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Disclaimer

Advice for users

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1 Introduction and functional overview

This specification specifies the functionality, API and configuration of the AUTOSAR Basic Software module called Core Test Driver. This specification is applicable to drivers for all kind of cores regardless if the driver is executing during power-on situations of an ECU or during ECU application runtime.

The Core Test Driver provides services for configuring, starting, polling, terminating and notifying the application about Core Test results. It also provides services for returning test results in a predefined way. Furthermore it provides several tests to verify dedicated core functionality like e.g. general purpose registers or Arithmetical and Logical Unit (ALU). It is assumed that every tested core hardware functionality can be exclusively accessed for testing purposes. It is up to the user of Core Test Driver API to choose suitable test combination and a scheduled execution order to fulfill the safety requirements of the system. The behaviour of those services is asynchronous or synchronous.

A Core Test driver accesses the microcontroller core directly without any intermediate software layers and is located in the Microcontroller Abstraction Layer (MCAL).

2 Acronyms and Abbreviations

Abbreviation / Acronym:	*Description:*
MCAL	Microcomputer Abstraction Layer
DEM	Diagnostic Event Manager
DET	Development Error Tracer
CPU	Central Processing Unit
MPU	Memory Protection Unit
L1	1st level memory
L2	2nd level memory
MCU	Microcontroller Unit
BIST	Built in Self Test
IRQ	Interrupt Request
Core	A CPU plus closely located functional resources
CSUM/Checksum /signature	A numerical representation of the result of a test execution.

Term:	*Description:*
Background test	Background test is called periodically by a SW-scheduler/RTOS.
Foreground test	A foreground test is a synchronous test and shall not be interrupted. It is called via user application calls.
'Golden (Ref.) Value'	Reference value used for comparison (e.g. Checksum/Signature) to a previously computed test result value.
'Good Case'	The execution finished without reporting an error
Atomic sequence/ atomic piece	An atomic sequence is a piece of test which shall not be interrupted.
External device	A physical external entity; e.g. a second microcontroller
Resource	A 'hardware resource' is the smallest unit (instance) that can be selected by a CORETest driver user. It can be tested in one or several atomic sequences. It is a core internal unit which executes a unique functionality (e.g. IRQ-controller).
Partial test (orange block in Figure3)	A partial test is defined as the test of one or more 'hardware resources'. (A partial test is interruptible because it is executed in background mode).
Entity/unit	Hardware functionality inside the core (e.g. CPU, MMU etc.)
Caller/calling entity	The caller/calling entity is located on a higher AUTOSAR or ISO layer. It is the user of the API call.
test interval	*CoreTest test Interval*: the sum of all the *partial tests* (executed in background mode) on the hardware resources that are configured to make one complete Core test.
Test Interval Id	Identifier of a test interval, which shall be incremented by each start of a new test interval.

As this is a document from professionals for professionals, all other terms are expected to be known.

3 Related documentation

3.1 Input documents

[1] List of Basic Software Modules
AUTOSAR_TR_BSWModuleList.pdf

[2] Layered Software Architecture
AUTOSAR_EXP_LayeredSoftwareArchitecture.pdf

[3] General Requirements on Basic Software Modules
AUTOSAR_SRS_BSWGeneral.pdf

[4] Specification of BSW Scheduler
AUTOSAR_SWS_BSW_Scheduler.pdf

[5] ECU Configuration Specification
AUTOSAR_SWS_ECUStateManager.pdf

[6] Specification of Memory Mapping
AUTOSAR_SWS_MemoryMapping.pdf

[7] Requirement on Core Test
AUTOSAR_SRS_CoreTest.pdf

[8] AUTOSAR Basic Software Module Description Template
AUTOSAR_RS_BSWModuleDescriptionTemplate.pdf

[9] General Specification of Basic Software Modules
AUTOSAR_SWS_BSWGeneral.pdf

3.2 Related standards and norms

[10] ISO DIS 26262, www.iso.org

3.3 Related specification

AUTOSAR provides a General Specification on Basic Software modules [9] (SWS BSW General), which is also valid for Core Test.

Thus, the specification SWS BSW General shall be considered as additional and required specification for Core Test.

4 Constraints and assumptions

4.1 Limitations

A Core test module implementation might be limited to be executed during power-up/start-up time where core resources are not shared among different active AUTOSAR related software tasks or hardware-entities (e.g. IRQ-controller, DMA, Cache, MMU/MPU and MemoryIF)

-OR-

might be limited to test resources which are not shared during runtime software execution (e.g. ALU and CPU-registers). This is overall automotive system architecture dependent and cannot be covered in a MCAL Core Test SWS specification.

There must be a managing entity or architecture available who manages tasks like ‘hardware-resource-access-managing’ due to the inability of a MCAL-driver to handle such tasks on its own.

4.2 Applicability to car domains

No restrictions.

4.3 Applicability to safety related environments

This module can be used within safety related systems if the upper layer software provides mechanisms to handle the Core Test API results by:

- Checksum/signature protection
- Checking Core Test code integrity before using it
- Redundant storage of Checksum/signature
- External decision execution of Core Test results

and the Core Test module implementation is embedded into a system safety architecture concept.

5 Dependencies to other modules

The CoreTest module depends on the following modules:

- BSW scheduler is required to trigger main function in background mode

The Core Test library module and/or source code module is dependent on the microcontroller platform and therefore on the silicon manufacturers hardware implementation and even on a silicon revision.

The Core Test library module and/or source code module is dependent on an actively working core clock domain.

5.1 File structure

5.1.1 Code file structure

[SWS_CorTst_00002]

「 The Core Test module shall provide interrupt service routines for test purposes only. 」(SRS_BSW_00164, SRS_CoreTst_14105)

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5.1.2 Header file structure

The Core Test inclusion structure for the source code shall be as follows:

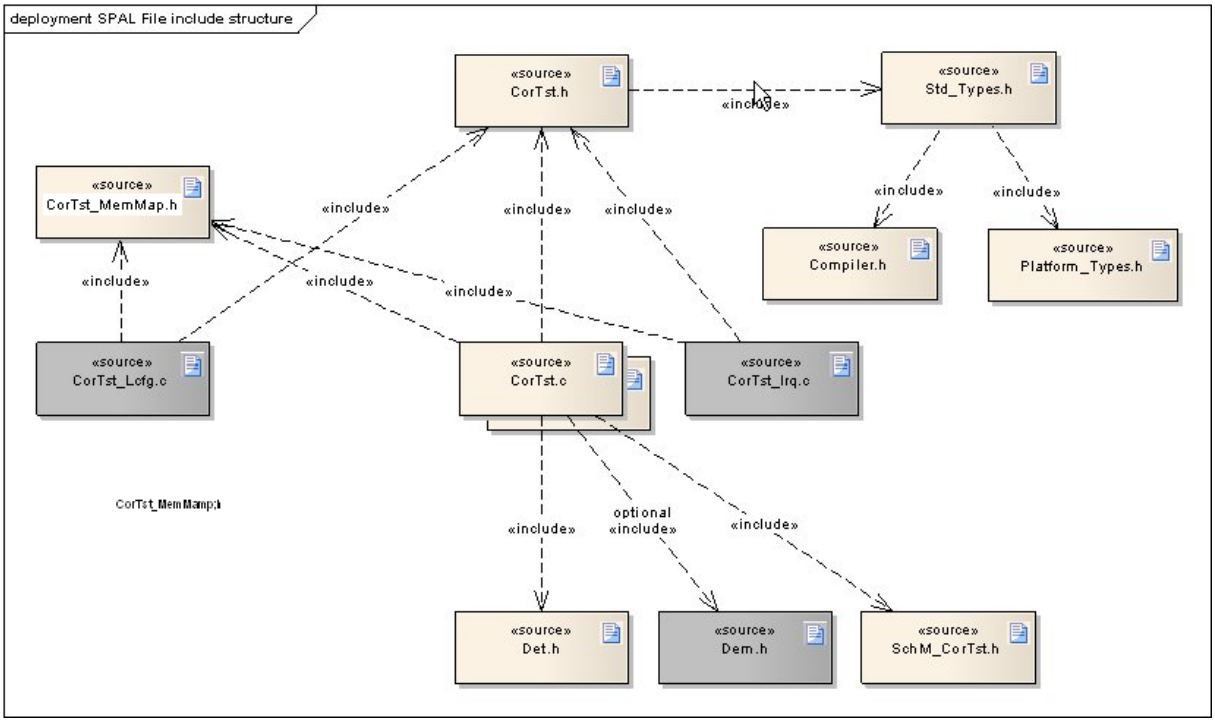


Figure 1 – File structure

6 Requirements traceability

Requirement	Description	Satisfied by
-	-	SWS_CorTst_00008
-	-	SWS_CorTst_00009
-	-	SWS_CorTst_00010
-	-	SWS_CorTst_00011
-	-	SWS_CorTst_00012
-	-	SWS_CorTst_00013
-	-	SWS_CorTst_00014
-	-	SWS_CorTst_00021
-	-	SWS_CorTst_00023
-	-	SWS_CorTst_00024
-	-	SWS_CorTst_00041
-	-	SWS_CorTst_00042
-	-	SWS_CorTst_00044
-	-	SWS_CorTst_00045
-	-	SWS_CorTst_00047
-	-	SWS_CorTst_00049
-	-	SWS_CorTst_00050
-	-	SWS_CorTst_00051
-	-	SWS_CorTst_00052
-	-	SWS_CorTst_00054
-	-	SWS_CorTst_00056
-	-	SWS_CorTst_00058
-	-	SWS_CorTst_00061
-	-	SWS_CorTst_00065
-	-	SWS_CorTst_00068
-	-	SWS_CorTst_00069
-	-	SWS_CorTst_00070
-	-	SWS_CorTst_00071
-	-	SWS_CorTst_00072
-	-	SWS_CorTst_00073
-	-	SWS_CorTst_00074
-	-	SWS_CorTst_00077
-	-	SWS_CorTst_00078
-	-	SWS_CorTst_00079
-	-	SWS_CorTst_00105
-	-	SWS_CorTst_00109

-	-	SWS_CorTst_00120
-	-	SWS_CorTst_00121
-	-	SWS_CorTst_00122
-	-	SWS_CorTst_00136
-	-	SWS_CorTst_00138
-	-	SWS_CorTst_00140
-	-	SWS_CorTst_00144
-	-	SWS_CorTst_00145
-	-	SWS_CorTst_00148
-	-	SWS_CorTst_00149
-	-	SWS_CorTst_00152
-	-	SWS_CorTst_00153
-	-	SWS_CorTst_00154
-	-	SWS_CorTst_00155
-	-	SWS_CorTst_00160
-	-	SWS_CorTst_00176
-	-	SWS_CorTst_00178
-	-	SWS_CorTst_00179
BSW00431	-	SWS_CorTst_00999
BSW00434	-	SWS_CorTst_00999
SRS_BSW_00003	All software modules shall provide version and identification information	SWS_CorTst_00112
SRS_BSW_00004	All Basic SW Modules shall perform a pre-processor check of the versions of all imported include files	SWS_CorTst_00112
SRS_BSW_00005	Modules of the æC Abstraction Layer (MCAL) may not have hard coded horizontal interfaces	SWS_CorTst_00999
SRS_BSW_00006	The source code of software modules above the æC Abstraction Layer (MCAL) shall not be processor and compiler dependent.	SWS_CorTst_00999
SRS_BSW_00009	All Basic SW Modules shall be documented according to a common standard.	SWS_CorTst_00999
SRS_BSW_00010	The memory consumption of all Basic SW Modules shall be documented for a defined configuration for all supported platforms.	SWS_CorTst_00999
SRS_BSW_00101	The Basic Software Module shall be able to initialize variables and hardware in a separate initialization function	SWS_CorTst_00040
SRS_BSW_00161	The AUTOSAR Basic Software shall provide a microcontroller abstraction layer which provides a standardized interface to higher software layers	SWS_CorTst_00999
SRS_BSW_00162	The AUTOSAR Basic Software shall provide a hardware abstraction layer	SWS_CorTst_00999
SRS_BSW_00164	The Implementation of interrupt service	SWS_CorTst_00002

	routines shall be done by the Operating System, complex drivers or modules	
SRS_BSW_00167	All AUTOSAR Basic Software Modules shall provide configuration rules and constraints to enable plausibility checks	SWS_CorTst_00999
SRS_BSW_00168	SW components shall be tested by a function defined in a common API in the Basis-SW	SWS_CorTst_00999
SRS_BSW_00170	The AUTOSAR SW Components shall provide information about their dependency from faults, signal qualities, driver demands	SWS_CorTst_00999
SRS_BSW_00171	Optional functionality of a Basic-SW component that is not required in the ECU shall be configurable at pre-compile-time	SWS_CorTst_00999
SRS_BSW_00172	The scheduling strategy that is built inside the Basic Software Modules shall be compatible with the strategy used in the system	SWS_CorTst_00999
SRS_BSW_00301	All AUTOSAR Basic Software Modules shall only import the necessary information	SWS_CorTst_00999
SRS_BSW_00302	All AUTOSAR Basic Software Modules shall only export information needed by other modules	SWS_CorTst_00999
SRS_BSW_00304	All AUTOSAR Basic Software Modules shall use the following data types instead of native C data types	SWS_CorTst_00027
SRS_BSW_00306	AUTOSAR Basic Software Modules shall be compiler and platform independent	SWS_CorTst_00999
SRS_BSW_00308	AUTOSAR Basic Software Modules shall not define global data in their header files, but in the C file	SWS_CorTst_00999
SRS_BSW_00309	All AUTOSAR Basic Software Modules shall indicate all global data with read-only purposes by explicitly assigning the const keyword	SWS_CorTst_00999
SRS_BSW_00310	API naming convention	SWS_CorTst_00999
SRS_BSW_00312	Shared code shall be reentrant	SWS_CorTst_00999
SRS_BSW_00314	All internal driver modules shall separate the interrupt frame definition from the service routine	SWS_CorTst_00999
SRS_BSW_00318	Each AUTOSAR Basic Software Module file shall provide version numbers in the header file	SWS_CorTst_00999
SRS_BSW_00321	The version numbers of AUTOSAR Basic Software Modules shall be enumerated according specific rules	SWS_CorTst_00999
SRS_BSW_00323	All AUTOSAR Basic Software Modules shall check passed API parameters for validity	SWS_CorTst_00161
SRS_BSW_00325	The runtime of interrupt service routines and functions that are running in interrupt context shall be kept short	SWS_CorTst_00999
SRS_BSW_00327	Error values naming convention	SWS_CorTst_00016

SRS_BSW_00328	All AUTOSAR Basic Software Modules shall avoid the duplication of code	SWS_CorTst_00999
SRS_BSW_00329	-	SWS_CorTst_00999
SRS_BSW_00330	It shall be allowed to use macros instead of functions where source code is used and runtime is critical	SWS_CorTst_00999
SRS_BSW_00331	All Basic Software Modules shall strictly separate error and status information	SWS_CorTst_00037, SWS_CorTst_00038, SWS_CorTst_00039
SRS_BSW_00333	For each callback function it shall be specified if it is called from interrupt context or not	SWS_CorTst_00999
SRS_BSW_00334	All Basic Software Modules shall provide an XML file that contains the meta data	SWS_CorTst_00999
SRS_BSW_00336	Basic SW module shall be able to shutdown	SWS_CorTst_00046
SRS_BSW_00337	Classification of development errors	SWS_CorTst_00016
SRS_BSW_00338	-	SWS_CorTst_00183
SRS_BSW_00339	Reporting of production relevant error status	SWS_CorTst_00999
SRS_BSW_00341	Module documentation shall contains all needed informations	SWS_CorTst_00999
SRS_BSW_00344	BSW Modules shall support link-time configuration	SWS_CorTst_00999
SRS_BSW_00346	All AUTOSAR Basic Software Modules shall provide at least a basic set of module files	SWS_CorTst_00999
SRS_BSW_00350	All AUTOSAR Basic Software Modules shall apply a specific naming rule for enabling/disabling the detection and reporting of development errors	SWS_CorTst_00183
SRS_BSW_00355	-	SWS_CorTst_00999
SRS_BSW_00357	For success/failure of an API call a standard return type shall be defined	SWS_CorTst_00064
SRS_BSW_00358	The return type of init() functions implemented by AUTOSAR Basic Software Modules shall be void	SWS_CorTst_00040
SRS_BSW_00359	All AUTOSAR Basic Software Modules callback functions shall avoid return types other than void if possible	SWS_CorTst_00076
SRS_BSW_00360	AUTOSAR Basic Software Modules callback functions are allowed to have parameters	SWS_CorTst_00076
SRS_BSW_00369	All AUTOSAR Basic Software Modules shall not return specific development error codes via the API	SWS_CorTst_00183
SRS_BSW_00370	All AUTOSAR Basic Software Modules shall group and out-source callback declarations in a separate header file	SWS_CorTst_00999
SRS_BSW_00371	The passing of function pointers as API parameter is forbidden for all AUTOSAR Basic Software Modules	SWS_CorTst_00999
SRS_BSW_00374	All Basic Software Modules shall provide a	SWS_CorTst_00999

	readable module vendor identification	
SRS_BSW_00375	Basic Software Modules shall report wake-up reasons	SWS_CorTst_00999
SRS_BSW_00378	AUTOSAR shall provide a boolean type	SWS_CorTst_00999
SRS_BSW_00379	All software modules shall provide a module identifier in the header file and in the module XML description file.	SWS_CorTst_00999
SRS_BSW_00383	The Basic Software Module specifications shall specify which other configuration files from other modules they use at least in the description	SWS_CorTst_00999
SRS_BSW_00385	List possible error notifications	SWS_CorTst_00016
SRS_BSW_00386	The BSW shall specify the configuration for detecting an error	SWS_CorTst_00999
SRS_BSW_00398	The link-time configuration is achieved on object code basis in the stage after compiling and before linking	SWS_CorTst_00999
SRS_BSW_00399	Parameter-sets shall be located in a separate segment and shall be loaded after the code	SWS_CorTst_00999
SRS_BSW_00404	BSW Modules shall support post-build configuration	SWS_CorTst_00999
SRS_BSW_00405	BSW Modules shall support multiple configuration sets	SWS_CorTst_00999
SRS_BSW_00406	A static status variable denoting if a BSW module is initialized shall be initialized with value 0 before any APIs of the BSW module is called	SWS_CorTst_00040
SRS_BSW_00407	Each BSW module shall provide a function to read out the version information of a dedicated module implementation	SWS_CorTst_00112
SRS_BSW_00409	All production code error ID symbols are defined by the Dem module and shall be retrieved by the other BSW modules from Dem configuration	SWS_CorTst_00999
SRS_BSW_00411	All AUTOSAR Basic Software Modules shall apply a naming rule for enabling/disabling the existence of the API	SWS_CorTst_00112
SRS_BSW_00413	An index-based accessing of the instances of BSW modules shall be done	SWS_CorTst_00999
SRS_BSW_00414	The init function may have parameters	SWS_CorTst_00040
SRS_BSW_00416	The sequence of modules to be initialized shall be configurable	SWS_CorTst_00999
SRS_BSW_00417	Software which is not part of the SW-C shall report error events only after the DEM is fully operational.	SWS_CorTst_00999
SRS_BSW_00422	Pre-de-bouncing of error status information is done within the DEM	SWS_CorTst_00999
SRS_BSW_00423	BSW modules with AUTOSAR interfaces shall be describable with the means of the SW-C	SWS_CorTst_00999

	Template	
SRS_BSW_00424	BSW module main processing functions shall not be allowed to enter a wait state	SWS_CorTst_00999
SRS_BSW_00425	The BSW module description template shall provide means to model the defined trigger conditions of schedulable objects	SWS_CorTst_00999
SRS_BSW_00426	BSW Modules shall ensure data consistency of data which is shared between BSW modules	SWS_CorTst_00999
SRS_BSW_00428	A BSW module shall state if its main processing function(s) has to be executed in a specific order or sequence	SWS_CorTst_00999
SRS_BSW_00429	BSW modules shall be only allowed to use OS objects and/or related OS services	SWS_CorTst_00999
SRS_BSW_00432	Modules should have separate main processing functions for read/receive and write/transmit data path	SWS_CorTst_00999
SRS_BSW_00433	Main processing functions are only allowed to be called from task bodies provided by the BSW Scheduler	SWS_CorTst_00067
SRS_BSW_00436	Each AUTOSAR Basic Software Module implementation *.c shall include the support memory mapping.	SWS_CorTst_00999
SRS_BSW_00437	Memory mapping shall provide the possibility to define RAM segments which are not to be initialized during startup	SWS_CorTst_00999
SRS_BSW_00438	Configuration data shall be defined in a structure	SWS_CorTst_00999
SRS_CoreTst_14105	Core Interrupt and Exception Detection Tests Shall Be Available [approved]	SWS_CorTst_00002
SRS_CoreTst_14112	There Shall Be a Single API for the Core Test Service [approved]	SWS_CorTst_00064, SWS_CorTst_00067
SRS_CoreTst_14113	The API Shall Have a Parameter to Select Which Component Shall Be Tested [approved]	SWS_CorTst_00064
SRS_CoreTst_14114	A Main Function for the Core Test Shall Be Available [approved]	SWS_CorTst_00067
SRS_CoreTst_14115	Test Metrics Shall Be Available to Caller [approved]	SWS_CorTst_00057, SWS_CorTst_00060
SRS_CoreTst_14116	A Service shall be provided which returns a checksum/signature as test result [approved]	SWS_CorTst_00057, SWS_CorTst_00060
SRS_CoreTst_14117	Faults Shall Be Treated as Production Errors [approved]	SWS_CorTst_00016
SRS_CoreTst_14118	The results of the Core test module shall be provided to the user [approved]	SWS_CorTst_00053
SRS_CoreTst_14119	A Notification of Completion Shall Be Provided [approved]	SWS_CorTst_00076
SRS_CoreTst_14124	-	SWS_CorTst_00999
SRS_CoreTst_14125	Diagnostic Coverage [rejected]	SWS_CorTst_00999
SRS_CoreTst_14126	It Shall Be Possible to Cancel a Running Test	SWS_CorTst_00048

	[approved]	
SRS_CoreTst_14130	Destructive Test Shall Restore Original State of tested Entity [approved]	SWS_CorTst_00026
SRS_CoreTst_14131	A Service shall be provided which returns a Pass/Fail Status Representation as a test result [approved]	SWS_CorTst_00055
SRS_CoreTst_14133	Each Core Test interval shall have an identifier [approved]	SWS_CorTst_00137, SWS_CorTst_00139

Document: AUTOSAR requirements on Basic Software, general

Requirement	***Satisfied by***
Functional Requirements	
[SRS_BSW_00101] Initialization interface	SWS_CorTst_00040
[SRS_BSW_00004] Version check	SWS_CorTst_00112
[SRS_BSW_00159] Tool-based configuration	Both static and runtime configuration parameters are located outside the source code of the module. This is the prerequisite for automatic configuration.
[SRS_BSW_00167] Static configuration checking	Not applicable (requirement on configuration tool)
[SRS_BSW_00168] Diagnostic interface of SW components	Not applicable
[SRS_BSW_00323] API parameter checking	SWS_CorTst_00161
[SRS_BSW_00336] Shutdown interface	SWS_CorTst_00046
[SRS_BSW_00337] Classification of errors	SWS_CorTst_00015: SWS_CorTst_00016:
[SRS_BSW_00338] Detection and reporting of development errors	SWS_CorTst_00017:
[SRS_BSW_00339] Reporting of production relevant error status	Not applicable (this module does not need such a function)
[SRS_BSW_00344] Reference to link-time configuration	Not applicable
[SRS_BSW_00345] Pre-compile-time configuration	§5.2 Header file structure.
[SRS_BSW_00369] Do not return development error codes via API	SWS_CorTst_00017: SWS_CorTst_00019:
[SRS_BSW_00375] Notification of wake-up reason	Not applicable (wakeups are not supported by this module)
[SRS_BSW_00380] Separate C-files for configuration parameters	CorTst004 SWS_CorTst_00006 SWS_CorTst_00007
[SRS_BSW_00381] Separate configuration header file for pre-compile time parameters	CorTst004 SWS_CorTst_00006 SWS_CorTst_00007
[SRS_BSW_00383] List dependencies of configuration files	Not applicable (there are no dependencies to other configuration files)
[SRS_BSW_00384] List dependencies to other modules	See chapter 5.
[SRS_BSW_00385] List possible error notifications	SWS_CorTst_00016:
[SRS_BSW_00386] Configuration for detecting an error	Not applicable (no configuration for error detection)
[SRS_BSW_00387] Specify the configuration class of callback function	This version supports only pointer at link time.
[SRS_BSW_00388] Introduce containers	See chapter 10.2
[SRS_BSW_00389] Containers shall have names	See chapter 10.2
[SRS_BSW_00390] Parameter content shall be	See chapter 10.2

unique within the module	
[SRS_BSW_00391] Parameter shall have unique names	Prefix “CorTst” added to each parameter
[SRS_BSW_00392] Parameters shall have a type	See chapter 8.2 and 10.2
[SRS_BSW_00393] Parameters shall have a range	See chapter 8.2 and 10.2
[SRS_BSW_00394] Specify the scope of the parameters	“Local” marked as Module. See chapter 10.2
[SRS_BSW_00395] List the required parameters (per parameter)	See chapter 10.2
[SRS_BSW_00396] Configuration classes	See chapter 10.2
[SRS_BSW_00397] Pre-compile-time parameters	See chapter 10.2
[SRS_BSW_00398] Link-time parameters	Not applicable (Module does not support link-time configuration)
[SRS_BSW_00399] Loadable post-build time parameters	Not applicable (Module does not support post build-time configuration)
[SRS_BSW_00400] Selectable post-build time parameters	(Module does not support post build-time configuration)
[SRS_BSW_00402] Published information	Only if delivered in source code and CorTst126
[SRS_BSW_00404] Reference to post build time configuration	Not applicable (post build time is not supported)
[SRS_BSW_00405] Reference to multiple configuration sets	Not applicable (post build time is not supported)
[SRS_BSW_00406] Check module initialization	SWS_CorTst_00040, SWS_CorTst_00018, SWS_CorTst_00170
[SRS_BSW_00407] Function to read out published parameters	SWS_CorTst_00112
[SRS_BSW_00409] Header files for production code error IDs	Not applicable (production code error IDs are not supported)
[SRS_BSW_00412] Separate H-file for configuration parameters	See figure in Header file structure
[SRS_BSW_00416] Sequence of Initialization	Not applicable (this is a general software integration requirement)
[SRS_BSW_00417] Reporting of error events by non-basic software	Not applicable (this is a basic software module)
[SRS_BSW_00419] Separate C-files for pre-compile time configuration parameters	See figure in Header file structure
[SRS_BSW_00422] Debouncing of production relevant error status	Not applicable (it makes no sense to debounce core error)
[SRS_BSW_00423] Usage of SW-C template to describe BSW modules with AUTOSAR interfaces	Not applicable (this module has no connection to the RTE)
[SRS_BSW_00424] BSW main processing function task allocation	Not applicable (the scheduling of a BSW is not part of this SWS)
[SRS_BSW_00425] Trigger conditions for schedulable objects	Not applicable (requirement for the implementer)
[SRS_BSW_00426] Exclusive areas in BSW modules	Not applicable (requirement for the implementer)
[SRS_BSW_00427] ISR description for BSW modules	
[SRS_BSW_00428] Execution order dependencies of main processing functions	Not applicable (requirement for the implementer and integrator)
[SRS_BSW_00429] Restricted BSW OS functionality access	Not applicable (this module does not use OS services)
[BSW00431] The BSW Scheduler module implements task bodies	Not applicable (this is a special requirement for the BSW scheduler)
[SRS_BSW_00432] Modules should have separate main processing functions for	Not applicable (this module does not have send/receive

read/receive and write/transmit data path	functionality)
[SRS_BSW_00433] Calling of main processing functions	SWS_CorTst_00067
[BSW00434] The Schedule Module shall provide an API for exclusive areas	Not applicable (this is a special requirement for the BSW scheduler)
[SRS_BSW_00437] No-init area in RAM	Not applicable (this is a requirement on the memory manager)
[SRS_BSW_00438] Post-build configuration data structure	Not applicable (post build time configuration is not supported)
Non-functional Requirements	
[SRS_BSW_00003] Version identification	SWS_CorTst_00112
[SRS_BSW_00005] No hard coded horizontal interfaces within MCAL	Not applicable (this is a requirement on architecture)
[SRS_BSW_00006] Platform independency	Not applicable (Core Test is heavily dependent on underlying hardware to be tested)
[SRS_BSW_00007] HIS MISRA C	Common AUTOSAR non-functional requirement for the implementer.
[SRS_BSW_00009] Module User Documentation	Not applicable (requirement for the implementer)
[SRS_BSW_00010] Memory resource documentation	Not applicable (requirement for the implementer)
[SRS_BSW_00158] Separation of configuration from implementation	CorTst001:
[SRS_BSW_00160] Human-readable configuration data	Common AUTOSAR non-functional requirement for the implementer.
[SRS_BSW_00161] Microcontroller abstraction	Not applicable (this is a requirement on architecture)
[SRS_BSW_00162] ECU layout abstraction	Not applicable (this is a requirement on architecture)
[SRS_BSW_00164] Implementation of service routines	SWS_CorTst_00002: (interrupt service routine for testing purposes)
[SRS_BSW_00170] Data for reconfiguration of AUTOSAR SW-Components	Not applicable (not a SW-Component)
[SRS_BSW_00171] Configurability of optional functionality	Not applicable (no optional functionality available)
[SRS_BSW_00172] Compatibility and documentation of scheduling strategy	Not applicable (requirement for the implementer)
[SRS_BSW_00300] Module naming convention	Applicable. Common AUTOSAR non-functional requirement for the implementer.
[SRS_BSW_00301] Limit imported information	Not applicable (requirement for the implementer)
[SRS_BSW_00302] Limit exported information	Not applicable (requirement for the implementer)
[SRS_BSW_00304] AUTOSAR integer data types	SWS_CorTst_00027:
[SRS_BSW_00305] Self-defined data types naming convention	applicable (requirement for the implementer)
[SRS_BSW_00306] Avoid direct use of compiler and platform specific keywords	Not applicable (requirement for the implementer)
[SRS_BSW_00307] Global variables naming convention	Common AUTOSAR non functional requirement for the implementer.
[SRS_BSW_00308] Definition of global data	Not applicable (requirement for the implementer)
[SRS_BSW_00309] Global data with read-only constraint	Not applicable (requirement for the implementer)
[SRS_BSW_00310] API naming convention	applicable
[SRS_BSW_00312] Shared code shall be reentrant	Not applicable (requirement for the implementer)

[SRS_BSW_00314] Separation of interrupt frames and service routines	Not applicable (interrupt service routine for testing purposes)
[SRS_BSW_00318] Format of module version numbers	Not applicable (requirement for the implementer)
[SRS_BSW_00321] Enumeration of module version numbers	Not applicable (requirement for the implementer)
[SRS_BSW_00325] Runtime of interrupt service routines	Not applicable (requirement for the implementer)
[SRS_BSW_00326] Transition from ISRs to OS tasks	applicable (requirement for the implementer)
[SRS_BSW_00327] Error values naming convention	SWS_CorTst_00016
[SRS_BSW_00328] Avoid duplication of code	Not applicable (requirement for the implementer)
[SRS_BSW_00329] Avoidance of generic interfaces	Not applicable (no generic interface are available)
[SRS_BSW_00330] Usage of macros / inline functions instead of functions	Not applicable (requirement for the implementer)
[SRS_BSW_00331] Separation of error and status values	SWS_CorTst_00037 SWS_CorTst_00038 SWS_CorTst_00039
[SRS_BSW_00333] Documentation of callback function context	Not applicable (requirement for the implementer)
[SRS_BSW_00334] Provision of XML file	Not applicable (requirement for the implementer)
[SRS_BSW_00335] Status values naming convention	Fulfilled for all defined status types see 8.2
[SRS_BSW_00341] Microcontroller compatibility documentation	Not applicable (requirement for the implementer)
[SRS_BSW_00342] Usage of source code and object code	Common AUTOSAR non-functional requirement for the implementer.
[SRS_BSW_00343] Specification and configuration of time	Common AUTOSAR non-functional requirement for the implementer.
[SRS_BSW_00346] Basic set of module files	Not applicable (requirement for the implementer)
[SRS_BSW_00347] Naming separation of different instances of BSW drivers	Common AUTOSAR non-functional requirement for the implementer and integrator.
[SRS_BSW_00348] Standard type header	Fulfilled for all defined status types see 8.2
[SRS_BSW_00350] Development error detection keyword	ECUC_CorTst_00082
[SRS_BSW_00353] Platform specific type header	§5.2 Header file structure.
[SRS_BSW_00355] Do not redefine AUTOSAR integer data types	Not applicable (requirement for the implementer)
[SRS_BSW_00357] Standard API return type	SWS_CorTst_00064
[SRS_BSW_00358] Return type of init() functions	SWS_CorTst_00040
[SRS_BSW_00359] Return type of callback functions	SWS_CorTst_00076
[SRS_BSW_00360] Parameters of callback functions	SWS_CorTst_00076
[SRS_BSW_00361] Compiler specific language extension header	§5.2 Header file structure.
[SRS_BSW_00370] Separation of callback interface from API	Not applicable (the notification functions will be handled via a function pointer in the configuration init structure)
[SRS_BSW_00371] Do not pass function pointers via API	Not applicable (requirement for the implementer)
[SRS_BSW_00373] Main processing function naming convention	See section 8.5.1, CorTst_MainFunction
[SRS_BSW_00374] Module vendor identification	Not applicable (requirement for the implementer)

[SRS_BSW_00376] Return type and parameters of main processing functions	See section CorTst_MainFunction
[SRS_BSW_00377] Module specific API return types	See section 8.2
[SRS_BSW_00378] AUTOSAR Boolean type	Not applicable (requirement for the implementer)
[SRS_BSW_00379] Module identification	Not applicable (requirement for the implementer)
[SRS_BSW_00401] Documentation of multiple instances of configuration parameters	Containers and configuration parameters
[SRS_BSW_00408] Configuration parameter naming convention	See section Containers and configuration parameters
[SRS_BSW_00410] Compiler switches shall have defined values	See section Containers and configuration parameters
[SRS_BSW_00411] Get version info keyword	SWS_CorTst_00112:
[SRS_BSW_00413] Accessing instances of BSW modules	Not applicable (instances makes no sense for this module)
[SRS_BSW_00414] Parameter of init function	SWS_CorTst_00040
[SRS_BSW_00415] User dependent include files	See figure in Header file structure
[SRS_BSW_00435] Module header file structure for the basic software scheduler	See figure in Header file structure
[SRS_BSW_00436] Module header file structure for the basic software memory mapping	Not applicable (requirement for the implementer)

Document: AUTOSAR requirements on Basic Software, cluster MCAL, Core Test driver module

Requirement	***Satisfied by***
[SRS_CoreTst_14101] The Core Test Shall Be Configurable	See section Containers and configuration parameters
[SRS_CoreTst_14102] Link Time Configuration Shall Be Supported	See section Containers and configuration parameters
[SRS_CoreTst_14104] Core Register Test Shall Be Available	[CorTst029]
[SRS_CoreTst_14105] Core Interrupt and Exception Detection Tests Shall Be Available	SWS_CorTst_00002, [CorTst030]
[SRS_CoreTst_14106] Core ALU Test Shall Be Available	[CorTst032]
[SRS_CoreTst_14107] Core Address Generator Test Shall Be Available	[CorTst033]
[SRS_CoreTst_14108] Core Memory Interfaces Test Shall Be Available	[CorTst034]
[SRS_CoreTst_14109] Memory Protection Unit (MPU) Test Shall Be Available	[CorTst035]
[SRS_CoreTst_14110] Cache Controller Test Shall Be Available	[CorTst036]
[SRS_CoreTst_14111] The Core Test Shall Be Divided into Atomic Sequences	Implementation specific
[SRS_CoreTst_14112] There Shall Be a Single API for the Core Test Service	[SWS_CorTst_00064], [SWS_CorTst_00067]
[SRS_CoreTst_14113] The API Shall Have a Parameter to Select Which Component Shall Be Tested	[SWS_CorTst_00064]
[SRS_CoreTst_14114] A Main Function for the Core Test Shall Be Available	[SWS_CorTst_00067]
[SRS_CoreTst_14115] Test Metrics Shall Be Available to Caller	[SWS_CorTst_00057], [SWS_CorTst_00060]

[SRS_CoreTst_14116] The Test Computes a Checksum/Signature as Test Result	[SWS_CorTst_00057], [SWS_CorTst_00060]
[SRS_CoreTst_14131] The Test Computes a Pass/Fail Status Representation as a test result	[SWS_CorTst_00055]
[SRS_CoreTst_14117] Faults Shall Be Treated as Production Errors	SWS_CorTst_00173
[SRS_CoreTst_14118] Test Status Polling	[SWS_CorTst_00053]
[SRS_CoreTst_14119] A Notification of Completion Shall Be Provided	[SWS_CorTst_00076]
[SRS_CoreTst_14126] It Shall Be Possible to Cancel a Running Test	[SWS_CorTst_00048]
[SRS_CoreTst_14130] Destructive Test Shall Restore Original State of tested Entity	[SWS_CorTst_00026]
[SRS_CoreTst_14123] Shared Resources to Be Tested Shall Be Made Exclusively Available to Test	Prerequisite to Core Test Module, shall be handled by upper AUTOSAR layers.
[SRS_CoreTst_14125] Diagnostic Coverage	Not applicable for an API
[SRS_CoreTst_14124] Compliance to The Automotive Standard	Not applicable for an API
SRS_CoreTst_14133 Core Test Interval Id	SWS_CorTst_00137 SWS_CorTst_00139

7 Functional specification

7.1 General Behavior

[SWS_CorTst_00008]
⌈ Core Test shall provide a procedure to test all CPU registers. ⌋()

[SWS_CorTst_00009] ⌈
The Core Test shall provide an Interrupt Controller and Exception detection test. Especially the detection of an interrupt itself and a branch to a valid interrupt service address shall be part of the test. It is regardless if the test is triggered by software exceptions or by a dedicated hardware unit built in silicon. ⌋()

[SWS_CorTst_00010]
⌈ The Core Test shall provide an Arithmetic and Logical Unit (ALU) test. ⌋()

[SWS_CorTst_00011]
⌈ The Core Test shall provide an address generation test. ⌋()

[SWS_CorTst_00012]
⌈ The Core Test shall provide a core memory interface test. This explicitly excludes tests on memory locations themselves which are connected external to a core itself or reside internal in a core. ⌋()

[SWS_CorTst_00013]
⌈ The Core Test shall provide a memory protection unit test (MPU). This is valid even if a Memory Management Unit (MMU) executes MPU functionality. ⌋()

[SWS_CorTst_00014]
⌈The Core Test shall provide a Cache Controller Test. Especially the coherency and consistency between data or instructions located in memory outside the core and its appropriate cache entry representation shall be tested. ⌋()

[SWS_CorTst_00137]
⌈ Each Core Test Interval shall have an Identifier, which shall be incremented by each start of a new test interval in background mode. ⌋(SRS_CoreTst_14133)

[SWS_CorTst_00144]
⌈ Core Test module shall provide test execution services in background and foreground mode. ⌋()

Core Test states in background mode are described in Figure 2. The described states are driver states in background operation mode only.

[SWS_CorTst_00153] ⌈

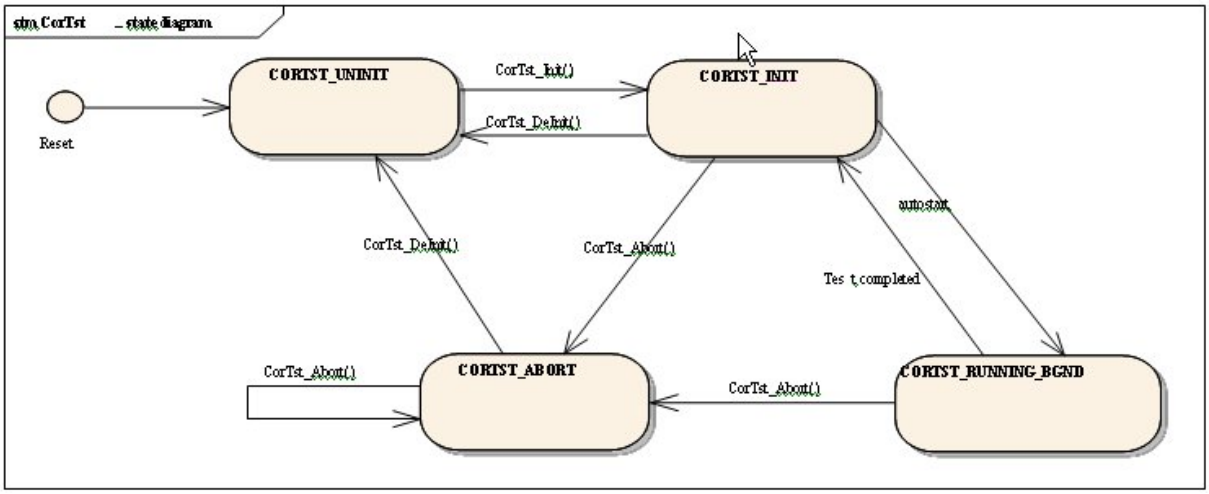


Figure 2 - State Diagram ⌋()

[SWS_CorTst_00145] ⌈

Core Test is structured in partial tests (sets of hardware resource test) which can be interrupted by a higher priority task. ⌋()

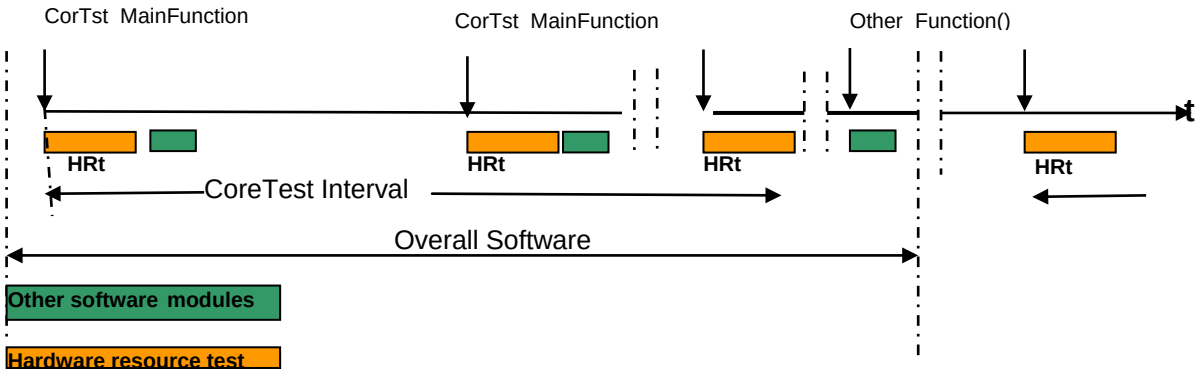
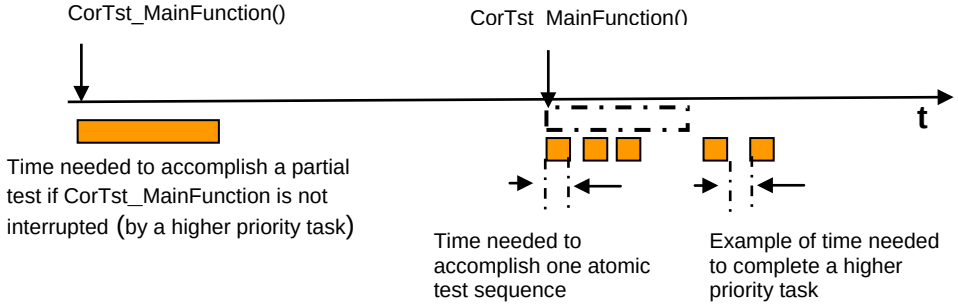


Figure 3 – Backgound Test: Scheduling of Core Test (CorTst)

Each partial test is made up of atomic sequences which cannot be interrupted. The following picture shows how *CorTst_MainFunction* is called by the scheduler, and how it can be interrupted between atomic pieces by higher priority tasks.



7.1.1 Background & Rationale

As described in the Core Test SRS, the Core Test is focused on testing the core, which includes the CPU and locally coupled units like e.g. MMU/MPU and Interrupt controller.
Due to complexity of a core implementation, a very deep knowledge of the core structure is a prerequisite to implement a Core Test. Therefore, it is assumed that a silicon manufacturer is the right entity to implement a Core Test by using an AUTOSAR API and provides the test as a library to user or application implementer.

Furthermore, it is assumed that a Core Test implementation may rarely be given away as a plain source code module from the silicon manufacturer to avoid IP draining.

7.2 Error classification

7.2.1 Developpement Errors

[SWS_CorTst_00016]
「The Core Test shall detect the following API parameter errors depending on its build options:

ID:	Type of error	Relevance	Related error code	Value [hex]
SWS_CorTst_00169	API service called with wrong parameter range	Development	CORTST_E_PARAM_INVALID	0x11
SWS_CorTst_00170	API called without Core Test initialization	Development	CORTST_E_UNINIT	0x20
SWS_CorTst_00172	API service CorTst_Init() called again without a CorTst_DeInit() in-between	Development	CORTST_E_ALREADY_INITIALIZED	0x23
SWS_CorTst_00180	API service called with a NULL pointer for CorTst_GetVersionInfo() and CorTst_GetCurrentStatus()	Development	CORTST_E_PARAM_POINTER	0x24
SWS_CorTst_00181	A particular API is called in an unexpected state	Development	CORTST_E_STATUS_FAILURE	0x01

」(SRS_BSW_00337, SRS_BSW_00385, SRS_BSW_00327, SRS_CoreTst_14117)

7.2.2 Production Errors

This module does not specify any production errors.

7.2.3 Extended Production Errors

Type or error	*Related error code*	*Value*
Core failure during tests.	`CORTST_E_CORE_FAILURE`	`Assigned by the DEM`

7.3 Error notification

[SWS_CorTst_00021]
⌈ Except faults detected inside the CPU itself (e.g.ALU, MAC, etc…), which cannot be reliably reported by software. The errors that cannot be reliably reported by the Dem_ReportErrorStatus API shall be documented by the implementer. ⌋()

7.4 Debugging Support

The following requirements deal with the definition of variables and the description of debug information.

[SWS_CorTst_00148] ⌈ The state described in SWS_CorTst_00039 shall be available for debugging purposes. ⌋()

7.5 General Requirements

[SWS_CorTst_00023]
⌈ Due to the fact that Core Test is a MCAL driver module with no knowledge about the hardware/software system architecture, the tested entities and resources (e.g. ALU] shall be exclusively available prior start of test execution during runtime. ⌋()

[SWS_CorTst_00024]
⌈ The Core Test implementer shall give an indication on the fault coverage achievements of a Core Test implementation. ⌋()

[SWS_CorTst_00026]

⌈ The Core Test shall be nondestructive to the tested entity. If Core Test modifies an entity setup, values, settings or selections on its own, it has to restore previous entity status before returning to calling service. ⌋(SRS_CoreTst_14130)

8 API specification

8.1 Imported types

This chapter lists all types included from other BSW modules.

[SWS_CorTst_00027]「

Module	*Imported Type*
Dem	Dem_EventIdType
	Dem_EventStatusType
Std_Types	Std_ReturnType
	Std_VersionInfoType

」(SRS_BSW_00304)

8.2 Type definitions

8.2.1 CorTst_CsumSignatureType

[SWS_CorTst_00037]「

Name:	`CorTst_CsumSignatureType`		
Type:	`uint16, uint32`		
Range:	`16..32 bit`	`--`	Size depends on target platform.
Description:	This is the type of the Core Test return value if a checksum/signature is returned from API to the caller of the API.		

」(SRS_BSW_00331)

8.2.2 CorTst_CsumSignatureBgndType

[SWS_CorTst_00176]「

Name:	`CorTst_CsumSignatureBgndType`		
Type:	`Structure`		
Element:	`uint8, uint16, uint32`	`implementation specifc`	Implementation specific type
	`uint8, uint16, uint32`	`0..<CorTstTestIntervalIdEndValue>`	value of CorTstTestIntervalId, which is incremented by each start of a test interval.
Description:	Type for test signature in background mode		

」()

8.2.3 CorTst_ErrOkType

[SWS_CorTst_00038]「

Name:	`CorTst_ErrOkType`		
Type:	`Structure`		
Element:	`uint8, uint16, uint32`	`0..<CorTstTestIntervalId EndValue>`	value of CorTstTestIntervalId, which is incremented by each start of a test interval.
	`CorTst_ResultType`	`returnvalue`	CORTST_E_NOT_OK The Core Test detected at least one single test errors. CORTST_E_OKAY The Core test passed without errors. CORTST_E_NOT_TESTED There is no Core Test result available (default)
Description:	This is the type of the Core Test test return if a status is retuned from API to the caller of the API.		

」(SRS_BSW_00331)

[SWS_CorTst_00138]
「 For the type `CorTst_ErrOkType`, the enumeration value `CORTST_E_NOT_TESTED` shall be the default value after a reset. This enumeration value shall have the numeric value 0. `CorTstTestIntervalId` shall have value zero per default. 」()

8.2.4 CorTst_StateType

[SWS_CorTst_00039]「

Name:	`CorTst_StateType`	
Type:	`Enumeration`	
Range:	`CORTST_ABORT`	0x00: The Core Test has been cancelled by API CorTst_Abort().
	`CORTST_INIT`	0x01: The Core Test is initialized and can be started.
	`CORTST_UNINIT`	0x02: The Core Test can be initialized.
	`CORTST_RUNNING_BGND`	0x03: The Core Test is currently executed
Description:	This is a status value returned by the API CorTst_GetState().	

」(SRS_BSW_00331)

8.2.5 CorTst_TestIdFgndType

[SWS_CorTst_00160]「

Name:	`CorTst_TestIdFgndType`
Type:	`uint8, uint16, uint32`

Range:	`8..32 bit`	`--`	Size depends on target platform.
Description:	This is the type of the parameter (Id) used for a specific foreground test configuration to run. (The Id shall be used in the call to the API CorTst_Start(CorTst_TestIdFgndType TestId)).		

」()

8.3 Function definitions

This is a list of functions provided for calling services and upper layer modules.

8.3.1 CorTst_Init

[SWS_CorTst_00040]「

Service name:	CorTst_Init

Syntax:	`void CorTst_Init(`
	`  void`
	`)`

Service ID[hex]:	0x00
Sync/Async:	Synchronous
Reentrancy:	Non Reentrant
Parameters (in):	None
Parameters (inout):	None
Parameters (out):	None
Return value:	None
Description:	Service for initialization and change of state of the Core Test

」(SRS_BSW_00101, SRS_BSW_00406, SRS_BSW_00358, SRS_BSW_00414)

[SWS_CorTst_00041]
「 The function `CorTst_Init` shall initialize all CorTst relevant data structures, global variables, registers and special test hardware (if existing) with appropriate values used for core test. 」()

[SWS_CorTst_00179]
「 The function `CorTst_Init` shall only initialize the configured resources and shall not touch resources that are not configured in the configuration file. 」()

[SWS_CorTst_00042]
「 Execution state will be changed to CORTST_INIT if the driver is called while in state CORTST_UNINIT. 」()

[SWS_CorTst_00178]
「 If `CorTst_Init` is called again while not in state CORTST_UNINIT a development error `CORTST_E_ALREADY_INITIALIZED` is reported. Execution state remains unchanged, the API call `CorTst_Init()` is ignored. 」()

[SWS_CorTst_00044]

「The function `CorTst_Init` shall be called first before calling any other CoreTest functions except the functions `CorTst_GetState` and `CorTst_GetVersionInfo`. If this sequence is not respected, the error code `CORTST_E_UNINIT` shall be reported to the Development Error Tracer (if development error detection is enabled). 」()

8.3.2 CorTst_DeInit

[SWS_CorTst_00045] 「

Service name:	CorTst_DeInit

Syntax:	`void CorTst_DeInit(`
	`  void`
	`)`

Service ID[hex]:	0x01
Sync/Async:	Synchronous
Reentrancy:	Non Reentrant
Parameters (in):	None
Parameters (inout):	None
Parameters (out):	None
Return value:	None
Description:	Service to change from CORTST_ABORT or CORTST_INIT to CORTST_UNINIT state

」()

[SWS_CorTst_00046]
「 The function API `CorTst_DeInit` shall initialize all data structures, global variables, registers and special test hardware (if existing) with the default values after running the startup software (variable/structures) or power-on (HW-default). 」(SRS_BSW_00336)

[SWS_CorTst_00047]
「 If in state CORTST_INIT: The state shall be changed from CORTST_INIT to CORTST_UNINIT state. 」()

[SWS_CorTst_00136]
「 If in state CORTST_ABORT: The state shall be changed from CORTST_ABORT to CORTST_UNINIT state. 」()

[SWS_CorTst_00149]

「 If the DET is enabled and the status of the CORE Test module is CORTST_RUNNING_BGND, the function CortTst_DeInit shall report the error value CORTST_E_STATUS_FAILURE to the DET, and then immediately return. 」()

8.3.3 CorTst_Abort

[SWS_CorTst_00048] 「

Service name:	CorTst_Abort

Syntax:	`void CorTst_Abort(`
	`  void`
	`)`

Service ID[hex]:	0x02
Sync/Async:	Synchronous
Reentrancy:	Non Reentrant
Parameters (in):	None
Parameters (inout):	None
Parameters (out):	None
Return value:	None
Description:	Service to change from CORTST_INIT to CORTST_ABORT state

」(SRS_CoreTst_14126)

[SWS_CorTst_00049]
「 If the current state is CORTST_INIT the state shall be changed from CORTST_INIT to CORTST_ABORT state. 」()

[SWS_CorTst_00105]
「 If the current state is CORTST_RUNNING_BGND the state shall be changed from CORTST_RUNNING_BGND to CORTST_ABORT state. 」()

[SWS_CorTst_00050]
「 When the CorTst_Abort function is called, CorTst_MainFunction shall finish the current atomic sequence it is executing plus shall provide already finished atomic test sequence results, before changing from CORTST_RUNNING_BGND to CORTST_ABORT state. 」()

[SWS_CorTst_00051]
「 After a call to CorTst_Abort, CorTst_MainFunction shall not begin testing again when called by the scheduler before a complete re-initialization of the Core test module takes place by calling CorTst_DeInit and CorTst_Init again. 」()

[SWS_CorTst_00052]

「 A call to CorTst_Abort while already being in state CORTST_ABORT does not change the state. 」()

[SWS_CorTst_00152]
「 A call to `CorTst_Abort` shall set the result of function `CorTst_GetCurrentStatus` to return CORTST_E_NOT_TESTED. 」()

8.3.4 CorTstGetState

[SWS_CorTst_00053] 「

Service name:	CorTst_GetState	
Syntax:	`CorTst_StateType CorTst_GetState( void )`	
Service ID[hex]:	0x03	
Sync/Async:	Synchronous	
Reentrancy:	Non Reentrant	
Parameters (in):	None	
Parameters (inout):	None	
Parameters (out):	None	
Return value:	CorTst_StateType	See type definition
Description:	Service for Core Test to immediately return status on currently executed Core Test.	

」(SRS_CoreTst_14118)

[SWS_CorTst_00054]
「 The function `CorTst_GetState` shall return the current Core Test execution state regardless which state is currently executed. It is allowed to call this function in any execution state. 」()

8.3.5 CorTst_GetCurrentStatus

[SWS_CorTst_00055] 「

Service name:	CorTst_GetCurrentStatus	
Syntax:	`void CorTst_GetCurrentStatus( CorTst_ErrOkType ErrOk )`	
Service ID[hex]:	0x04	
Sync/Async:	Synchronous	
Reentrancy:	Non Reentrant	
Parameters (in):	None	
Parameters (inout):	None	
Parameters (out):	ErrOk	See type definition

Return value:	None
Description:	Service for Core Test to get indicator of the last executed Core Test result

」(SRS_CoreTst_14131)

[SWS_CorTst_00056]
「 The function `CorTst_GetCurrentStatus` shall return the result of the last completed Core Test run plus it shall return the Test Interval Id of the last background test. 」()

[SWS_CorTst_00120]
「 The function `CorTst_GetCurrentStatus` shall return CORTST_E_NOT_TESTED per default if no result is available. 」()

8.3.6 CorTstGetSignature

[SWS_CorTst_00057] 「

Service name:	CorTst_GetSignature	
Syntax:	`CorTst_CsumSignatureBgndType CorTst_GetSignature( void )`	
Service ID[hex]:	0x05	
Sync/Async:	Synchronous	
Reentrancy:	Non Reentrant	
Parameters (in):	None	
Parameters (inout):	None	
Parameters (out):	None	
Return value:	CorTst_CsumSignatureBgndType	Implementation specific
Description:	Service to get signature of the last executed Core Test in background mode.	

」(SRS_CoreTst_14115, SRS_CoreTst_14116)

[SWS_CorTst_00058]
「 The function `CorTst_GetSignature` shall return currently pending Core Test result signature and Core Test Interval Id of the last completed test run in background mode. 」()

[SWS_CorTst_00121]
「 The function `CorTst_GetSignature` shall return value zero per default as signature until a first initial Core Test run has successfully been executed which will provide a first valid signature representation. 」()

8.3.7 CorTst_GetFgndSignature

[SWS_CorTst_00060]「

Service name:	CorTst_GetFgndSignature	
Syntax:	`CorTst_CsumSignatureType CorTst_GetFgndSignature( void )`	
Service ID[hex]:	0x06	
Sync/Async:	Synchronous	
Reentrancy:	Non Reentrant	
Parameters (in):	None	
Parameters (inout):	None	
Parameters (out):	None	
Return value:	CorTst_CsumSignatureType	Implementation specific
Description:	Service to get signature of the last executed Core Test in foreground mode.	

」(SRS_CoreTst_14115, SRS_CoreTst_14116)

[SWS_CorTst_00061]
「 The function `CorTst_GetFgndSignature` shall return Core Test result signature type as Core Test result of the last completed test run in foreground mode. 」()

[SWS_CorTst_00122]
「 The function `CorTst_GetFgndSignature` shall return value zero per default as signature until a first initial Core Test run has successfully been executed which will provide first valid signature representation. 」()

8.3.8 CorTst_Start

[SWS_CorTst_00064]「

Service name:	CorTst_Start	
Syntax:	`Std_ReturnType CorTst_Start( CorTst_TestIdFgndType TestId )`	
Service ID[hex]:	0x07	
Sync/Async:	Synchronous	
Reentrancy:	Non Reentrant	
Parameters (in):	TestId	Id of the foreground test configuration to be executed.
Parameters (inout):	None	
Parameters (out):	None	
Return value:	Std_ReturnType	E_OK: Foreground test processed E_NOT_OK: Foreground test not accepted

Description:	Service for executing foreground Core Test.

」(SRS_BSW_00357, SRS_CoreTst_14112, SRS_CoreTst_14113)

[SWS_CorTst_00065]
「 The function `CorTst_Start` is only applicable for Foreground mode Core Test operation. 」()

[SWS_CorTst_00109]
「 If the execution state is `CORTST_RUNNING_BGND` while this function API is called, the function shall return without any action and the return value shall be E_OK. 」()

[SWS_CorTst_00154]
「 In case an error occurs during test, the `CorTst_Start` function shall report the production error `CORTST_E_CORE_FAILURE` to the DEM if the core can still report errors reliably by software. 」()

[SWS_CorTst_00161]
「 If development error detection is enabled and the parameter TestId is out of the range, the DET error value `CORTST_E_PARAM_INVALID` shall be raised and the function shall return without any action with return value E_NOT_OK.
」(SRS_BSW_00323)

8.3.9 CorTst_GetVersionInfo

[SWS_CorTst_00112] ⌈

Service name:	CorTst_GetVersionInfo
Syntax:	`void CorTst_GetVersionInfo( Std_VersionInfoType* versioninfo )`
Service ID[hex]:	0x08
Sync/Async:	Synchronous
Reentrancy:	Reentrant
Parameters (in):	None
Parameters (inout):	None
Parameters (out):	versioninfo | Pointer to where to store the version information of this module.
Return value:	None
Description:	Service returns the version information of this module.

⌋(SRS_BSW_00004, SRS_BSW_00407, SRS_BSW_00003, SRS_BSW_00411)

SWS_CorTst_00118] ⌈
If the function CorTst_GetVersionInfo is called with a NULL pointer as parameter, it shall return immediately without any further action. If DET is enabled, this function shall report the error value CORTST_E_PARAM_POINTER to the DET module, before returning without any further action. ⌋()

8.4 Call-back notifications

Since Core Test module is a MCAL driver module, it does not provide any call-back functions for lower layered modules.

8.5 Scheduled functions

For details refer to the chapter 8.5 “Scheduled functions” in *SWS_BSWGeneral*

8.5.1 CorTst_MainFunction

[SWS_CorTst_00067] ⌈

Service name:	CorTst_MainFunction
Syntax:	`void CorTst_MainFunction( void )`
Service ID[hex]:	0x0b
Description:	Cyclically called by scheduler to perform processing of Core Test.

⌋(SRS_BSW_00433, SRS_CoreTst_14112, SRS_CoreTst_14114)

[SWS_CorTst_00068]
⌈ The function `CorTst_MainFunction` shall set state to `CORTST_INIT`, if all work within a Core Test interval has been finished. ⌋()

[SWS_CorTst_00069]
⌈ The function `CorTst_MainFunction` shall set state to `CORTST_INIT`, if no work within a Core Test needs to be done. ⌋()

[SWS_CorTst_00070]
⌈ If the CoreTest module is in the state `CORTST_INIT`, a call to the API `CorTst_MainFunction` shall change the state of the module to `CORTST_RUNNING_BGND`. ⌋()

[SWS_CorTst_00071]
⌈ `CorTst_MainFunction` shall test all selected core hardware entities as configured in ECUC_CorTst_00087. ⌋()

[SWS_CorTst_00072]
⌈ The function `CorTst_MainFunction` shall set Core Test result status to `CORTST_E_OKAY` or `CORTST_E_NOT_OK` after each complete test cycle - which may consist itself of many different atomic test cycles - depending on the result of Core Test. ⌋()

[SWS_CorTst_00073]
⌈ `CORTST_E_OKAY` shall be set as status from `CorTst_MainFunction` processing only in the case that every selected atomic part of `CorTst_MainFunction` has been successfully executed without any kind of errors. In all other cases `CORTST_E_NOT_OK` is returned as current status. Status can be checked by calling `CorTst_GetCurrentStatus`. ⌋()

[SWS_CorTst_00074]
⌈ `CorTst_MainFunction` shall set `CORTST_E_NOT_OK` status after first detected error in a sequence of atomic parts of Core Test module. Status can be checked by calling `CorTst_GetCurrentStatus`. ⌋()

[SWS_CorTst_00139]
⌈ The function `CorTst_MainFunction` shall increment Test Interval Id before start of a new test interval. The first test interval shall always have the Test Interval Id = “0” (=zero). If Test Interval Id becomes greater than or equal to `CorTstTestIntervalIdEndValue` Test Interval Id shall start again with value “0” (=zero) for the next test interval. The value shall be provided as part of the return

values of `CorTst_GetSignature and CorTst_GetCurrentStatus` in background mode. ⌋(SRS_CoreTst_14133)

[SWS_CorTst_00155]
⌈ In case an error occurs during test, the `CorTest_MainFunction` function shall report the production error `CORTST_E_CORE_FAILURE` to the DEM if the core can still report errors reliably by software. ⌋()

8.6 Expected Interfaces

This chapter lists all functions the Core Test module requires from other modules.

8.6.1 Mandatory Interfaces

This chapter lists all functions the Core Test module requires to fulfill its task.

[CorTst0177⌈
]

API function	***Description***
Dem_ReportErrorStatus	Queues the reported events from the BSW modules (API is only used by BSW modules). The interface has an asynchronous behavior, because the processing of the event is done within the Dem main function. OBD Events Suppression shall be ignored for this computation.

⌋()

8.6.2 Optional Interfaces

This chapter lists all functions the Core Test module requires to fulfill an optional functionality.

[SWS_CorTst_00183] ⌈

API function	***Description***
Det_ReportError	Service to report development errors.

⌋(SRS_BSW_00338, SRS_BSW_00369, SRS_BSW_00350)

8.6.3 Configurable interfaces

In this chapter, all interfaces are listed where the target function could be configured. The target function is usually a callback function.

8.6.3.1 CorTst Test Completed Notification

[SWS_CorTst_00076] ⌈

Service name:	CorTst_TestCompletedNotification	
Syntax:	`void CorTst_TestCompletedNotification( CorTst_ErrOkType ResultOfLastCorTstRun )`	
Service ID[hex]:	0x0c	
Sync/Async:	Synchronous	
Reentrancy:	Non Reentrant	
Parameters (in):	ResultOfLastCorTstRun	CORTST_E_OKAY Last Core Test execution successfully finished with no errors CORTST_E_NOT_OK Last Core Test execution finished with errors.
Parameters (inout):	None	
Parameters (out):	None	
Return value:	None	
Description:	The function CorTst_TestCompletedNotification shall be called every time when a complete test cycle has been executed.	

」(SRS_BSW_00359, SRS_BSW_00360, SRS_CoreTst_14119)

[SWS_CorTst_00077]

「 The Core Test module shall call the callback notification `CorTst_TestCompletedNotification` every time when it has executed a complete Core Test cycle based on a combination of atomic parts of Core Test in background mode. 」()

[SWS_CorTst_00140]

「 The call of function `CorTst_TestCompletedNotification` shall be pre compile time configurable by the configuration parameter `CorTstNotificationSupported.` 」()

9 Sequence diagrams

9.1 Initialization

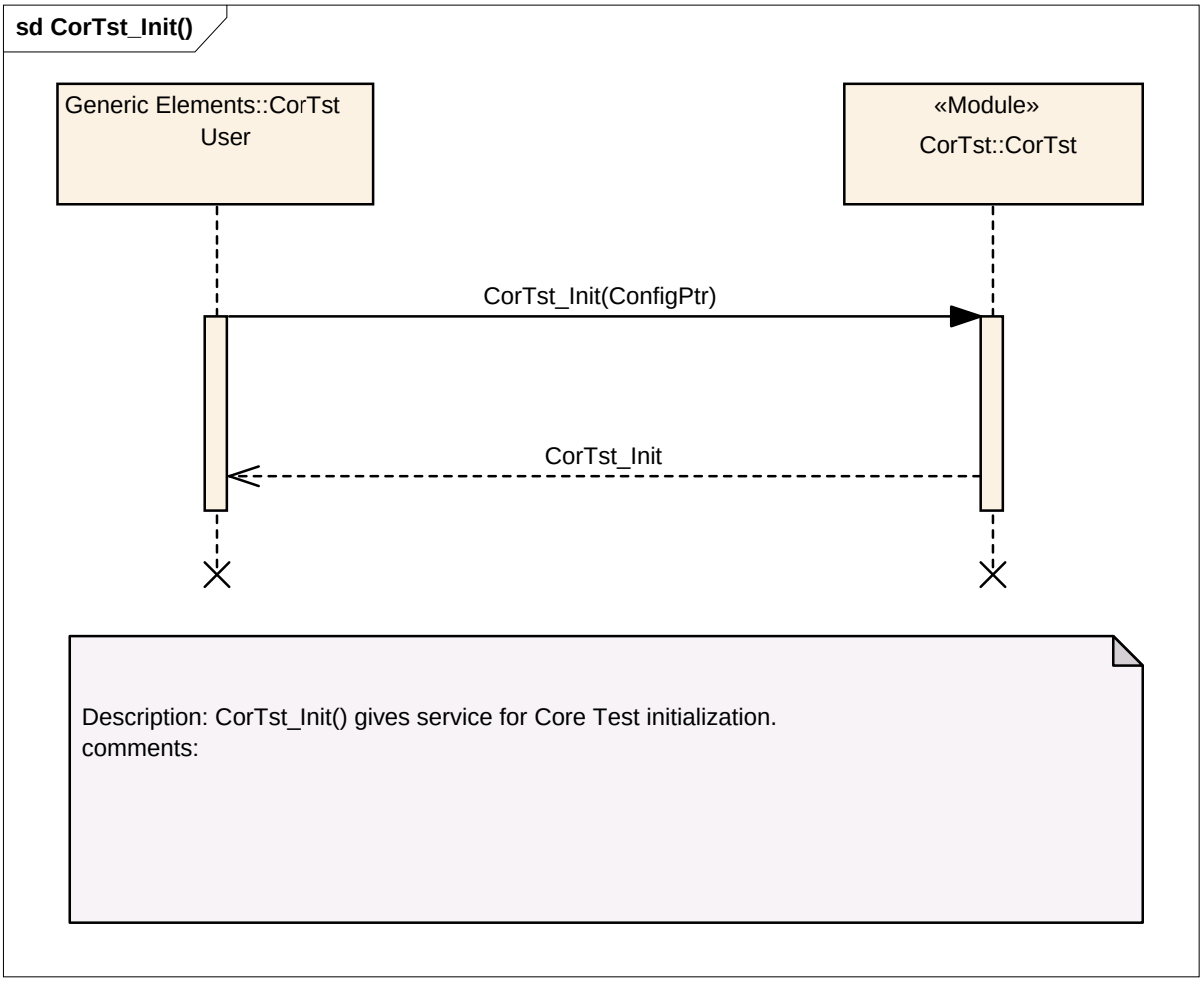


Figure 4 – Core Test Init

9.2 Deinitialization

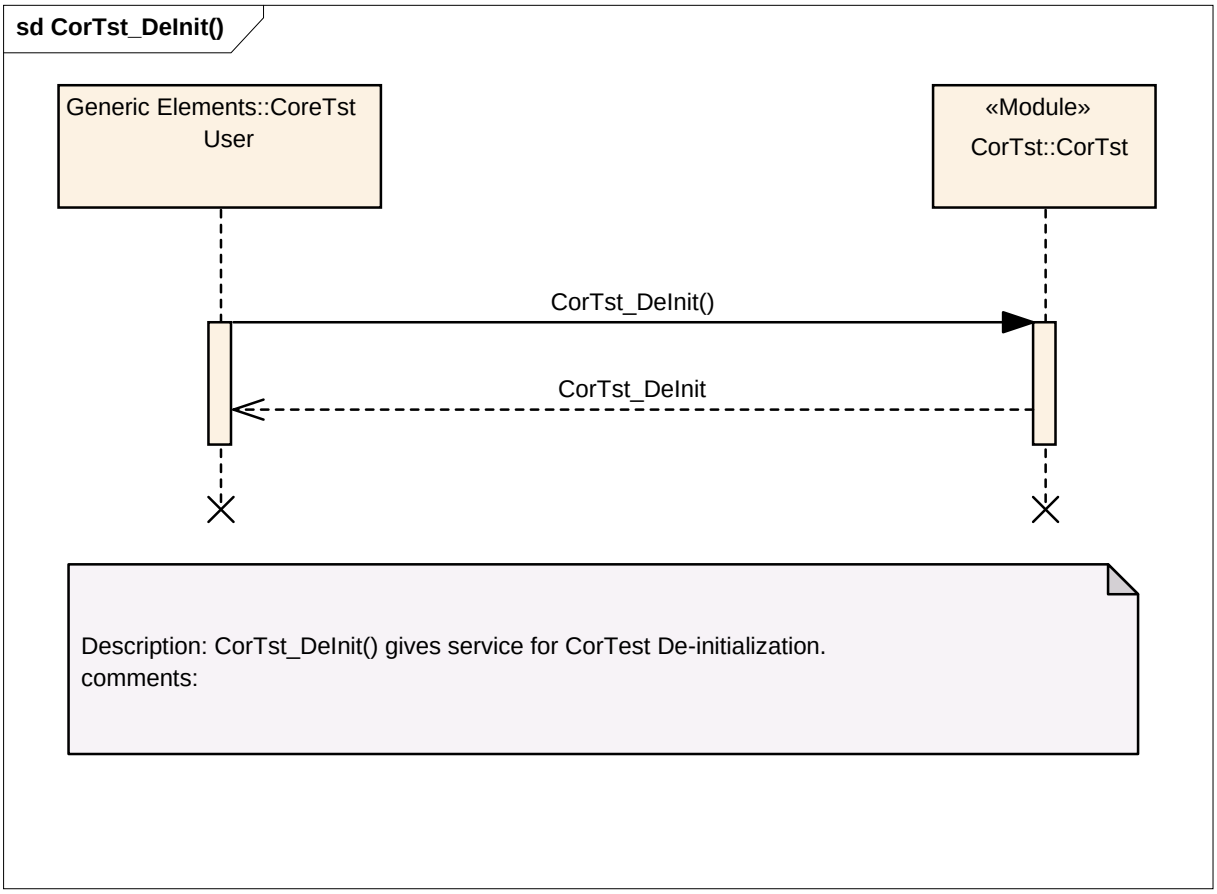


Figure 5 – Core Test De-initialization

9.3 Background Test

9.3.1 Test Result Calculation within Core Test Module

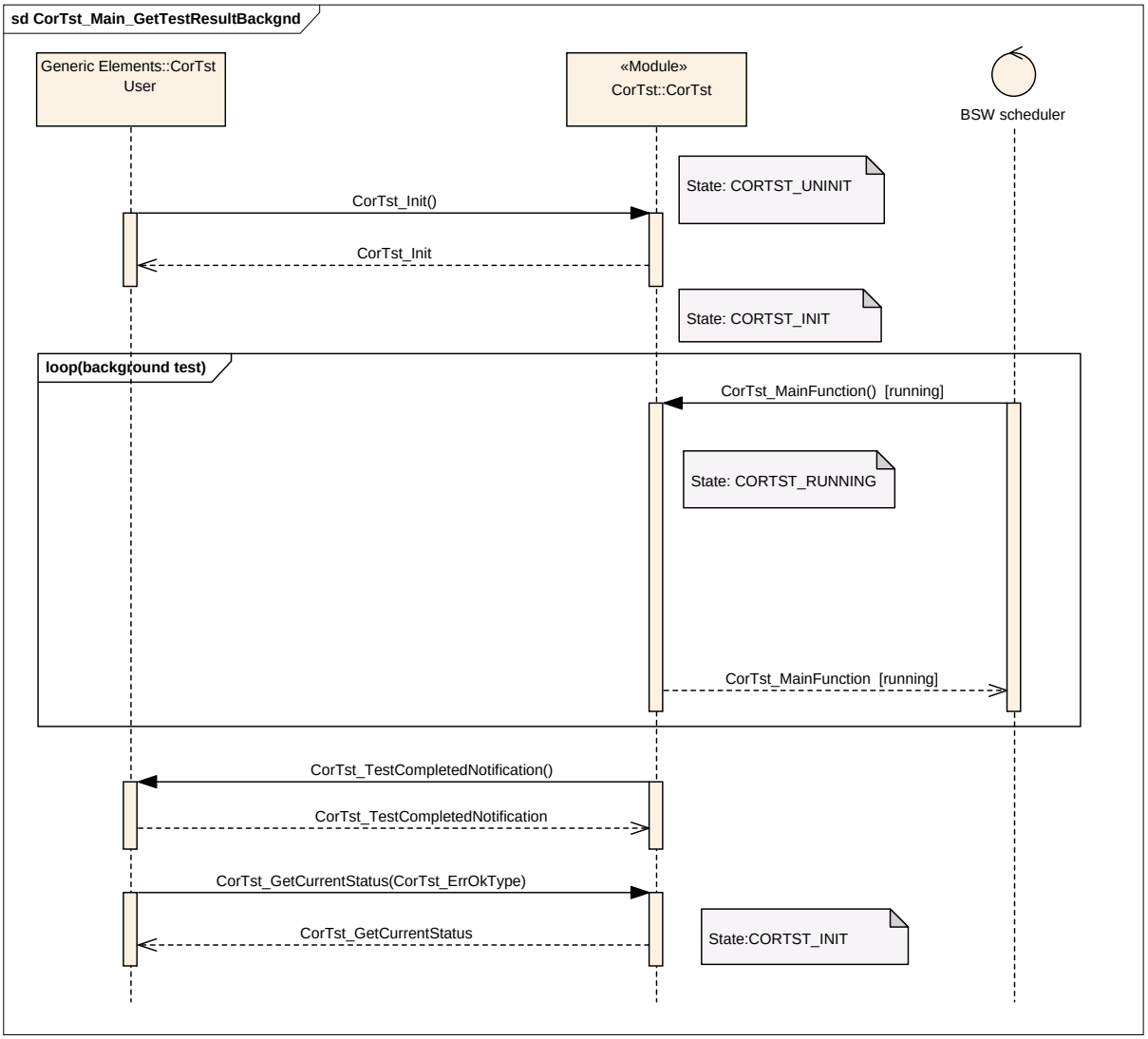


Figure 6 – Result Calculation within Core Test Driver

9.3.2 Core Test Signature provided to Calling Entity

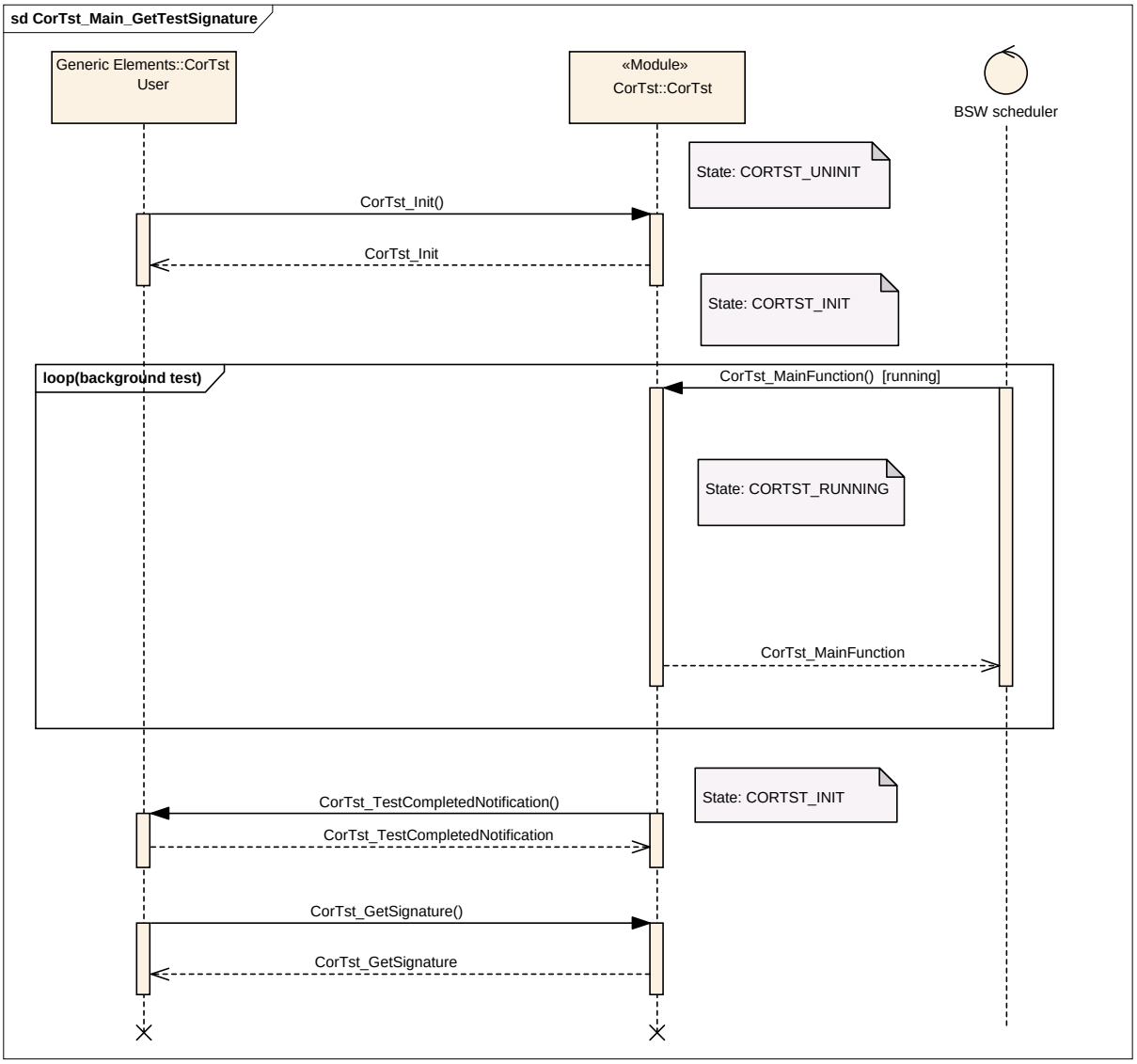


Figure 7 – Result Calculation on Calling Entity

10 Configuration specification

In general, this chapter defines configuration parameters and their clustering into containers.

10.1 How to read this chapter

For details refer to the chapter 10.1 “Introduction to configuration specification” in SWS_BSWGeneral

10.2 Containers and configuration parameters

The following chapters summarize all configuration parameters. The detailed meanings of the parameters describe Chapter Functional specification and Chapter API specification.

10.2.1 Variants

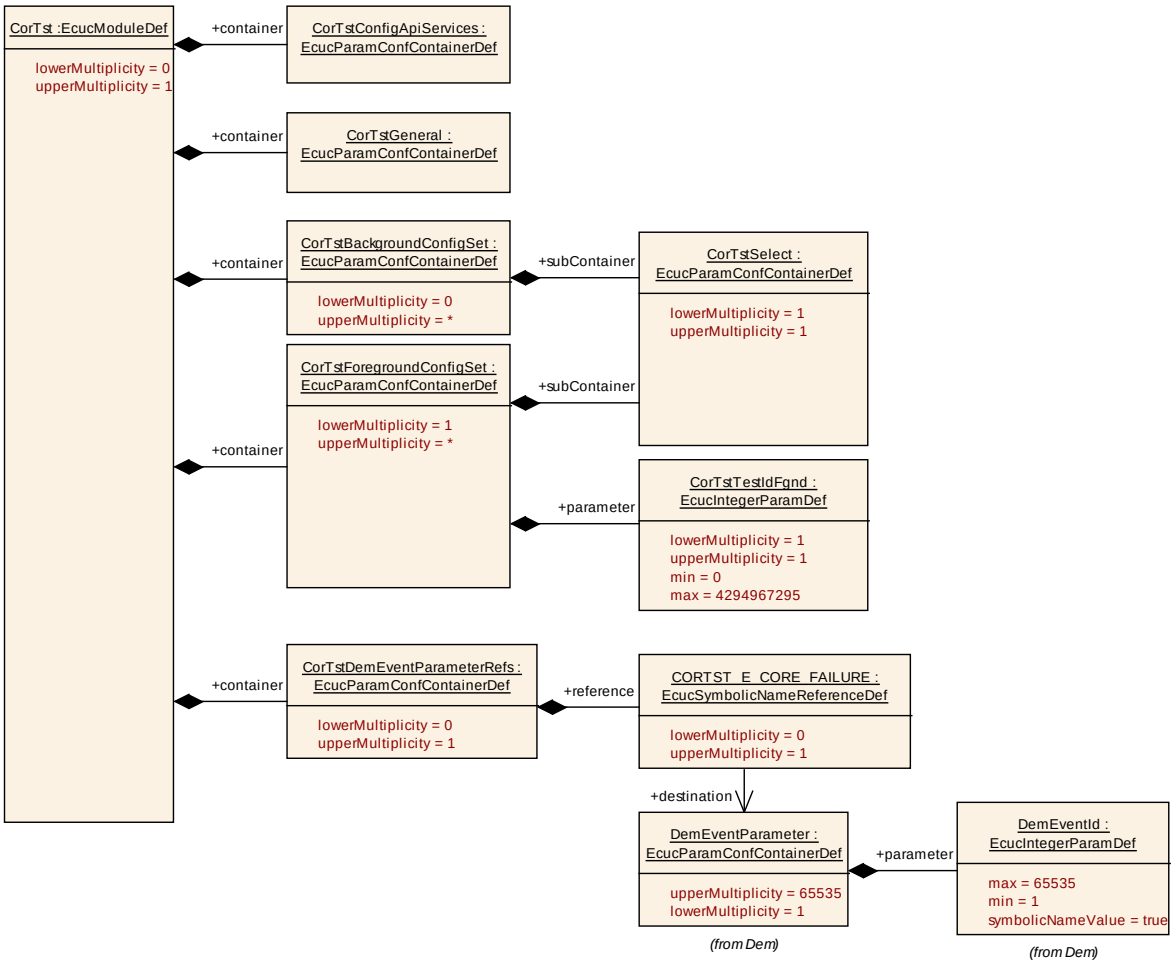
[SWS_CorTst_00078]
⌈ VARIANT-PRE-COMPILE: This variant is limited to pre-compile-configuration parameters only. The intention of this variant is to optimize the parameters configuration for a source code delivery. ⌋()

[SWS_CorTst_00079]
⌈ VARIANT-LINK-TIME: This variant allows a mix of pre-compile time-, link time-configuration parameters. The intention of this variant is to optimize the parameters configuration for an object code delivery. ⌋()

10.2.2 CorTst

SWS Item	**ECUC_CorTst_00125 :**
Module Name	*CorTst*
Module Description	Configuration of the CorTst module.

Included Containers		
Container Name	***Multiplicity***	***Scope / Dependency***
CorTstBackgroundConfigSet	0..*	Multiple Configuration Set Container, defines background mode.
CorTstConfigApiServices	1	--
CorTstDemEventParameterRefs	0..1	Container for the references to DemEventParameter elements which shall be invoked using the API Dem_ReportErrorStatus in case the corresponding error occurs. The EventId is taken from the referenced DemEventParameter's DemEventId value. The standardized errors are provided in the container and can be extended by vendor specific error references.
CorTstForegroundConfigSet	1..*	Multiple Configuration Set Container , defines foreground mode.
CorTstGeneral	1	--



10.2.3 CorTstGeneral

SWS Item	**ECUC_CorTst_00081 :**
Container Name	CorTstGeneral{CORTSTMODULECONFIGURATION}
Description	--
Configuration Parameters	

SWS Item	**ECUC_CorTst_00082 :**		
Name	CorTstDevErrorDetect {CORTST_DEV_ERROR_DETECT}		
Description	Switch for enabling the development error detection.		
Multiplicity	1		
Type	EcucBooleanParamDef		
Default value	false		
ConfigurationClass	***Pre-compile time***	X	All Variants
	Link time	--	
	Post-build time	--	
Scope / Dependency	scope: local		

SWS Item	**ECUC_CorTst_00159 :**	
Name	CorTstFgndTestNumber {CORTST_FGND_TEST_NUMBER}	
Description	This parameter holds the number of test configurations available for the foreground tests as defined in this configuration.	
Multiplicity	1	
Type	EcucIntegerParamDef	
Range	1 .. 4294967295	
Default value	--	

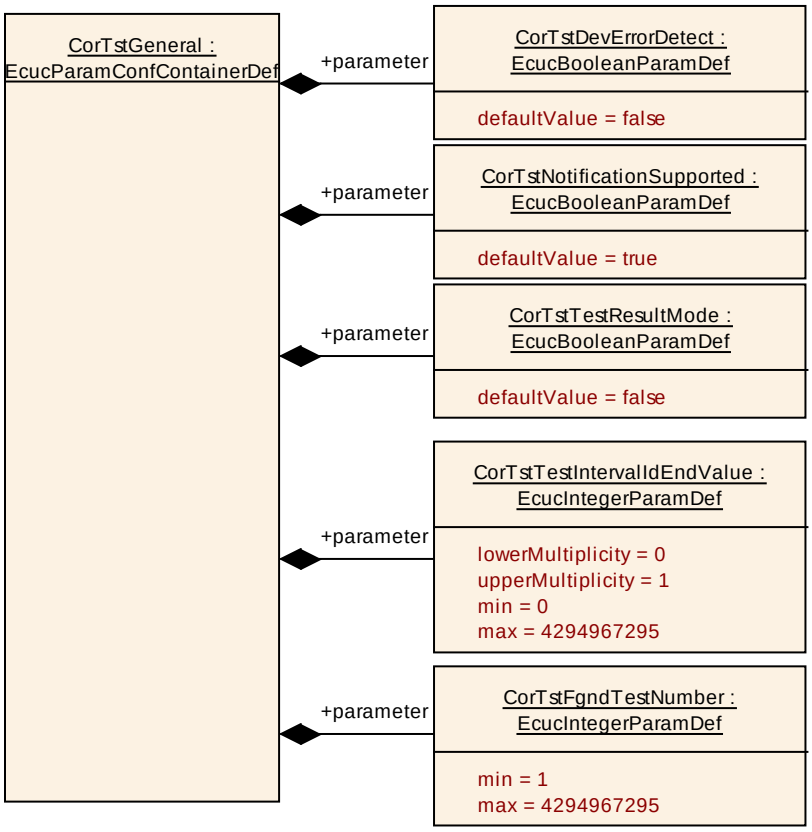
ConfigurationClass	***Pre-compile time***	X	All Variants
	Link time	--	
	Post-build time	--	
Scope / Dependency	scope: local		

SWS Item	**ECUC_CorTst_00083 :**		
Name	CorTstNotificationSupported {CORTST_NOTIFICATION_SUPPORTED}		
Description	Switch to indicate that the notification is supported.		
Multiplicity	1		
Type	EcucBooleanParamDef		
Default value	true		
ConfigurationClass	***Pre-compile time***	X	All Variants
	Link time	--	
	Post-build time	--	
Scope / Dependency	scope: local		

SWS Item	**ECUC_CorTst_00143 :**		
Name	CorTstTestIntervalIdEndValue {CORTST_TEST_INTERVAL_ID_END_VALUE}		
Description	Defines the end value of the Test Interval Id.		
Multiplicity	0..1		
Type	EcucIntegerParamDef		
Range	0 .. 4294967295		
Default value	--		
ConfigurationClass	***Pre-compile time***	X	All Variants
	Link time	--	
	Post-build time	--	
Scope / Dependency	scope: local		

SWS Item	**ECUC_CorTst_00086 :**		
Name	CorTstTestResultMode {CORTST_TEST_RESULT_MODE}		
Description	Switch for enabling test result comparison within the Core test driver. In this mode a core test result OK or NOTOK shall not be calculated from the core test driver. Within core test driver no comparison against the reference value is processed.		
Multiplicity	1		
Type	EcucBooleanParamDef		
Default value	false		
ConfigurationClass	***Pre-compile time***	X	All Variants
	Link time	--	
	Post-build time	--	
Scope / Dependency	scope: local		

No Included Containers



10.2.4 CorTstSelect

SWS Item	**ECUC_CorTst_00089 :**
Container Name	CorTstSelect{CORTST_SELECT}
Description	This container specifies configuration parameters to select individual tests for foreground mode and background mode. The availability is hardware and implementation specific.
Configuration Parameters	

SWS Item	**ECUC_CorTst_00130 :**		
Name	CorTstAddress {CORTST_ADDRESS}		
Description	Enable/Disables core address test.		
Multiplicity	1		
Type	EcucBooleanParamDef		
Default value	false		
ConfigurationClass	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	--	
Scope / Dependency	scope: local		

SWS Item	**ECUC_CorTst_00129 :**		
Name	CorTstAlu {CORTST_ALU}		
Description	Enable/Disables core ALU test.		
Multiplicity	1		
Type	EcucBooleanParamDef		
Default value	false		
ConfigurationClass	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	--	
Scope / Dependency	scope: local		

SWS Item	**ECUC_CorTst_00133 :**		
Name	CorTstCache {CORTST_CACHE}		
Description	Enable/Disables core cache test.		
Multiplicity	1		
Type	EcucBooleanParamDef		
Default value	false		
ConfigurationClass	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	--	
Scope / Dependency	scope: local		

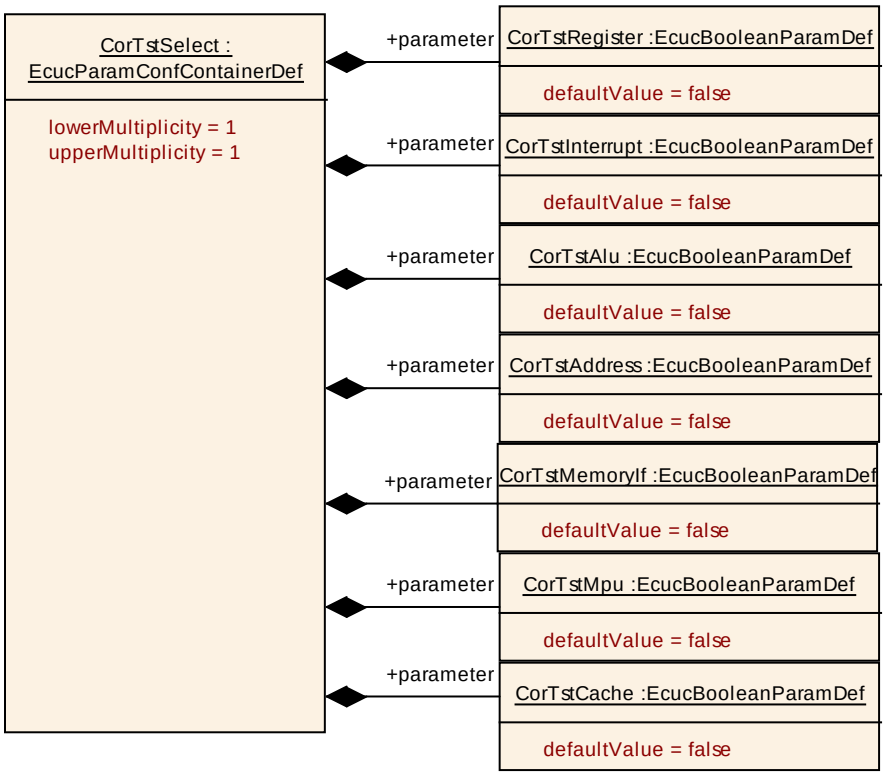
SWS Item	**ECUC_CorTst_00128 :**		
Name	CorTstInterrupt {CORTST_INTERRUPT}		
Description	Enable/Disables core interrupt test		
Multiplicity	1		
Type	EcucBooleanParamDef		
Default value	false		
ConfigurationClass	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	--	
Scope / Dependency	scope: local		

SWS Item	**ECUC_CorTst_00131 :**		
Name	CorTstMemoryIf {CORTST_MEMORYIF}		
Description	Enable/Disables core memory interface test		
Multiplicity	1		
Type	EcucBooleanParamDef		
Default value	false		
ConfigurationClass	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	--	
Scope / Dependency	scope: local		

SWS Item	**ECUC_CorTst_00132 :**		
Name	CorTstMpu {CORTST_MPU}		
Description	Enable/Disables core MPU test		
Multiplicity	1		
Type	EcucBooleanParamDef		
Default value	false		
ConfigurationClass	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	--	
Scope / Dependency	scope: local		

SWS Item	**ECUC_CorTst_00127 :**		
Name	CorTstRegister {CORTST_REGISTER}		
Description	Enable/Disables core register test		
Multiplicity	1		
Type	EcucBooleanParamDef		
Default value	false		
ConfigurationClass	***Pre-compile time***	X	VARIANT-PRE-COMPILE
	Link time	X	VARIANT-LINK-TIME
	Post-build time	--	
Scope / Dependency	scope: local		

No Included Containers



10.2.5 CorTstBackgroundConfigSet

SWS Item	**ECUC_CorTst_00087 :**
Container Name	CorTstBackgroundConfigSet
Description	Multiple Configuration Set Container, defines background mode.
Configuration Parameters	

Included Containers		
Container Name	*Multiplicity*	*Scope / Dependency*
CorTstSelect	1	This container specifies configuration parameters to select individual tests for foreground mode and background mode. The availability is hardware and implementation specific.

10.2.6 CorTstForegroundConfigSet

SWS Item	**ECUC_CorTst_00088 :**
Container Name	CorTstForegroundConfigSet
Description	Multiple Configuration Set Container , defines foreground mode.
Configuration Parameters	

SWS Item	**ECUC_CorTst_00158 :**
Name	CorTstTestIdFgnd {CORTST_TEST_ID_FGND}
Description	This is the Id of this specific foreground test configuration. The value shall be used in the call to the API CorTst_Start(CorTst_TestIdFgndType TestId).
Multiplicity	1

Type	EcucIntegerParamDef		
Range	0 .. 4294967295		
Default value	--		
ConfigurationClass	***Pre-compile time***	X	All Variants
	Link time	--	
	Post-build time	--	
Scope / Dependency	scope: local		

Included Containers		
Container Name	***Multiplicity***	***Scope / Dependency***
CorTstSelect	1	This container specifies configuration parameters to select individual tests for foreground mode and background mode. The availability is hardware and implementation specific.

10.2.7 CorTstConfigApiServices

SWS Item	**ECUC_CorTst_00092 :**
Container Name	CorTstConfigApiServices
Description	--
Configuration Parameters	

SWS Item	**ECUC_CorTst_00094 :**		
Name	CorTstAbortApi {CORTST_ABORT_API}		
Description	Adds / removes the service CorTst_Abort() from the code.		
Multiplicity	1		
Type	EcucBooleanParamDef		
Default value	false		
ConfigurationClass	***Pre-compile time***	X	All Variants
	Link time	--	
	Post-build time	--	
Scope / Dependency	scope: local		

SWS Item	**ECUC_CorTst_00104 :**		
Name	CorTstGetCurrentStatus {CORTST_GET_CURRENT_STATUS_API}		
Description	Adds / removes the service CorTst_GetCurrentStatus() from the code.		
Multiplicity	1		
Type	EcucBooleanParamDef		
Default value	false		
ConfigurationClass	***Pre-compile time***	X	All Variants
	Link time	--	
	Post-build time	--	
Scope / Dependency	scope: local		

SWS Item	**ECUC_CorTst_00103 :**		
Name	CorTstGetFgndSignature {CORTST_GET_FGND_SIGNATURE_API}		
Description	Adds / removes the service CorTst_GetFgndSignature() from the code.		
Multiplicity	1		
Type	EcucBooleanParamDef		
Default value	false		
ConfigurationClass	***Pre-compile time***	X	All Variants
	Link time	--	
	Post-build time	--	
Scope / Dependency	scope: local		

SWS Item	**ECUC_CorTst_00097 :**
Name	CorTstGetSignature {CORTST_GET_SIGNATURE_API}

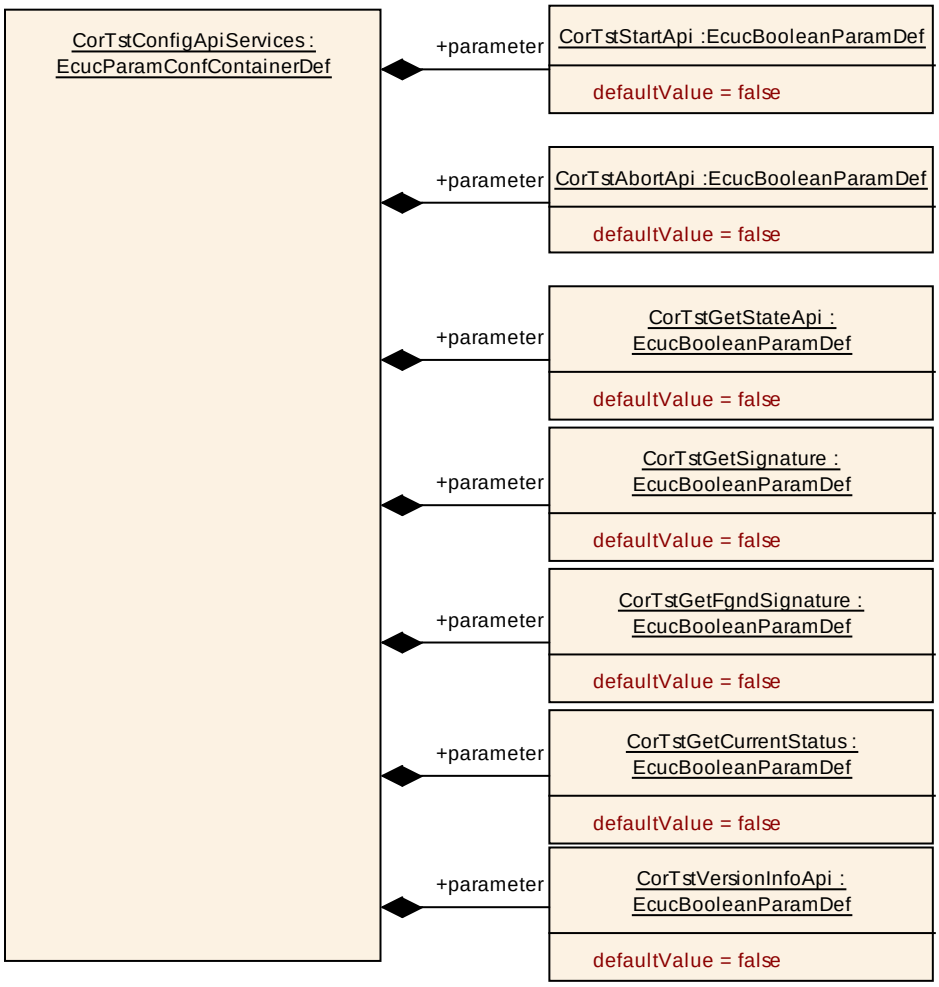
Description	Adds / removes the service CorTst_GetSignature() from the code.		
Multiplicity	1		
Type	EcucBooleanParamDef		
Default value	false		
ConfigurationClass	***Pre-compile time***	X	All Variants
	Link time	--	
	Post-build time	--	
Scope / Dependency	scope: local		

SWS Item	**ECUC_CorTst_00096 :**		
Name	CorTstGetStateApi {CORTST_GET_STATE_API}		
Description	Adds / removes the service CorTst_GetState() from the code.		
Multiplicity	1		
Type	EcucBooleanParamDef		
Default value	false		
ConfigurationClass	***Pre-compile time***	X	All Variants
	Link time	--	
	Post-build time	--	
Scope / Dependency	scope: local		

SWS Item	**ECUC_CorTst_00093 :**		
Name	CorTstStartApi {CORTST_START_API}		
Description	Adds / removes the service CorTst_Start() from the code.		
Multiplicity	1		
Type	EcucBooleanParamDef		
Default value	false		
ConfigurationClass	***Pre-compile time***	X	All Variants
	Link time	--	
	Post-build time	--	
Scope / Dependency	scope: local		

SWS Item	**ECUC_CorTst_00098 :**		
Name	CorTstVersionInfoApi {CORTST_VERSION_INFO_API}		
Description	Adds / removes the service CorTst_GetVersionInfo() from the code.		
Multiplicity	1		
Type	EcucBooleanParamDef		
Default value	false		
ConfigurationClass	***Pre-compile time***	X	All Variants
	Link time	--	
	Post-build time	--	
Scope / Dependency	scope: local		

No Included Containers



10.2.8 CorTstDemEventParameterRefs

SWS Item	**ECUC_CorTst_00156 :**
Container Name	CorTstDemEventParameterRefs
Description	Container for the references to DemEventParameter elements which shall be invoked using the API Dem_ReportErrorStatus in case the corresponding error occurs. The EventId is taken from the referenced DemEventParameter's DemEventId value. The standardized errors are provided in the container and can be extended by vendor specific error references.
Configuration Parameters	

SWS Item	**ECUC_CorTst_00157 :**		
Name	CORTST_E_CORE_FAILURE {CORTST_E_CORE_FAILURE}		
Description	Reference to the DemEventParameter which shall be issued when the error "CORE failure" has occured.		
Multiplicity	0..1		
Type	Symbolic name reference to [DemEventParameter]		
ConfigurationClass	***Pre-compile time***	X	All Variants
	Link time	--	
	Post-build time	--	
Scope / Dependency	scope: local dependency: Dem		

No Included Containers

10.3 Published Information

For details refer to the chapter 10.3 “Published Information” in *SWS_BSWGeneral*

11 Not applicable requirements

[SWS_CorTst_00999] ⌈ These requirements are not applicable to this specification. ⌋ (SRS_BSW_00167, SRS_BSW_00168, SRS_BSW_00339, SRS_BSW_00344, SRS_BSW_00375, SRS_BSW_00383, SRS_BSW_00386, SRS_BSW_00398, SRS_BSW_00399, SRS_BSW_00404, SRS_BSW_00405, SRS_BSW_00409, SRS_BSW_00416, SRS_BSW_00417, SRS_BSW_00422, SRS_BSW_00423, SRS_BSW_00424, SRS_BSW_00425, SRS_BSW_00426, SRS_BSW_00428, SRS_BSW_00429, BSW00431, SRS_BSW_00432, BSW00434, SRS_BSW_00437, SRS_BSW_00438, SRS_BSW_00005, SRS_BSW_00006, SRS_BSW_00009, SRS_BSW_00010, SRS_BSW_00161, SRS_BSW_00162, SRS_BSW_00170, SRS_BSW_00171, SRS_BSW_00172, SRS_BSW_00301, SRS_BSW_00302, SRS_BSW_00306, SRS_BSW_00308, SRS_BSW_00309, SRS_BSW_00310, SRS_BSW_00312, SRS_BSW_00314, SRS_BSW_00318, SRS_BSW_00321, SRS_BSW_00325, SRS_BSW_00328, SRS_BSW_00329, SRS_BSW_00330, SRS_BSW_00333, SRS_BSW_00334, SRS_BSW_00341, SRS_BSW_00346, SRS_BSW_00355, SRS_BSW_00370, SRS_BSW_00371, SRS_BSW_00374, SRS_BSW_00378, SRS_BSW_00379, SRS_BSW_00413, SRS_BSW_00436, SRS_CoreTst_14125, SRS_CoreTst_14124)