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1 Scope of Document

This document specifies requirements on the function component AP Hardware Test Manager of the AUTOSAR Adaptive Platform. The motivation is to provide a standardized and portable way to utilize hardware test manage API for safe and efficient autonomous driving.

2 Conventions to be used

2.1 Document Conventions

The representation of requirements in AUTOSAR documents follows the table specified in [TPS_STDT_00078], see [1, Standardization Template].

The verbal forms for the expression of obligation specified in [TPS_STDT_00053] shall be used to indicate requirements, see [1, Standardization Template].

2.2 Requirements Guidelines

The requirements for the functional component AP Hadware Test Manager should consider AUTOSAR Safety Requirements [2].

3 Acronyms and abbreviations

The glossary below includes acronyms, abbreviations and terms relevant to the current document that are not included in the AUTOSAR TR Glossary [3].

Abbreviation / Acronym:	Description:
HTM	Hardware Test Manager
STL	Software Test Library
FTTI	Fault Tolerant Time Interval
WCET	Worst Case Execution Time

Table 3.1: Acronyms and abbreviations used in the scope of this Document

Term:	Description:
Test Pattern	A predefined set of inputs and operations used to verify hardware functionality
Hardware Health Status	The current operational state and condition of hardware components
Test Report	A detailed record of test execution results and hardware status information

Table 3.2: Terms used in the scope of this document

4 Requirements Specification

This chapter describes all requirements driving the work to define the Hardware Test Manager (HTM) functional component. The HTM provides standardized mechanisms for managing hardware tests, including test pattern execution, result handling, and hardware status monitoring.

4.1 Functional Overview

The AUTOSAR Adaptive Platform HTM provides APIs for Adaptive Applications and other functional clusters of the AUTOSAR Adaptive Platform. The HTM is responsible for the following core aspects:

- Managing the execution of hardware test patterns through standardized interfaces
  - Support one-shot and periodic test execution
  - Control test execution lifecycle (start, stop)
- Processing and reporting test results
  - Collect test execution results
  - Provide interfaces for applications to access test results
- Monitoring hardware operational status
  - Track hardware status during test execution
  - Report hardware health information to applications
- Providing basic configuration capabilities
  - Configure test execution parameters
  - Manage test scheduling options

The HTM functional cluster focuses on providing essential functionality for hardware test management while maintaining simplicity and reliability in its first release.

4.2 Functional Requirements

[AP_RS_HTM_00001] Hardware Test Execution ⌈

Description:	The HTM shall provide APIs for scheduling and executing sets of test patterns on hardware device (e.g., CPU, GPU, AI/C, I/O).
Rationale:	This requirement ensures that the HTM can initiate and manage the execution of hardware tests, enabling the detection of potential faults and ensuring system reliability.
Dependencies:	–
Use Case:	–
Supporting Material:	–

⌋

[AP_RS_HTM_00002] Test Pattern Management ⌈

Description:	The HTM shall provide interfaces for registering, retrieving, and managing test patterns and test cases (e.g., software self-test library).
Rationale:	This requirement allows the HTM to maintain a repository of available test patterns and cases, facilitating their selection and execution as needed.
Dependencies:	–
Use Case:	–
Supporting Material:	–

⌋

[AP_RS_HTM_00003] Hardware Resource Management ⌈

Description:	The HTM shall provide mechanisms to limit and control hardware resource (e.g., CPU, memory) usage based on system safety needs (e.g., FTTI, WCET) and machine manifest configurations.
Rationale:	Hardware resource management is essential for ensuring safe and efficient test execution without impacting critical system operations. The HTM shall respect platform-defined resource constraints when executing tests, coordinating with platform resource management to ensure test execution does not exceed available CPU, memory, or other system resources.
Dependencies:	–
Use Case:	–
Supporting Material:	–

⌋

[AP_RS_HTM_00004] Test Result Handling ⌈

Description:	The HTM shall provide mechanisms for handling and reporting test execution results and reports. The test results shall be queryable from and/or notified to the application.
Rationale:	This requirement enables the HTM to capture and communicate test results, allowing for further analysis, evaluation, and reporting to other components or applications.
Dependencies:	–
Use Case:	–
Supporting Material:	–

⌋

[AP_RS_HTM_00005] Test Abstraction and Standardization ⌈

Description:	The HTM shall provide an execution framework and a standardized reporting facility to abstract and integrate Software Test Libraries (STLs) from different vendors.
Rationale:	This requirement ensures that the HTM can seamlessly work with test patterns (e.g., software self-test library) from various vendors, abstracting their differences and providing a standardized interface for test execution and reporting.
Dependencies:	[AP_RS_HTM_00001], [AP_RS_HTM_00004]
Use Case:	–
Supporting Material:	–

⌋

[AP_RS_HTM_00006] Test Execution Control ⌈

Description:	The HTM shall provide interfaces for controlling the execution flow of individual test patterns (start, pause, stop).
Rationale:	This requirement allows for fine-grained control over test execution, enabling pause/resume functionality or early termination of tests if needed.
Dependencies:	[AP_RS_HTM_00001]
Use Case:	–
Supporting Material:	–

⌋

[AP_RS_HTM_00007] Hardware Health Monitoring ⌈

Description:	The HTM shall provide HW health monitoring capabilities for test pattern execution, including the detection of timeouts, crashes, and abnormal hardware behavior during test execution. This complements the basic test execution capability in [AP_RS_HTM_00001] by specifically monitoring the hardware's health status during testing.

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Rationale:	This requirement ensures that HTM can detect and report hardware anomalies during test execution, enabling early fault detection and preventing system failures. It focuses on monitoring the test execution process itself rather than general hardware enumeration.
Dependencies:	[AP_RS_HTM_00001]
Use Case:	–
Supporting Material:	–

⌋

[AP_RS_HTM_00008] Runtime Configuration ⌈

Description:	The HTM shall provide APIs for configuring test parameters and settings at runtime, including: 1. Specifying test execution modes (one-shot, periodic, factory test mode). 2. Obtaining test pattern characteristics (compute-intensive, IO-intensive, etc.). 3. Adjusting software/hardware configurations (schedule policy, CPU frequency, etc.) for test optimization. The HTM shall also provide interfaces for: 1. Retrieving real-time system/application performance metrics. 2. Coordinating test execution with application workloads for optimal resource utilization.
Rationale:	This requirement allows for dynamic configuration of test parameters and execution modes, enabling flexibility and adaptation to changing requirements or conditions.
Dependencies:	–
Use Case:	–
Supporting Material:	–

⌋

4.3 Non-Functional Requirements

The HTM currently does not have any non-functional requirements.

5 References

[1] Standardization Template
AUTOSAR_FO_TPS_StandardizationTemplate

[2] Safety Requirements for AUTOSAR Adaptive Platform and AUTOSAR Classic Platform
AUTOSAR_FO_RS_Safety

[3] Glossary
AUTOSAR_FO_TR_Glossary

A Appendix

There is no content.

B Trace Groups

The requirements in this document are divided into trace groups according to the following table.

Defined Trace Groups	
Identifier	**Included Requirements**
No Trace Groups defined	

Table B.1: Trace Groups of this document

C Change history of AUTOSAR traceable items

Please note that the lists in this chapter also include traceable items that have been removed from the specification in a later version. These items do not appear as hyperlinks in the document.

C.1 Traceable item history of this document according to AUTOSAR Release R26.11

C.1.1 Added Requirements in R26-11

none

C.1.2 Changed Requirements in R26-11

none

C.1.3 Deleted Requirements in R26-11

none

C.2 Traceable item history of this document according to AUTOSAR Release R25.11

C.2.1 Added Requirements in R25-11

Number	Heading
[AP_RS_HTM_00001]	Hardware Test Execution
[AP_RS_HTM_00002]	Test Pattern Management
[AP_RS_HTM_00003]	Hardware Resource Management
[AP_RS_HTM_00004]	Test Result Handling
[AP_RS_HTM_00005]	Test Abstraction and Standardization
[AP_RS_HTM_00006]	Test Execution Control
[AP_RS_HTM_00007]	Hardware Health Monitoring
[AP_RS_HTM_00008]	Runtime Configuration

Table C.1: Added Requirements in R25-11

C.2.2 Changed Requirements in R25-11

none

C.2.3 Deleted Requirements in R25-11

none