependencies:	–
Supporting Material:	ISO14229-1 v.2013

](RS_Main_00260)

[SRS_Diag_04071] The DEM module shall process events according to their defined importance like priority and/or severity [

Type:	Valid
Description:	The events shall be sorted or assigned to a specific priority (e.g. Severity Mask - ISO14229-1 v.2013,Annex D3) representing their importance like: <ul style="list-style-type: none"> • Healed events can be overwritten; • Privileged storing in case of Event Buffer filled up with less privileged events.
Rationale:	ISO14229-1 v.2013

Use Case:	Improved clustering and judging of events.
Applies to:	CP
Dependencies:	–
Supporting Material:	ISO14229-1 v.2013

](RS_Main_00260)

[SRS_Diag_04072] The DEM shall provide additional event information to report the occurrence of an event by km-stamp, driving cycles or time [

Type:	Valid
Description:	Fault duration e.g. by km-stamp, driving cycles or time: <ul style="list-style-type: none"> • Between failed and passed; • Since failed; • Since last clear.
Rationale:	Advanced fault analysis
Use Case:	Improved clustering and judging of events/faults
Applies to:	CP
Dependencies:	–
Supporting Material:	ISO14229-1 v.2013

](RS_Main_00260)

[SRS_Diag_04134] The DEM shall be able to store internal data to Extended Data Records and Snapshot Records [

Type:	Valid
Description:	The DEM shall provide the capability to store internal data to Extended Data Records and Snapshot Records. This means that DEM internal data elements like Operation Cycle Counter, Fault Detection Counter (FDC) and Occurrence Counter can be assigned to environmental data records.
Rationale:	Some data objects that are internally generated by the DEM can be retrieved by service \$19.
Use Case:	Reading Operation Cycle Counter, Fault Detection Counter and Occurrence Counter
Applies to:	CP
Dependencies:	–
Supporting Material:	–

](RS_Main_00260)

[SRS_Diag_04127] Configurable record numbers and trigger options for DTC-SnapshotRecords and DTCExtendedDataRecords [

Type:	Valid
Description:	The DEM module shall provide the capability to configure record numbers and trigger options for the storage of DTCSnapshotRecords and DTCExtendedDataRecords.
Rationale:	Advanced fault analysis
Use Case:	Flexible handling of DTCSnapshotRecords and DTCExtendedDataRecords
Applies to:	CP
Dependencies:	–
Supporting Material:	–

]([RS_Main_00260](#))

[SRS_Diag_04079] The size of a FreezeFrame shall be reported to the DCM by the DEM [

Type:	Valid
Description:	If the DEM module is requested to support freeze frames, the DEM module shall be able to determine the size of a FreezeFrame and to provide this information via API call.
Use Case:	An external testing tool connected to the vehicle requests currently stored error codes and the corresponding environmental data.
Applies to:	CP
Dependencies:	–
Supporting Material:	–

]([RS_Main_00260](#))

[SRS_Diag_04151] Diagnostics shall support event status handling [

Type:	Valid
Description:	Diagnostics shall support event status handling.
Rationale:	Support OEM specific event status handling
Use Case:	Evaluation of monitor results and deriving corresponding actions from them
Applies to:	CP
Dependencies:	–
Supporting Material:	–

]([RS_Main_00260](#))

[SRS_Diag_04076] The DEM module shall provide a set of system cycles that may qualify the event in an additional manner [

Type:	Valid
Description:	<p>The cycles are used for event qualification, event aging or warning indicator handling. Typical cycles are:</p> <ul style="list-style-type: none"> • driving cycle • engine warm up cycle • ignition on off cycle • power up power down cycle • operation active passive cycle • in or out of voltage range cycle
Rationale:	Event status management, ISO14229-1 v.2013
Use Case:	Improved clustering and judging of events/faults
Applies to:	CP
Dependencies:	–
Supporting Material:	–

]([RS_Main_00260](#))

[SRS_Diag_04123] The DEM module shall support harmonized Driving//WarmUp cycles [

Type:	Valid
Description:	<p>The DEM module shall support harmonized Driving-/WarmUp cycles.</p> <p>The calculation of Driving-/WarmUp cycles is based on legal requirements.</p>
Rationale:	OBd certification requires vehicle consistent calculations based on a harmonized Driving-/WarmUp cycle in the centralized OBd Master ECU.
Use Case:	Qualification of OBd-relevant DTCs
Applies to:	CP
Dependencies:	–
Supporting Material:	–

]([RS_Main_00260](#))

[SRS_Diag_04091] Notifications about valid freeze frame data [

Type:	Valid
Description:	<p>The DEM shall be enabled to notify other SW-C (or BSW modules) about valid freeze frame data (e.g. time stamp). If this functionality is configured for an event, it shall be executed on each entry of a valid freeze frame of this event into the event memory.</p>

Rationale:	In the current version of the DEM SWS, there is no possibility to provide freeze frame data (like time stamp) to another SW-C / BSW module beside the DCM. Additionally this functionality provides a simple way for supporting this data to other components (at every time, where valid data are available), so that no cyclic polling is needed.
Use Case:	The information provided by this functionality is needed by modules like a special 'Diagnostic active response handler'.
Applies to:	CP
Dependencies:	–
Supporting Material:	–

]([RS_Main_00260](#))

[SRS_Diag_04092] Control of event handling [

Type:	Valid
Description:	The DEM shall provide locking functionality for dedicated events. If this functionality is configured for an event, it shall be called before clearing this event from the event memory. Unless the functionality does not allow clearance, the event must not be cleared.
Rationale:	If the environmental conditions do not allow the clearance of an event, the application must have the opportunity to prohibit the deletion.
Use Case:	Some dedicated events must never get cleared from event memory, while the ECU is in a special operation mode (e.g. assembly, transport, or flashmode).
Applies to:	CP
Dependencies:	–
Supporting Material:	–

]([RS_Main_00260](#), [RS_Main_00011](#))

[SRS_Diag_04093] Memory Overflow indication [

Type:	Valid
Description:	For each Event Memory it shall be indicated if the related event memory (e.g. primary, secondary, mirror) is full and the next event occurs to be stored in this event memory.
Rationale:	The information that an event memory overflow occurred is very important for fault analysis.
Use Case:	<ul style="list-style-type: none"> • Triggering further internal behavior of the DEM module (e.g. displacement strategies) • Linking this information to a dedicated Extended Data Record • Vendor specific UDS-Service
Applies to:	CP
Dependencies:	–

Supporting Material:	–
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](RS_Main_00260)

[SRS_Diag_04109] The DEM module shall provide an interface to retrieve the number of event memory entries [

Type:	Valid
Description:	The DEM module shall provide an interface to retrieve the number of event memory entries currently stored in Primary, Secondary and Mirror Memory to the application. Additionally, the corresponding Client Server Interface shall be provided.
Rationale:	The interface is required from application, to check if event memory entries exist that influence the ECU behavior.
Use Case:	There is an application message where a status bit must be set as soon as events are stored in the event memory. Therefore, the application needs to know how many event memory entries exist in the DEM.
Applies to:	CP
Dependencies:	–
Supporting Material:	–

](RS_Main_00420)

[SRS_Diag_04105] Event memory management [

Type:	Valid
Description:	The DEM module shall be able to handle valid events, update existing event memory entries or replace events in case of a full event memory. The processing is trigger externally (e.g. by the reported event status) or depends on internal information (e.g. value of debounce counter \timer, occurrence counter, ...)
Rationale:	Support of fault storage and analysis
Use Case:	Support of fault storage and analysis
Applies to:	CP
Dependencies:	–
Supporting Material:	ISO 14229-1 v.2013

](RS_Main_00420)

[SRS_Diag_04107] Defensive behavior of the DEM module [

Type:	Valid
Description:	For safety-related applications, the Diagnostics Event Manager shall ensure data integrity of errors information stored in non-volatile memory.

Rationale:	Protection of error events memory is needed for safety-related
Use Case:	Error events memory could have been corrupted
Applies to:	CP
Dependencies:	–
Supporting Material:	Use the optional CRC and redundancy capabilities provided by the NVRAM Manager for Diagnostics Event Manager NVRAM Blocks. Only blocks assigned to error events of high severity can be protected. These blocks can be stored in non-volatile memory when the error event is confirmed (before shutdown of the ECU)

]([RS_Main_00011](#))

[SRS_Diag_04126] Configurable suppression of events [

Type:	Valid
Description:	The DEM shall provide a postbuild/loadable boolean configuration option per event. If the DemEventParameterSuppressed is set to true the event behaves the same as if it is suppressed by API call. An event suppressed by configuration can not be activated via API call.
Rationale:	Use case-specific configuration of fault memory, only required events are visible and usable in ECU.
Use Case:	Variant coding
Applies to:	CP
Dependencies:	–
Supporting Material:	–

]([RS_Main_00260](#))

[SRS_Diag_04110] The DEM module shall support SAE J1939 lamp status [

Type:	Valid
Description:	The composite and DTC-specific lamp status of the following lamps shall be supported: Malfunction Indicator Lamp, Red Stop Lamp, Amber Warning Lamp and Protect Lamp.
Rationale:	Support of SAE J1939-73
Use Case:	Diagnostics in HDV, HDOBD
Applies to:	CP
Dependencies:	–
Supporting Material:	–

]([RS_Main_00260](#), [RS_Main_00420](#))

[SRS_Diag_04111] The DEM module shall support SAE J1939 Expanded / FreezeFrame [

Type:	Valid
Description:	The composite and DTC-specific lamp status of the following lamps shall be supported: Malfunction Indicator Lamp, Red Stop Lamp, Amber Warning Lamp and Protect Lamp.
Rationale:	Support of SAE J1939-73
Use Case:	Diagnostics in HDV, HDOBD
Applies to:	CP
Dependencies:	–
Supporting Material:	–

]([RS_Main_00260](#), [RS_Main_00420](#))

[SRS_Diag_04117] The DEM shall provide a configurable behavior for the deletion of DTC [

Type:	Valid
Description:	Usually, only ClearAllDTCs is used for the deletion of DTCs. Therefore, the DEM shall provide a configurable behavior which optionally limits the deletion of DTCs to ClearAllDTCs.
Rationale:	OEM specific behavior
Use Case:	Allow only ClearAllDTCs and therefore optimization of ClearDTC behavior.
Applies to:	CP
Dependencies:	–
Supporting Material:	–

]([RS_Main_00260](#))

[SRS_Diag_04113] The DEM module shall support a set of SAE J1939 DM-messages [

Type:	Valid
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Description:	The following DM-messages shall be supported:
	Name Description
	DM01 Active Diagnostic Trouble Codes
	DM02 Previously Active Diagnostic Trouble Codes
	DM03 Diagnostic Data Clear/Reset for Previously Active DTCs
	DM04 Freeze Frame Parameters
	DM05 Diagnostic Readiness 1
	DM06 Emission Related Pending DTCs
	DM11 Diagnostic Data Clear/Reset for Active DTCs
	DM12 Emissions Related Active DTCs
	DM13 Stop Start Broadcast
	DM19 Calibration Information
	DM20 Monitor Performance Ratio SAE J1939-73 Revised SEP2006
	DM21 Diagnostic Readiness 2
	DM23 Previously Active Emission Related Faults
	DM24 SPN Support
	DM25 Expanded Freeze Frame
DM26 Diagnostic Readiness 3	
DM28 Permanent DTCs	
DM29 Regulated DTC Counts (Pending, Permanent, MIL-On, PMIL-On)	
DM31 DTC to Lamp Association	
DM35 Immediate Fault Status	
Rationale:	Support of SAE J1939-73
Use Case:	Diagnostics in HDV, HD-OBD
Applies to:	CP
Dependencies:	–
Supporting Material:	–

]([RS_Main_00260](#), [RS_Main_00420](#))

[SRS_Diag_04130] The DEM shall provide the capability to process a new request [

Type:	Valid
Description:	If the DEM is executing an asynchronous request and meanwhile gets a new request with a different parameter set, the Dem shall immediately process the new request without issuing a negative response.
Rationale:	During diagnostic sessions, a running protocol may be canceled and another protocol with higher priority is started.
Use Case:	Abortion of request with low priority to process a request with higher priority
Applies to:	CP
Dependencies:	–
Supporting Material:	–

]([RS_Main_00260](#))

[SRS_Diag_04131] Event management mechanisms in DEM [

Type:	Valid
Description:	All memory locations except mirror memory provided by the DEM shall use the same event management mechanisms.
Rationale:	Ensure identical event management behavior.
Use Case:	–
Applies to:	CP
Dependencies:	–
Supporting Material:	–

]([RS_Main_00260](#))

[SRS_Diag_04137] Definition of replacement failure in DEM [

Type:	Valid
Description:	Upon filtering the storage of failure reports by central conditions (Storage Condition), it shall be possible to define and store a replacement failure info which then can be stored to the event memory. This replacement failure will represent the actual failure reason.
Rationale:	Improvement of failure analysis.
Use Case:	–
Applies to:	CP
Dependencies:	–
Supporting Material:	–

]([RS_Main_00260](#))

[SRS_Diag_04154] Diagnostics shall support suppression of events and DTCs [

Type:	Valid
Description:	Diagnostics shall support the suppression of events and DTCs.
Rationale:	Only show DTCs that are really used for monitoring of active functionality (not deactivated by variant coding).
Use Case:	Allows hiding the DTCs depending on the vehicle usage.
Applies to:	CP
Dependencies:	–
Supporting Material:	–

]([RS_Main_00260](#))

[SRS_Diag_04155] Notification of SWCs and BSW modules about updates of event related data [

Type:	Valid
Description:	The DEM shall notify other SWCs / BSW modules about updates of the event-related data in the event memory.
Rationale:	Changes to the event related data are done by the Dem internally while evaluating event information passed from the diagnostic monitors. Third parties interested in the change of event related data need to get notified.
Use Case:	Allow OEM specific reaction on updates of the event related data.
Applies to:	CP
Dependencies:	–
Supporting Material:	–

](RS_Main_00260)

[SRS_Diag_04158] Support clearing of recorded failure information [

Type:	Valid
Description:	The DEM shall support clearing failure information including event status information (status byte according to ISO14229-1) stored in the different fault memories provided by the DEM.
Rationale:	In several situations, it is necessary to clear fault memory content.
Use Case:	Clearing at the end of the production line or in workshop after repair.
Applies to:	CP
Dependencies:	–
Supporting Material:	–

](RS_Main_00260)

[SRS_Diag_04160] Diagnostics shall support ResponseOnEvent according to ISO 14229-1 [

Type:	Valid
Description:	Diagnostics shall support ResponseOnEvent according to ISO 14229-1.
Rationale:	Needed for failure analysis and fault memory tracking.
Use Case:	Inform diagnostic tooling about certain runtime conditions.
Applies to:	CP
Dependencies:	–
Supporting Material:	–

](RS_Main_00260)

[SRS_Diag_04164] DEM shall support independent event memory for multiple diagnostic server instances (virtual ECUs) [

Type:	Valid
Description:	The DEM shall provide multiple sets of independent event memories that can store information independently from each other.
Rationale:	Individual assignment of fault memories to dedicated diagnostic servers.
Use Case:	ECUs with multiple independent diagnostic servers. Common faults of the host ECU shall be stored in each of the virtual ECU which is affected by such a fault. Common faults need to be stored in each virtual ECU to ensure that storing and clearing of fault entries has no or little side-effects with the information stored in other virtual ECUs. This use-case assumes that the cost to store a common fault in multiple event memory entries is accepted because sharing of a single event memory entry may have unintended side-effects.
Applies to:	CP
Dependencies:	–
Supporting Material:	–

](RS_Main_00260)

[SRS_Diag_04165] DEM shall support the triggering of multiple events upon a master event is reported [

Type:	Valid
Description:	The DEM shall provide the capability to trigger multiple events upon an event is reported.
Rationale:	From one unique fault source, multiple events shall be derived and each derived event can trigger an own DTC and event memory entry.
Use Case:	Storing DTCs from one unique source into different event memories without changing and recompiling the reporting software. A given software can report event status information and depending on configuration multiple DTCs and event related data in different fault memories can be stored.
Applies to:	CP
Dependencies:	–
Supporting Material:	–

](RS_Main_00260)

4.2.2.1 Dem Interfaces and APIs

[SRS_Diag_04077] The DEM uses standard mechanisms provided by NVRAM-Manager [

Type:	Valid
Description:	–
Rationale:	Non volatile data storage

Use Case:	The DEM triggers data storage during normal ECU operation to avoid loss of volatile data / event information.
Applies to:	CP
Dependencies:	–
Supporting Material:	–

](RS_Main_00130)

[SRS_Diag_04030] The DEM shall provide an interface via the RTE to monitoring SW components for reporting and processing diagnostic test results [

Type:	Valid
Description:	The DEM shall provide via the RTE an Interface to Monitoring SW Components for reporting and processing diagnostic results. Monitoring SW-components report diagnostic results as soon as valid results are available.
Rationale:	Interface to event generating monitoring SW-Components
Use Case:	Ensure the basic diagnostic functionality
Applies to:	CP
Dependencies:	–
Supporting Material:	–

](RS_Main_00060)

[SRS_Diag_04031] The DEM shall notify the Function Inhibition Manager (FIM) upon changes of the event status in order to process them according to the SW components dependencies [

Type:	Valid
Description:	Control (enable/disable) of functionalities of SW components based on the following inhibit condition: - faults
Rationale:	DEM information for Inhibition of functions
Use Case:	Usage of DEM information for Inhibition of functions
Applies to:	CP
Dependencies:	–
Supporting Material:	–

](RS_Main_00011)

4.2.2.2 DTC and event-related data

[SRS_Diag_04156] Diagnostics shall support DTCFunctionalUnit [

Type:	Valid
Description:	Diagnostics shall support DTCFunctionalUnit according to ISO 14229-1.
Rationale:	Compliance to ISO 14229-1.
Use Case:	OEM-specific use of DTCs.
Applies to:	CP
Dependencies:	–
Supporting Material:	–

](RS_Main_00011)

[SRS_Diag_04157] Diagnostics shall support the reporting of DTCs and related data [

Type:	Valid
Description:	Diagnostics shall provide the reporting of DTCs and related data.
Rationale:	Report failure memory data to the requester.
Use Case:	All services reporting fault memory data.
Applies to:	CP
Dependencies:	–
Supporting Material:	–

](RS_Main_00011)

[SRS_Diag_04158] Diagnostics shall support control of DTC storage [

Type:	Valid
Description:	Diagnostics shall support control of DTC storage.
Rationale:	Avoiding unwanted storage of DTCs.
Use Case:	No DTCs storage when functional communication is deactivated during ECU reprogramming.
Applies to:	CP
Dependencies:	–
Supporting Material:	–

](RS_Main_00011)

[SRS_Diag_04162] Diagnostics shall allow parallel fault memory access [

Type:	Valid
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Description:	Diagnostics shall provide parallel access to the fault memory to various clients. Each client shall be able to access the fault memory independent from other clients. Conflicts occurring during parallel access to shared resources shall be resolved.
Rationale:	OEMs require parallel access to diagnostics.
Use Case:	<ul style="list-style-type: none"> • Support of OBD and UDS in parallel • Software interacting with secondary ECUs in OBD • Software components accessing event memory data
Applies to:	CP
Dependencies:	–
Supporting Material:	–

](RS_Main_00011)

4.2.3 Diagnostic Communication Manager(DCM)

[SRS_Diag_04007] The DCM shall provide a diagnostic service handling for the SW-Components which are using the DCM [

Type:	Valid
Description:	The DCM shall provide the diagnostic service handling, according to ISO14229-1 v.2013, ISO 15031-5 and ISO 15765-3 for the communication between an AUTOSAR conform ECU and an internal tester or an external diagnostic tool).
Rationale:	Only one diagnostic service instance in an ECU.
Use Case:	<p>Communication with an external diagnostic tools in :</p> <ul style="list-style-type: none"> • development • manufacturing • service (garage) • OBD scan tools <p>Communication with an internal tester.</p>
Applies to:	CP
Dependencies:	–
Supporting Material:	ISO14229-1 v.2013, ISO 15031-5, ISO 15765-3

](RS_Main_00011)

[SRS_Diag_04021] The DCM shall support the handling of different diagnostic sessions in parallel [

Type:	Valid
Description:	DCM needs to handle an established diagnostic communication and a parallel diagnostic access request in parallel. This is necessary to open a diagnostic access with high priority and the controlled shutdown of the established diagnostic access with low priority.
Rationale:	To prioritize handling of different Diagnostic Protocols e.g. OBD and normal diagnostic communication as UDS.
Use Case:	An internal vehicle diagnostic tester communication is interrupted by OBD diagnostic access request.
Applies to:	CP
Dependencies:	–
Supporting Material:	–

](RS_Main_00011)

[SRS_Diag_04032] Different diagnostic addresses shall be supported by multiple (physical) channels [

Type:	Valid
Description:	Modern ECUs contain more than one functionality (e.g. board computer, instrument cluster). Each functionality shall be addressable by a diagnostic tool with a different diagnostic address. This does not imply that those multiple requests are allowed in parallel.
Rationale:	High flexibility and granularity for addressing of SW-Components
Use Case:	At the service (garage) a fault symptom is based on functionality. The service only wants to address this functionality.
Applies to:	CP
Dependencies:	[SRS_Diag_04021] Switch diagnostic communication access
Supporting Material:	–

](RS_Main_00011)

[SRS_Diag_04058] The DCM module shall be able to access different event memories provided by the DEM module [

Type:	Valid
Description:	The DCM module shall support diagnostic services to read or remove event entries from the configured event memory separately.
Rationale:	Advanced fault analysis
Use Case:	The development departments of the OEMs and Suppliers need as much as possible deeper fault/event analysis although the mechanics may have deleted the faults or may not need to know if there are more detailed root causes for an event or fault.
Applies to:	CP
Dependencies:	–

Supporting Material:	–
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](RS_Main_00011)

[SRS_Diag_04024] The DCM module shall be able to access and handle specific data elements and data element groups if requested by an external scan tool [

Type:	Valid
Description:	The DCM module shall provide interfaces for the DEM module and for SWCs to access diagnostic data and to process diagnostic services. The size of a diagnostic data element is derived from the RTE or provided as an attribute of the API call itself.
Rationale:	Optimized usage of resources
Use Case:	Transfer environmental / FreezeFrame data between DEM and DCM
Applies to:	CP
Dependencies:	–
Supporting Material:	–

](RS_Main_00011)

[SRS_Diag_04098] Standard bootloader interaction [

Type:	Valid
Description:	<p>Integration of a standard bootloader into the AUTOSAR architecture.</p> <ul style="list-style-type: none"> • If the DCM is requested to change into the programming session (\$1002), the DCM shall either send the final response and then activate the bootloader or it shall not send the final response and activate the bootloader where the activate the bootloader and the final response shall be sent by the bootloader (according HIS [FL-504]). • The DCM shall check the environmental conditions like engine speed before activating the bootloader (Interface already supported in AUTOSAR 3.0). • The behavior of the DCM to optionally issue a NRC 0x78 (RCRRP, retrigger the timeout supervision of the diagnostic client) during transition to the bootloader shall be configurable.
Rationale:	Bootloader concept has to be standardized within AUTOSAR.
Use Case:	Usage of "off-the-shelf" bootloader
Applies to:	CP
Dependencies:	–
Supporting Material:	–

](RS_Main_00260)

[SRS_Diag_04100] The DCM shall provide an interface for DLT to transport log and trace data over a diagnostic service [

Type:	Valid
Description:	DCM should provide an interface for DLT to send and receive data over the diagnostic service. Logging and tracing data are sent over this service and control requests for DLT are received. For this purpose the DCM should implement the ResponseOnEvent service (see UDS spec.). DCM should provide an interface for DLT to send data and receive control requests.
Rationale:	LogAndTrace needs an interface to send LogAndTrace data out of the ECU. DCM provides a bus independent access to the ECU over standardized diagnostic. This is available during production phase and provides a secured session control. Because log and trace messages are event triggered and the storage on the ECU is limited, these messages must be sent when they occur.
Use Case:	<ul style="list-style-type: none"> • Transmitting log and trace data during a diagnostic session • Advanced Diagnostic Tracing, optional via telematics services
Applies to:	CP
Dependencies:	–
Supporting Material:	–

]([RS_Main_00011](#))

[SRS_Diag_04015] The DCM shall support timing handling according to ISO15765-3 [

Type:	Valid
Description:	In ISO15765-3 timing handling for physical and functional communication is described. Also how to react on errors. DCM shall work according this specification. Timing parameters shall be configurable (see dependencies).
Rationale:	Ensure a steady and save communication link and guarantee specified timing conditions.
Use Case:	Optimizing of timing for high performance during reprogramming.
Applies to:	CP
Dependencies:	[SRS_Diag_04059] Configuration of timing parameter
Supporting Material:	ISO15765-3

]([RS_Main_00011](#))

[SRS_Diag_04135] The DCM shall support UDS service \$38 (RequestFileTransfer) [

Type:	Valid
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Description:	The DCM shall support UDS service 0x38 ("RequestFileTransfer").
Rationale:	The requestFileTransfer service is used by the client to initiate a file data transfer from either the client to the server or from the server to the client (download or upload). Additionally, this service has capabilities to retrieve information about the file system
Use Case:	Upload of files (e.g. data files, graphics...)
Applies to:	CP
Dependencies:	[SRS_Diag_04059] Configuration of timing parameter
Supporting Material:	ISO 14229-1 v.2013

](RS_Main_00011)

[SRS_Diag_04001] The DEM and DCM shall support the Diagnostic Standard OBD (ISO15031-5) [

Type:	Valid
Description:	The DEM and DCM shall support all services of OBD Standard (ISO15031-5).
Rationale:	This standard is required for emission related control units by law
Use Case:	Diagnostic with a OBD Tester (e.g. Scan Tool)
Applies to:	CP
Dependencies:	[SRS_Diag_04059] Configuration of timing parameter
Supporting Material:	ISO 15031-5

](RS_Main_00011, RS_Main_00420)

[SRS_Diag_04005] The DCM shall manage Security Access level handling [

Type:	Valid
Description:	The DCM shall manage the handling of the UDS-service SecurityAccess (0x27) and also the Security level handling. The accessibility of the services (service identifier) in the actual security level shall be checked by the DCM
Rationale:	Some diagnostic services are in dependence to a security access level. Therefore it is necessary that the DCM has knowledge about the current level and no service which is restricted by security will be processed without authorization.
Use Case:	Not all diagnostic services are allowed in each security level.
Applies to:	CP
Dependencies:	[SRS_Diag_04000] Support Diagnostic Standard UDS
Supporting Material:	–

](RS_Main_00011)

[SRS_Diag_04006] Session handling is managed by DCM [

Type:	Valid
Description:	The DCM shall support the transition from a default session to any other session, also back to the default session. (A diagnostic session enables a specific set of diagnostic services and/or functionality).
Rationale:	Some diagnostic services are not available in the default session. Therefore it is necessary that the DCM has knowledge about the current session and no service which is connected to a non default session will be processed in the default session.
Use Case:	Special services need a different session than the default session, e.g. Reduction of communication traffic on the network in order to get more performance for the flash programming.
Applies to:	CP
Dependencies:	[SRS_Diag_04000] Support Diagnostic Standard UDS [SRS_Diag_04005] SecurityAccess level handling is managed by DCM
Supporting Material:	–

](RS_Main_00011)

[SRS_Diag_04016] The DCM shall support "Busy handling" by sending a negative response 0x78 [

Type:	Valid
Description:	DCM shall provide the sending of the negative response 0x78 in order get more time to build up the final positive or negative response.
Rationale:	Ensure a steady and save communication link and guarantee specified timing conditions.
Use Case:	When an application cannot provide the response in the protocol specific time
Applies to:	CP
Dependencies:	[SRS_Diag_04000] Support Diagnostic Standard UDS
Supporting Material:	ISO15765-3 ISO14229-1 v.2013

](RS_Main_00011)

[SRS_Diag_04119] The DCM shall handle the execution of diagnostic services according to the assigned diagnostic session [

Type:	Valid
Description:	If the current diagnostic session transitions to a different session (initiated by UDS Service \$10 DiagnosticSessionControl), the DCM shall only maintain active diagnostic functionality if supported in the valid session and if not prohibited by security access.
Rationale:	No interruption of diagnostic functionality
Use Case:	Deactivation of fault management and normal communication during ECU reprogramming
Applies to:	CP
Dependencies:	[SRS_Diag_04000] Support Diagnostic Standard UDS

Supporting Material:	ISO14229-1 v.2013
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](RS_Main_00011)

[SRS_Diag_04019] The DCM shall confirm transmitting if complete to continue processing [

Type:	Valid
Description:	In some cases it is necessary that the application starts execution of the requested functionality after the positive response is completely transmitted. The application needs the callback functionality to get the information that the positive response is complete transmitted. After this callback the application can execute the requested functionality.
Rationale:	This behavior is specified by ISO 14229-1 v.2013.
Use Case:	E.g. call of the reset function. This call needs to be done after transmission of the positive response is over.
Applies to:	CP
Dependencies:	[SRS_Diag_04000] Support Diagnostic Standard UDS
Supporting Material:	ISO14229-1 v.2013

](RS_Main_00011)

[SRS_Diag_04020] DCM shall suppress responses to diagnostic tool requests [

Type:	Valid
Description:	DCM shall suppress responses in following cases: <ul style="list-style-type: none"> • Suppress positive response (SuppressPosRequest Bit set) • Suppress negative responses (NRC 11, 12 and 31 at functional addressing)
Rationale:	This behavior is specified by ISO 14229-1. Prevent bus burst as result of a functional request.
Use Case:	E.g. call of the reset function. This call needs to be done after transmission of the positive response is over.
Applies to:	CP
Dependencies:	[SRS_Diag_04000] Support Diagnostic Standard UDS
Supporting Material:	ISO14229-1 v.2013 ISO15031-5

](RS_Main_00011)

[SRS_Diag_04033] The DCM shall support the upload/download services for reading/writing data in an ECU in an extended and manufacturer specific diagnostic session [

Type:	Valid
Description:	The UDS services RequestDownload, RequestUpload, TransferData, RequestTransferExit (0x34-0x37) are used for data handling, e.g. accessing NVRAM. This does not interfere the reprogramming, because this is handled by the bootloader.
Rationale:	Enable a possibility to modify set of parameters
Use Case:	End of line configuration in the manufacturing
Applies to:	CP
Dependencies:	[SRS_Diag_04000] Support Diagnostic Standard UDS
Supporting Material:	ISO14229-1 v.2013

](RS_Main_00011)

[SRS_Diag_04115] The optional parameter DTCSettingControlOptionRecord as part of UDS service ControlDTCSetting shall be limited to GroupOfDTC [

Type:	Valid
Description:	ISO14229-1 does not specify how the parameter DTCSettingControlOptionRecord needs to be used. Therefore, the usage of the parameter shall be limited to GroupOfDTC.
Rationale:	Currently, no other use case for parameter DTCSettingControlOptionRecord is known than the usage for GroupOfDTC.
Use Case:	Fault storage is activated and deactivated for one specific DTC or for all DTCs.
Applies to:	CP
Dependencies:	–
Supporting Material:	ISO14229-1 v.2013

](RS_Main_00260)

[SRS_Diag_04120] The DCM shall support a predefined AddressAndLengthFormatIdentifier [

Type:	Valid
Description:	The DCM shall support a predefined AddressAndLengthFormatIdentifier for UDS service \$23 (ReadMemoryByAddress), UDS service 0x2C (DynamicallyDefineDataIdentifier with subservice DefineByMemoryAddress), UDS service 0x3D (WriteMemoryByAddress), UDS service 0x34 (RequestDownload) and UDS service 0x35 (RequestUpload).
Rationale:	AddressAndLengthFormatIdentifier is defined once in DCM and afterwards used in corresponding UDS services.
Use Case:	Static configuration of AddressAndLengthFormatIdentifier
Applies to:	CP
Dependencies:	–
Supporting Material:	ISO14229-1 v.2013

](RS_Main_00011, RS_Main_00260)

[SRS_Diag_04121] The DCM shall provide the handling of service Dynamically-DefineDataIdentifier according to ISO 14229-1 [

Type:	Valid
Description:	The DCM shall provide the handling of service DynamicallyDefineDataIdentifier according to ISO 14229-1 v.2013.
Rationale:	Standardized ISO 14229-1 v.2013 behavior
Use Case:	–
Applies to:	CP
Dependencies:	–
Supporting Material:	ISO14229-1 v.2013

](RS_Main_00011, RS_Main_00260)

[SRS_Diag_04153] Diagnostics shall support generic connections [

Type:	Valid
Description:	Diagnostics shall support generic connections. Addressed information is then using MetaData.
Rationale:	Channel and connection configuration optimization through the layers.
Use Case:	Limit the request execution due to vehicle- or ECU states/-conditions.
Applies to:	CP
Dependencies:	Generic connections are supported for CAN diagnostics using normal fixed or mixed 29 bit addressing formats according to ISO15765-2. Depending on the actual layout of the CAN IDs, generic connections could also be used for extended or normal and mixed 11 bit addressing formats.
Supporting Material:	–

](RS_Main_00260)

4.2.3.1 Dcm Interfaces and APIs

[SRS_Diag_04078] The DCM shall use a common API of the diagnostic event manager to access the fault memory [

Type:	Valid
Description:	An external or internal diagnostic tool needs access to the fault memory to get or change information about the fault status. An interface between diagnostic communication management and diagnostic event management is required.
Rationale:	The DCM and the DEM are separated modules with the necessity to interact. Therefore an interface is necessary.

Use Case:	A diagnostic test tool needs to read or clear the fault memory with the corresponding diagnostic services, e.g. "ReadDTCInformation", "ClearDiagnosticInformation"
Applies to:	CP
Dependencies:	[SRS_Diag_04002] Diagnostic event (error) management
Supporting Material:	–

](RS_Main_00011, RS_Main_00420)

[SRS_Diag_04011] The DCM shall provide diagnostic state information for AUTOSAR Software Component via RTE [

Type:	Valid
Description:	The Software modules above the RTE need to know about the actual session and security state, because it is not predictable if the information's lead to a different functional diagnostic behavior.
Rationale:	Functional requirement
Use Case:	With the diagnostic session which the garage is using, it is allowed to switch between different sets of parameters. With an enhanced diagnostic session which could be used in development and a corresponding security level, it is allowed to change the data within the set of parameters.
Applies to:	CP
Dependencies:	–
Supporting Material:	–

](RS_Main_00011)

[SRS_Diag_04003] The interface of the DCM to PDU Router (CAN/LIN, FlexRay, MOST) shall be network independent [

Type:	Valid
Description:	All network (CAN, LIN, FlexRay, MOST) dependent parts shall be done outside the DCM module. That means the module PDU Router shall provide a network independent interface.
Rationale:	The DCM describes only the services for communication and the behavior of network is out of scope. Highest granularity and best option to adapt upcoming networks.
Use Case:	DCM has to be network independent. So, the interface to the Transport Protocol shall be network independent.
Applies to:	CP
Dependencies:	–
Supporting Material:	–

](RS_Main_00011, RS_Main_00260)

[SRS_Diag_04147] The DCM shall communicate with the PDU Router to receive and send diagnostic data [

Type:	Valid
Description:	The DCM shall communicate with the PDU Router to receive and send diagnostic data.
Rationale:	Ensure diagnostic communication.
Use Case:	Support of various transport protocols (ISO-15765-2, ...).
Applies to:	CP
Dependencies:	–
Supporting Material:	–

](RS_Main_00011, RS_Main_00260)

4.2.4 Function Inhibition Manager (FIM)

The specification of Software requirements of the function inhibition manager is not a part of this specification. For details, please refer to the AUTOSAR_FIM_SRS.

4.2.5 Defaut Error Tracer (DET)

[SRS_Diag_04090] A configurable list of error report receivers shall be provided [

Type:	Valid
Description:	The Default Error Tracer shall support a configurable list of functions for fan-out of received error reports. This list can be empty.
Rationale:	This implements the debugging concept in R4.0 (DocumentId 298).
Use Case:	Even development errors shall be captured by the Log and Trace functionality. Error Handling shall be enabled to react on development errors
Applies to:	CP
Dependencies:	–
Supporting Material:	–

](RS_Main_00011)

[SRS_Diag_04086] Report errors shall contain a dedicated set of information [

Type:	Valid
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Description:	Error reports, which the Default Error Tracer receives, shall consist of the ID of the reporting module, the ID of reporting instance, the ID of the API service in which the error has been detected and the error ID itself.
Rationale:	For optimal support of the error tracing some tracing information is necessary.
Use Case:	During software development phase a BSW module has been called using wrong parameters. Due to communication of some tracing information the location of the error source will be supported.
Applies to:	CP
Dependencies:	–
Supporting Material:	–

](RS_Main_00011)

[SRS_Diag_04087] The Default Error Tracer shall provide a development error report reception service [

Type:	Valid
Description:	The Default Error Tracer shall be accessible by SW-C's to report development error.
Rationale:	It shall be possible to perform error tracing during development of SW-C's.
Use Case:	During software development phase a SW-C has received an unexpected response by a BSW module. By generating a development error and reporting it to the DET, configuration errors can be detected.
Applies to:	CP
Dependencies:	–
Supporting Material:	–

](RS_Main_00011)

[SRS_Diag_04089] Fan-out of received error reports [

Type:	Valid
Description:	The Default Error Tracer shall forward each received error report by calling each element of a configurable list of functions.
Rationale:	This implements the debugging concept in R4.0 (DocumentId 298)
Use Case:	Even development errors shall be captured by the Log and Trace functionality. Error Handling shall be enabled to react on development errors
Applies to:	CP
Dependencies:	–
Supporting Material:	–

](RS_Main_00011)

[SRS_Diag_04085] The Default Error Tracer shall provide an interface to receive error reports [

Type:	Valid
Description:	The Default Error Tracer shall provide an interface to get a development error report.
Rationale:	An interface will be needed to enable handling of development errors
Use Case:	During software development phase a BSW module has been called using wrong parameters. By generating a development error and reporting it to the DET, configuration errors can be detected.
Applies to:	CP
Dependencies:	–
Supporting Material:	–

]([RS_Main_00011](#), [RS_Main_00100](#))

[SRS_Diag_04101] The DET module shall forward its trace events to the DLT [

Type:	Valid
Description:	The DET receives trace events from errors from the BSW and SWC during debugging time. If a DLT module exists, these events should be forwarded to the DLT to collect logs and traces only in one instance.
Rationale:	To have an overview of all log, trace and error messages and to set all of them in the correct context, it is important to have all these messages and events in one list (context). Also it is not practicable to use more than one mechanism to report errors, logs and traces to a debugging interface. So all these sources should be routed to the DLT.
Use Case:	<ul style="list-style-type: none"> • A debugging scenario, an SWC or BSW Module uses the DET interface to trace an error • This error is forwarded by the DET to the DLT • The DLT turns these events in the DLT format and sends it over the debugging interface, together with all the other logs and traces
Applies to:	CP
Dependencies:	–
Supporting Material:	–

]([RS_Main_00011](#))

[SRS_Diag_04143] The Default Error Tracer shall provide an interface to receive runtime error reports [

Type:	Valid
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Description:	The Default Error Tracer shall provide an interface to get a runtime error report, issued by BSW modules. The Default Error Tracer returns to the caller in order to allow continuation of intended program flow.
Rationale:	An interface will be needed to enable handling of runtime errors, caused by seldom occurring systematic faults. The caller will handle the error and continue appropriate in a deterministic manner.
Use Case:	CANNM_E_NET_START_IND: Reception of NM PDUs in Bus-Sleep Mode
Applies to:	CP
Dependencies:	–
Supporting Material:	–

|(RS_Main_00011, RS_Main_00100)

[SRS_Diag_04144] The Default Error Tracer shall provide an interface to receive transient fault reports [

Type:	Valid
Description:	The Default Error Tracer shall provide an interface to get a transient fault report, issued by BSW modules. The Default Error Tracer returns to the caller in order to allow continuation of intended program flow.
Rationale:	An interface will be needed to enable handling of transient faults, caused by seldom occurring transient hardware faults.
Use Case:	<ul style="list-style-type: none"> • CAN controller goes offline due to bit-flip in its control register • Peripheral action lasts accidentally longer than expected (and specified)
Applies to:	CP
Dependencies:	–
Supporting Material:	–

|(RS_Main_00011, RS_Main_00100)

[SRS_Diag_04145] The Default Error Tracer shall forward received runtime error reports to configured integrator code [

Type:	Valid
Description:	The Default Error Tracer shall propagate all received runtime error reports using configurable callout. The received callout return value shall be returned to the reporter of the runtime error. If no callout has been configured, a default return value shall be provided. The Default Error Tracer returns to the caller in order to allow continuation of intended program flow.
Rationale:	Integrator shall be able to recognize runtime errors and to handle in an appropriate manner.
Use Case:	CANNM_E_NET_START_IND: Reception of NM PDUs in Bus-Sleep Mode
Applies to:	CP

Dependencies:	–
Supporting Material:	–

]([RS_Main_00011](#), [RS_Main_00100](#))

[SRS_Diag_04146] The Default Error Tracer shall forward received transient fault reports to configured integrator code [

Type:	Valid
Description:	The Default Error Tracer shall propagate all received transient fault report using configurable callout. The received callout return value shall be returned to the reporter of the transient fault. If no callout has been configured, a default return value shall be provided. The Default Error Tracer returns to the caller in order to allow continuation of intended program flow.
Rationale:	Integrator shall be able to recognize transient faults and to handle in an appropriate manner and to advice the reporter.
Use Case:	<ul style="list-style-type: none"> • CAN controller goes offline due to bit-flip in its control register. Integrator decides that reporting CAN driver shall re-initialize the CAN controller. • CAN controller goes offline due to bit-flip in its control register. Integrator decides that reporting CAN driver shall treat offline state of CAN controller as intended.
Applies to:	CP
Dependencies:	–
Supporting Material:	–

]([RS_Main_00011](#), [RS_Main_00100](#))

4.3 Diagnostic requirements for the adaptive platform

[SRS_Diag_04207] AUTOSAR shall comply to ISO 14229 (all parts) [

Type:	Valid
Description:	AUTOSAR shall comply to ISO 14229-1 and -2 with a commonly used and recommended subset.
Rationale:	UDS is the standard protocol for production and workshop.
Applies to:	AP
Dependencies:	–
Use Case:	A standardized protocol for vehicle external communication is essential for independent repair shops (see e.g. StVZO Å§ 29)
Supporting Material:	ISO 14229-1

](RS_Main_00260, RS_Main_00011)

[SRS_Diag_04212] AUTOSAR shall comply to ISO 14229-5 (UDSonIP) and ISO 13400 (all parts) [

Type:	Valid
Description:	AUTOSAR shall comply to ISO 14229-5 (UDSonIP) and ISO 13400 (all parts).
Rationale:	UDS ISO 14229-1 is network independent.
Applies to:	AP
Dependencies:	–
Use Case:	UDS in IP-based Ethernet 100Base-TX networks.
Supporting Material:	ISO 14229-1

](RS_Main_00260, RS_Main_00011)

[SRS_Diag_04166] The Diagnostic Management shall support several tester conversations in parallel with assigned priorities [

Type:	Valid
Description:	The Diagnostic Management shall generally support a configurable amount of tester conversations/connections in parallel. Per tester connection, a priority shall be configurable. The priority is assigned to the tester address (SA of the UDS request), which identifies the connection.
Rationale:	ECUs in the Adaptive Platform generally have enough resources to handle multiple tester conversations in parallel.
Applies to:	AP
Dependencies:	–
Use Case:	Support for vehicle internal and external testers in parallel, which can not be easily synchronized.
Supporting Material:	ISO 14229-1

](RS_Main_00260, RS_Main_00011)

[SRS_Diag_04209] The Diagnostic Management shall support pseudo parallel client interaction according to ISO [

Type:	Valid
Description:	The Diagnostic Management shall support the parallelism defined by the ISO as pseudo parallel concept, which is defined in ISO 14229-1 under Figure J.2.
Applies to:	AP
Dependencies:	–
Use Case:	Support of scenarios, where testers in parallel is only allowed, when in default session.
Supporting Material:	ISO 14229-1

](RS_Main_00260, RS_Main_00011)

[SRS_Diag_04210] The Diagnostic Management shall support fully parallel client interaction [

Type:	Valid
Description:	The Diagnostic Management shall support fully parallel client interaction, where clients are fully shielded from each other and can have different non-default sessions.
Rationale:	ECUs in the Adaptive Platform generally have enough resources to handle multiple tester conversations in parallel.
Applies to:	AP
Dependencies:	–
Use Case:	Support of scenarios, where maximum of testers in parallel shall be allowed
Supporting Material:	ISO 14229-1

] ([RS_Main_00260](#), [RS_Main_00011](#))

[SRS_Diag_04167] The Diagnostic Management shall support conversation pre-emption/abortion [

Type:	Valid
Description:	The Diagnostic Management shall generally support the preemption of a tester conversation in case all configured tester connections are currently active and a new connection of a tester with higher priority than an existing one takes place, the DM shall abort the lowest priority conversation and accept the new connection/conversation.
Rationale:	A ECU will have limited resources for parallel processing of diagnostic requests and different requests will have different priorities therefore the need for abortion.
Applies to:	AP
Dependencies:	–
Use Case:	Support for vehicle internal and external testers in parallel, which can not be easily synchronized.
Supporting Material:	ISO 14229-1

] ([RS_Main_00260](#))

[SRS_Diag_04168] The Diagnostic Management shall support adding of user-defined transport layers [

Type:	Valid
Description:	The Diagnostic Management shall support adding of user-defined transport layers.
Rationale:	Although the Adaptive Platform starts out with Ethernet support, later extension to other networks (CAN, Fr) should already be prepared. Additionally there is at least one OEM, which has its own DoIP implementation, which differs from ISO 13400. It should be possible to integrate this DoIP implementation with manageable effort/costs.
Applies to:	AP

Dependencies:	–
Use Case:	Plugability of UDS transport layers, to support different networks.

]([RS_Main_00260](#))

[SRS_Diag_04169] The Diagnostic Management shall provide an interface for external UDS service processors. [

Type:	Valid
Description:	For all UDS services, which are NOT processed/implemented internally by DM (either by configuration or because DM generally does not support it internally), but by external service processors, the DM has to delegate the processing to the external application.
Rationale:	The majority of diagnostic services is implemented by the application, where the DM has to delegate the service processing to.
Applies to:	AP
Dependencies:	SRS_Diag_04097, SRS_Diag_04007
Use Case:	Service processing by software components.
Supporting Material:	ISO 14229-1

]([RS_Main_00260](#), [RS_Main_00420](#))

[SRS_Diag_04170] The Diagnostic Management shall provide connection specific meta information to external service processors [

Type:	Valid
Description:	The Diagnostic Management shall provide connection specific meta-information to the external service processor, which is processing the UDS service request. Since in the first step DM solely supports DoIP, the meta-information shall contain Src-IP-Adr/Port and Target-IP-Adr/Port of the request. The meta-information should be designed, that it can later easily extended to also cover connection information of other network technologies (like CAN, Flexray).
Rationale:	Sometimes the reaction of service processor implementations on a UDS request depend on the connection properties of the tester.
Dependencies:	SRS_Diag_04169
Use Case:	Flexibility for service processor implementations.
Applies to:	AP
Dependencies:	–

]([RS_Main_00260](#), [RS_Main_00420](#))

[SRS_Diag_04171] The Diagnostic Management shall support synchronous and asynchronous interaction with external service processors [

Type:	Valid
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Description:	<p>The Diagnostic Management shall support both types of interaction:</p> <ul style="list-style-type: none"> • Calling a service processor synchronously, which means a blocking call until the service processor returns the final result (pos./neg. response, optional out parameters). • Calling a service processor asynchronously, which means a call to the service processor, where the service processor returns, that the job is not yet finished and later reports back to DM via a separate callback, that the service processing has finished.
Rationale:	For long running service processing, which delegate the processing to own worker threads, the asynchronous callback model is more efficient, while for simple service processors the strict synchronous model is easier to implement.
Applies to:	AP
Dependencies:	SRS_Diag_04169
Use Case:	Flexibility for service processor implementations.

]([RS_Main_00260](#), [RS_Main_00420](#))

[SRS_Diag_04172] The Diagnostic Management shall inform external service processors about outcome of the final response. [

Type:	Valid
Description:	For each UDS service which DM delegates to a SWC for processing, it shall inform the SWC, whether a response has been successfully sent out or not.
Rationale:	For long running service processing, which delegate the processing to own worker threads, the asynchronous callback model is more efficient, while for simple service processors the strict synchronous model is easier to implement.
Applies to:	AP
Dependencies:	SRS_Diag_04169
Use Case:	Flexibility for service processor implementations.

]([RS_Main_00260](#), [RS_Main_00420](#))

[SRS_Diag_04173] The Diagnostic Management shall support different signature types, when delegating processing of UDS service to the application [

Type:	Valid
Description:	<p>The Diagnostic Management shall support the following signatures, when delegating processing of UDS service to the application:</p> <ul style="list-style-type: none"> • Untyped interface, where the entire payload including SID and sub-service is given as a byte array to service processors • Typed interface per SID, sub-service and data element, where a mapping from the UDS parameters/data stream to middleware datatypes is described in the configuration.

Rationale:	Depending on the use case/complexity of the UDS service and its parameters, it is much more efficient to do the parsing/interpretation in the implementation of the service processor. On the other hand, there are use cases, where the description of mapping from UDS data stream to interface type has the benefit, that the service processor implementation may stay unchanged, where the mapping description may be adapted to an altered on the wire representation.
Applies to:	AP
Dependencies:	SRS_Diag_04169
Use Case:	Flexibility for service processor implementations.

]([RS_Main_00260](#), [RS_Main_00420](#))

[SRS_Diag_04174] The Diagnostic Management shall provide SA and TA to external service processors [

Type:	Valid
Description:	The Diagnostic Management shall provide source and target address to the external service processor, which is processing the UDS service request.
Rationale:	Sometimes the reaction of service processor implementations on a UDS request depend on the tester (SA) or on the target.
Applies to:	AP
Dependencies:	SRS_Diag_04169
Use Case:	Flexibility for service processor implementations.

]([RS_Main_00260](#), [RS_Main_00420](#))

[SRS_Diag_04175] The Diagnostic Management shall support a dynamic configuration process to define external service processors [

Type:	Valid
Description:	Applications in the role as UDS service processor are installed during runtime. They contain a description, which UDS service they implement and optionally a description of the UDS data representation to application data type mapping. The Diagnostic Management shall (re)configure itself on those new requirements of application installation or reject the installation in case these requirements are in conflict with the current configuration of DM.
Rationale:	A core functionality of the adaptive platform is to support installation of applications during runtime. Applications with diagnostic needs/interactions therefore demand a dynamic reconfiguration of DM.
Applies to:	AP
Dependencies:	SRS_Diag_04169
Use Case:	Runtime installation of software packages with DM interactions.

]([RS_Main_00150](#))

4.4 Configuration

[SRS_Diag_04059] The Diagnostic Management shall support the configuration of timing parameters [

Type:	Valid
Description:	Every physical layer requires specific timing parameter values therefore it is necessary to include the ability to configure the timing constraints depending on the used network. The timing parameters are set to default values when a communication starts and shall be changeable at runtime.
Rationale:	Usability with different networks.
Use Case:	The diagnostic communication can be done at different networks (e.g.CAN/LIN/FlexRay).
Applies to:	CP, AP
Dependencies:	–
Supporting Material:	

] ([RS_Main_00011](#), [RS_Main_00260](#))

[SRS_Diag_04064] The Diagnostic Management shall support buffers of scalable sizes for the storage of the events, status information and environmental data [

Type:	Valid
Description:	<ol style="list-style-type: none"> 1. For the internal administration the The Diagnostic Management needs an Event buffer which shall be configurable depending on the number of the possible events in the system i.e. related to all SW components which are assigned to the The Diagnostic Management ; 2. The fault storage [event buffer] shall provide enough space to store all high priority failures.
Rationale:	Processor resource constraints
Use Case:	In case of large systems with many events a selection of events shall take place to fulfill NVRAM / RAM constraints of smaller processors.
Applies to:	CP, AP
Dependencies:	–
Supporting Material:	

] ([RS_Main_00011](#))

[SRS_Diag_04177] Custom Diagnostic Services [

Type:	Valid
Description:	The Diagnostic Management shall support the configuration of custom diagnostic services.

Rationale:	In some cases diagnostic services beyond the set of services standardized in ISO 14229-1 are needed.
Applies to:	CP, AP
Dependencies:	RS_DEXT_00047

](RS_Main_00260)

5 Requirements Tracing

The following tables reference the requirements specified in [?,] and links to the fulfillment of these. Please note that if column "Satisfied by" is empty for a specific requirement this means that this requirement is not fulfilled by this document.

Requirement	Description	Satisfied by
[RS_Main_00011]	AUTOSAR shall support the development of reliable systems	[SRS_Diag_04001] [SRS_Diag_04003] [SRS_Diag_04005] [SRS_Diag_04006] [SRS_Diag_04007] [SRS_Diag_04011] [SRS_Diag_04015] [SRS_Diag_04016] [SRS_Diag_04019] [SRS_Diag_04020] [SRS_Diag_04021] [SRS_Diag_04024] [SRS_Diag_04031] [SRS_Diag_04032] [SRS_Diag_04033] [SRS_Diag_04057] [SRS_Diag_04058] [SRS_Diag_04059] [SRS_Diag_04063] [SRS_Diag_04064] [SRS_Diag_04078] [SRS_Diag_04085] [SRS_Diag_04086] [SRS_Diag_04087] [SRS_Diag_04089] [SRS_Diag_04090] [SRS_Diag_04092] [SRS_Diag_04100] [SRS_Diag_04101] [SRS_Diag_04107] [SRS_Diag_04119] [SRS_Diag_04120] [SRS_Diag_04121] [SRS_Diag_04135] [SRS_Diag_04143] [SRS_Diag_04144] [SRS_Diag_04145] [SRS_Diag_04146] [SRS_Diag_04147] [SRS_Diag_04156] [SRS_Diag_04157] [SRS_Diag_04158] [SRS_Diag_04162] [SRS_Diag_04166] [SRS_Diag_04189] [SRS_Diag_04190] [SRS_Diag_04191] [SRS_Diag_04193] [SRS_Diag_04195] [SRS_Diag_04198] [SRS_Diag_04199] [SRS_Diag_04205] [SRS_Diag_04206] [SRS_Diag_04207] [SRS_Diag_04208] [SRS_Diag_04209] [SRS_Diag_04210] [SRS_Diag_04211] [SRS_Diag_04212]
[RS_Main_00060]	AUTOSAR shall provide a standardized software interface for communication between Applications	[SRS_Diag_04030] [SRS_Diag_04181] [SRS_Diag_04182] [SRS_Diag_04183] [SRS_Diag_04184] [SRS_Diag_04185] [SRS_Diag_04186] [SRS_Diag_04194] [SRS_Diag_04204]

Requirement	Description	Satisfied by
[RS_Main_00100]	AUTOSAR shall provide standardized Basic Software	[SRS_Diag_04085] [SRS_Diag_04143] [SRS_Diag_04144] [SRS_Diag_04145] [SRS_Diag_04146]
[RS_Main_00130]	AUTOSAR shall provide an abstraction from hardware	[SRS_Diag_04077]
[RS_Main_00150]	AUTOSAR shall support the deployment and reallocation of AUTOSAR Application Software	[SRS_Diag_04175]
[RS_Main_00260]	AUTOSAR shall provide diagnostics means during runtime, for production and services purposes	[SRS_Diag_04002] [SRS_Diag_04003] [SRS_Diag_04010] [SRS_Diag_04059] [SRS_Diag_04067] [SRS_Diag_04068] [SRS_Diag_04070] [SRS_Diag_04071] [SRS_Diag_04072] [SRS_Diag_04076] [SRS_Diag_04079] [SRS_Diag_04082] [SRS_Diag_04091] [SRS_Diag_04092] [SRS_Diag_04093] [SRS_Diag_04097] [SRS_Diag_04098] [SRS_Diag_04110] [SRS_Diag_04111] [SRS_Diag_04113] [SRS_Diag_04115] [SRS_Diag_04117] [SRS_Diag_04118] [SRS_Diag_04120] [SRS_Diag_04121] [SRS_Diag_04123] [SRS_Diag_04124] [SRS_Diag_04126] [SRS_Diag_04127] [SRS_Diag_04129] [SRS_Diag_04130] [SRS_Diag_04131] [SRS_Diag_04133] [SRS_Diag_04134] [SRS_Diag_04136] [SRS_Diag_04137] [SRS_Diag_04139] [SRS_Diag_04140] [SRS_Diag_04141] [SRS_Diag_04147] [SRS_Diag_04148] [SRS_Diag_04149] [SRS_Diag_04150] [SRS_Diag_04151] [SRS_Diag_04153] [SRS_Diag_04154] [SRS_Diag_04155] [SRS_Diag_04158] [SRS_Diag_04160] [SRS_Diag_04161] [SRS_Diag_04163] [SRS_Diag_04164] [SRS_Diag_04165] [SRS_Diag_04166] [SRS_Diag_04167] [SRS_Diag_04168] [SRS_Diag_04169] [SRS_Diag_04170] [SRS_Diag_04171] [SRS_Diag_04172] [SRS_Diag_04173] [SRS_Diag_04174] [SRS_Diag_04177] [SRS_Diag_04178] [SRS_Diag_04179] [SRS_Diag_04180] [SRS_Diag_04187] [SRS_Diag_04188] [SRS_Diag_04189] [SRS_Diag_04190] [SRS_Diag_04191] [SRS_Diag_04192] [SRS_Diag_04193] [SRS_Diag_04194] [SRS_Diag_04195] [SRS_Diag_04196] [SRS_Diag_04198] [SRS_Diag_04199] [SRS_Diag_04200] [SRS_Diag_04201] [SRS_Diag_04203] [SRS_Diag_04205] [SRS_Diag_04206] [SRS_Diag_04207] [SRS_Diag_04208] [SRS_Diag_04209] [SRS_Diag_04210] [SRS_Diag_04212]

Requirement	Description	Satisfied by
[RS_Main_00420]	AUTOSAR shall use established software standards and consolidate de-facto standards for basic software functionality	[SRS_Diag_04001] [SRS_Diag_04067] [SRS_Diag_04068] [SRS_Diag_04078] [SRS_Diag_04082] [SRS_Diag_04097] [SRS_Diag_04105] [SRS_Diag_04109] [SRS_Diag_04110] [SRS_Diag_04111] [SRS_Diag_04113] [SRS_Diag_04124] [SRS_Diag_04125] [SRS_Diag_04169] [SRS_Diag_04170] [SRS_Diag_04171] [SRS_Diag_04172] [SRS_Diag_04173] [SRS_Diag_04174] [SRS_Diag_04192] [SRS_Diag_04204]
[RS_Main_00440]	AUTOSAR shall standardize access to non-volatile memory	[SRS_Diag_04211]
[RS_Main_00480]	AUTOSAR shall support the test of implementations	[SRS_Diag_04202]

6 References

6.1 Deliverables of AUTOSAR

1. General Requirements of Basic Software Modules:
AUTOSAR_SRS_BSWGeneral.pdf
2. Specification of the Virtual Functional Bus : *AUTOSAR_EXP_VFB.pdf*
3. Software Standardization Template : *AUTOSAR_TPS_StandardizationTemplate.pdf*

6.2 Related standards and norms

6.2.1 ITEA-EAST

4. D1.5-General Architecture; ITEAEAST-EEA, Version 1.0; chapter 3, page 72 et seq.
5. D2.1-Embedded Basic Software Structure Requirements; ITEAEAST-EEA, Version 1.0 or higher
6. D2.2-Description of existing solutions; ITEA/EAST-EEA, Version 1.0 or higher.

6.2.2 ISO

7. ISO 14229-1 Unified diagnostic services (UDS) Part 1: Specification and Requirements (v.2013)

8. ISO 15031-5 Communication between vehicle and external equipment for emissions related diagnostics Part 5: Emissions related diagnostic services (2005-01-13)
9. ISO 15765-3 Diagnostics on controller area network (CAN) Part 3: Implementation of unified diagnostic services (UDS on CAN) (2004-10-06)
10. ISO 15765-4 Diagnostics on controller area network (CAN) Part 4: Requirements for emissions-related systems (2005-01-04)