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## 1 Scope of this document

This document specifies requirements on the module Flash Driver.

### Constraints

First scope for specification of requirements on basic software modules are systems which are not safety relevant. For this reason safety requirements are assigned to medium priority.

## 2 How to read this document

Each requirement has its unique identifier starting with the prefix “BSW” (for “Basic Software”). For any review annotations, remarks or questions, please refer to this unique ID rather than chapter or page numbers!

### 2.1 Conventions used

In requirements, the following specific semantics are used (taken from Request for Comment RFC 2119 from the Internet Engineering Task Force IETF)

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC 2119. Note that the requirement level of the document in which they are used modifies the force of these words.

- **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 interoperate 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 interoperate with another implementation, which does not include the option (except, of course, for the feature the option provides.)

## 2.2 Requirements structure

Each module specific chapter contains a short functional description of the Basic Software Module. Requirements of the same kind within each chapter are grouped under the following headlines (where applicable):

### Functional Requirements:

- Configuration (which elements of the module need to be configurable)
- Initialisation
- Normal Operation
- Shutdown Operation
- Fault Operation
- ...

### Non-Functional Requirements:

- Timing Requirements
- Resource Usage
- Usability
- Output for other WPs (e.g. Description Templates, Tooling,...)
- ...

### 3 Acronyms and abbreviations

Acronyms and abbreviations that have a local scope are not contained in the AUTOSAR glossary. These must appear in a local glossary.

<b>Acronym / Abbreviation</b>	<b>Description:</b>
CS	Chip select
DIO	Digital Input Output
ECU	Electric Control Unit
EOL	End Of Line Often used in the term 'EOL Programming' or 'EOL Configuration'
HIS	Herstellerinitiative Software
ICU	Interrupt Capture Unit
MAL	Old name of Microcontroller Abstraction Layer (replaced by MCAL because 'MAL' is a french term meaning 'bad')
MCAL	Microcontroller Abstraction Layer
MCU	Microcontroller Unit
MMU	Memory Management Unit
Master	A device controlling other devices (slaves, see below)
Slave	A device beeing completely controlled by a master device
NMI	Non maskable interrupt
OS	Operating System
PLL	Phase Locked Loop
PWM	Pulse Width Modulation
RX	Reception (in the context of bus communication)
SPAL	The name of this working group
SFR	Special Function Register
RTE	Runtime environment
WP	Work Package
STD	Standard
REQ	Requirement
UNINIT	Uninitialized (= not initialized)

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

## 4 Requirement Specification

### 4.1 Internal Flash Driver

#### 4.1.1 Functional overview

The internal Flash driver provides services for initialization and reading, writing, erasing the internal Flash memory. The Flash driver provides a built-in loader capability that allows loading the flash access code to RAM and execute the write/erase operations from there if this is required.

In application mode of the ECU, the flash driver is only to be used by the Flash EEPROM emulation module for writing data. It is not intended to write program code to flash memory in application mode. This shall be done in boot mode which is out of scope of AUTOSAR.

#### 4.1.2 Functional requirements

##### 4.1.2.1 Configuration

###### 4.1.2.1.1 [BSW12132] Flash driver static configuration

<b>Initiator:</b>	DC
<b>Date:</b>	18.11.2005
<b>Short Description:</b>	Flash driver static configuration
<b>Type:</b>	Changed (maximum block sizes for read (and compare) jobs added, duplicated for normal and fast mode configuration)
<b>Importance:</b>	High
<b>Description:</b>	The following constants of the Flash driver shall be statically configurable: <ol style="list-style-type: none"> <li>1. Flash memory base address</li> <li>2. Flash memory size</li> <li>3. Maximum block sizes for read (compare), write and erase operations processed within the job processing function in normal mode</li> <li>4. Maximum block sizes for read (compare), write and erase operations processed within the job processing function in fast mode</li> <li>5. Job processing triggered by interrupt or cyclic job processing (polling) function for write and erase</li> <li>6. Call cycle of cyclic job processing function for write and erase, protect (in case the flash hardware does not provide this timing)</li> <li>7. Flash write protection</li> </ol>
<b>Rationale:</b>	Basic configuration
<b>Use Case:</b>	<p>→ 1+2: can also be used for restricting the accessible flash memory area (protect program code from being overwritten)</p> <p>→ 4: Some microcontrollers provide flash memory interrupts</p> <p>→ 5: Needed if the flash memory hardware does not provide this timing and/or deadline checks are necessary</p>
<b>Dependencies:</b>	--
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--



#### 4.1.2.1.2 [BSW12133] Publication of flash properties

<b>Initiator:</b>	DC
<b>Date:</b>	14.06.2004
<b>Short Description:</b>	Publication of flash properties
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	The flash driver description shall publish the following flash memory properties: <ol style="list-style-type: none"> <li>1. value of erased flash cell</li> <li>2. size of one flash cell (e.g. 8bit, 16bit, ...)</li> <li>3. flash memory size in bytes</li> <li>4. flash memory base address</li> <li>5. physical memory segmentation (minimum writable / readable / erasable / protectable units)</li> </ol>
<b>Rationale:</b>	For configuration of higher layers
<b>Use Case:</b>	→ 1: The NVRAM manager wants to perform an flash blank check. For that he needs the value of an erased flash cell. → 5: During NVRAM layout configuration data blocks shall not be misaligned to segmentation borders.
<b>Dependencies:</b>	--
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--

#### 4.1.2.2 Normal Operation

##### 4.1.2.2.1 [BSW12134] Flash read function

<b>Initiator:</b>	DC
<b>Date:</b>	14.06.2004
<b>Short Description:</b>	Flash read function
<b>Type:</b>	Changed (reactivated)
<b>Importance:</b>	High
<b>Description:</b>	The flash driver shall provide an asynchronous read function that reads a data block starting from the requested flash address with the passed length from the internal flash memory.
<b>Rationale:</b>	Basic functionality
<b>Use Case:</b>	Flash EEPROM Emulation; access of flash that is not memory mapped
<b>Dependencies:</b>	--
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--

#### 4.1.2.2.2 [BSW12135] Flash write function

<b>Initiator:</b>	DC
<b>Date:</b>	14.06.2004
<b>Short Description:</b>	Flash write function
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	<p>The flash driver shall provide an asynchronous write function that writes a data block starting from the requested flash address with the passed length to the internal flash memory.</p> <p>The flash address and the length shall be aligned to the physical memory segmentation of the flash memory. Unaligned write requests shall be rejected by the flash driver with an error code.</p>
<b>Rationale:</b>	Basic functionality
<b>Use Case:</b>	--
<b>Dependencies:</b>	The flash memory shall be erased.
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--

#### 4.1.2.2.3 [BSW12136] Flash erase function

<b>Initiator:</b>	DC
<b>Date:</b>	14.06.2004
<b>Short Description:</b>	Flash erase function
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	<p>The flash driver shall provide an asynchronous erase function that erases one or multiple flash segments starting from the requested flash address with the passed length.</p> <p>The flash address and the length shall be aligned to the physical memory segmentation of the flash memory. Unaligned erase requests shall be rejected by the flash driver with an error code.</p> <p>The flash driver shall choose the optimal erase strategy internally. E.g. use block erase commands if supported by flash hardware.</p>
<b>Rationale:</b>	Basic functionality
<b>Use Case:</b>	--
<b>Dependencies:</b>	--
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--

#### 4.1.2.2.4 [BSW13301] Flash compare function

<b>Initiator:</b>	DC
<b>Date:</b>	18.11.2005
<b>Short Description:</b>	Flash compare function
<b>Type:</b>	New (copied and adapted from SRS EEPROM because of RfC #6793)
<b>Importance:</b>	High
<b>Description:</b>	The flash driver shall provide an asynchronous compare function that compares a section in memory with a section in flash memory with the passed length.
<b>Rationale:</b>	RfC #6793: The flash driver shall provide the same functionality as the EEPROM driver to allow for transparency towards the NVRAM manager.
<b>Use Case:</b>	Internal mechanisms in the Flash EEPROM Emulation can use this function to determine, whether erasing / writing a sector / page is needed or not.
<b>Dependencies:</b>	RfC #6793: Provide the same functionality as the EEPROM driver
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--

#### 4.1.2.2.5 [BSW12137] Flash cancel function

<b>Initiator:</b>	DC
<b>Date:</b>	14.06.2004
<b>Short Description:</b>	Flash cancel function
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	<p>The flash driver shall provide a synchronous cancel function that stops the currently processed job. The states and data of the affected flash cells are undefined! The flash driver and controller itself is ready for new jobs.</p> <p>Note: In most cases, ongoing hardware write/erase processes cannot be stopped, but the writing/erasing of further data blocks is aborted.</p>
<b>Rationale:</b>	Needed for EEPROM emulation only (urgent write commands can be performed without any delay).
<b>Use Case:</b>	Writing crash relevant data in case of detected vehicle crash without any delay.
<b>Dependencies:</b>	The NVRAM manager shall pay attention to the priority of the jobs. Only he is authorized to use this function!
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--

#### 4.1.2.2.6 [BSW12138] Flash driver status function

<b>Initiator:</b>	DC
<b>Date:</b>	14.06.2004
<b>Short Description:</b>	Flash driver status function
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	The flash driver shall provide a synchronous function which returns the job processing status.
<b>Rationale:</b>	Check if flash driver is busy
<b>Use Case:</b>	<p>Only example (will be specified within API definition):</p> <ul style="list-style-type: none"> <li>• After Reset and before a successful initialization the driver state is UNINIT.</li> <li>• After a successful initialization the driver state is IDLE.</li> <li>• During job processing the driver state is BUSY.</li> <li>• After canceling a job the driver state is IDLE.</li> </ul>
<b>Dependencies:</b>	--
<b>Conflicts:</b>	HIS specification
<b>Supporting Material:</b>	--

#### 4.1.2.2.7 [BSW13302] Flash driver mode selection function

<b>Initiator:</b>	DC
<b>Date:</b>	18.11.2005
<b>Short Description:</b>	Flash driver mode selection function
<b>Type:</b>	New (copied and adapted from SRS EEPROM because of RfC #6793)
<b>Importance:</b>	High
<b>Description:</b>	<p>The flash driver shall provide a synchronous function that allows to switch the operation mode between normal and fast flash memory access.</p> <p>Comment: For specification of these two modes see the links below.</p>
<b>Rationale:</b>	RfC #6793: The flash driver shall provide the same functionality as the EEPROM driver to allow for transparency towards the NVRAM manager.
<b>Use Case:</b>	--
<b>Dependencies:</b>	<a href="#">[BSW12132]</a> Flash driver static configuration <a href="#">[BSW13304]</a> Job processing – fast mode <a href="#">[BSW13303]</a> Job processing – normal mode
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--

#### 4.1.2.2.8 [BSW12159] Flash address check

<b>Initiator:</b>	WP4.2.2.1.12
<b>Date:</b>	06.07.2004
<b>Short Description:</b>	Flash address check
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	<p>The write and erase functions of the Flash driver shall check the passed address parameters for being within the valid configured address borders.</p> <p>Write/erase accesses beyond the allowed borders shall be rejected with an error code.</p>
<b>Rationale:</b>	Avoid write attempts to not allowed flash areas (e.g. program code).
<b>Use Case:</b>	--
<b>Dependencies:</b>	<a href="#">[BSW12132]</a> Flash driver static configuration, items 1 + 2
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--

#### 4.1.2.2.9 [BSW12158] Flash blank check

<b>Initiator:</b>	WP4.2.2.1.12
<b>Date:</b>	06.07.2004
<b>Short Description:</b>	Flash blank check
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	<p>Before writing data to flash memory, the flash driver shall verify if the addressed memory area has been erased.</p> <p>If the memory is not erased, the processing of the write function shall be aborted with an error notification.</p> <p>This feature shall be statically configurable (on/off).</p>
<b>Rationale:</b>	Avoid write attempts to not erased flash memory.
<b>Use Case:</b>	--
<b>Dependencies:</b>	--
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--

#### 4.1.2.2.10 [BSW12141] Flash write verification

<b>Initiator:</b>	DC
<b>Date:</b>	14.06.2004
<b>Short Description:</b>	Flash write verification
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	The flash driver shall verify written data by reading back from flash and comparing with the source data after each write access. Differences shall be notified as error. The checking shall be done within the processing of the write function.  This feature shall be statically configurable (on/off).
<b>Rationale:</b>	Detecting data corruption.
<b>Use Case:</b>	--
<b>Dependencies:</b>	--
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--

#### 4.1.2.2.11 [BSW12160] Flash erase verification

<b>Initiator:</b>	DC
<b>Date:</b>	07.07.2004
<b>Short Description:</b>	Flash erase verification
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	After execution of an erase job, the flash driver shall verify that the addressed block has been erased completely.  This feature shall be statically configurable (on/off).
<b>Rationale:</b>	--
<b>Use Case:</b>	--
<b>Dependencies:</b>	--
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--

#### 4.1.2.2.12 [BSW12143] Flash driver job management

<b>Initiator:</b>	DC
<b>Date:</b>	14.06.2004
<b>Short Description:</b>	Flash driver job management
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	<p>The flash driver shall handle only one job (write or erase) at one time. Job requests during a running job shall be rejected and handled as error.</p> <p>This error detection shall be statically configurable (on/off).</p> <p>Further explanation: The calling function is responsible for buffering and queueing of jobs, not the flash driver.</p>
<b>Rationale:</b>	Different operations like write and erase can't be handled at the same time and the results are dependent of the execution order.
<b>Use Case:</b>	During development, the error detection is enabled. For production code, the error detection is disabled for efficiency reasons.
<b>Dependencies:</b>	--
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--

#### 4.1.2.2.13 [BSW12144] Flash driver job processing function

<b>Initiator:</b>	DC
<b>Date:</b>	14.06.2004
<b>Short Description:</b>	Flash driver job processing function
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	<p>The flash driver shall provide a function that has to be called for job processing. All job processing shall be done within this function.</p> <p>If supported by hardware, this function can be called from an interrupt. Otherwise, this function can be called with a fixed cycle time.</p> <p>Further comments for better understanding: The job processing function usually contains a big state machine which processes the write and erase jobs and sets the driver status variable.</p>
<b>Rationale:</b>	Allow flexible possibilities of job processing.
<b>Use Case:</b>	Example: The job processing function is called every 10ms.
<b>Dependencies:</b>	--
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--

#### 4.1.2.2.14 [BSW13303] Job processing – normal mode

<b>Initiator:</b>	DC
<b>Date:</b>	18.11.2005
<b>Short Description:</b>	Job processing – normal mode
<b>Type:</b>	New (copied and adapted from SRS EEPROM because of RfC #6793)
<b>Importance:</b>	High
<b>Description:</b>	In normal mode, one cycle of the job processing function of the flash driver shall limit the block size that is read from flash memory to the configured default block size.  Simplified comment: Only read a few bytes during one call of the job processing function.
<b>Rationale:</b>	RfC #6793: The flash driver shall provide the same functionality as the EEPROM driver to allow for transparency towards the NVRAM manager.
<b>Use Case:</b>	Example: In normal mode, the maximum block size of read data is 16. In fast mode, the maximum block size of read data is 128.
<b>Dependencies:</b>	<a href="#">[BSW12132]</a> Flash driver static configuration <a href="#">[BSW13302]</a> Flash driver mode selection function
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--

#### 4.1.2.2.15 [BSW13304] Job processing – fast mode

<b>Initiator:</b>	DC
<b>Date:</b>	18.11.2005
<b>Short Description:</b>	Job processing – fast mode
<b>Type:</b>	New (copied and adapted from SRS EEPROM because of RfC #6793)
<b>Importance:</b>	High
<b>Description:</b>	In fast mode, one cycle of the job processing function of the flash driver shall limit the block size that is read from flash memory to the configured maximum block size.  Simplified comment: Read a big block of data during one call of the job processing function.
<b>Rationale:</b>	RfC #6793: The flash driver shall provide the same functionality as the EEPROM driver to allow for transparency towards the NVRAM manager.
<b>Use Case:</b>	Example: In normal mode, the maximum block size of read data is 16. In fast mode, the maximum block size of read data is 128.
<b>Dependencies:</b>	<a href="#">[BSW12132]</a> Flash driver static configuration <a href="#">[BSW13302]</a> Flash driver mode selection function
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--



#### 4.1.2.2.16 [BSW12193] Load flash access code to RAM on job start

<b>Initiator:</b>	DC
<b>Date:</b>	25.05.2005
<b>Short Description:</b>	Load flash access code to RAM on job start
<b>Type:</b>	Changed
<b>Importance:</b>	High
<b>Description:</b>	<p>The flash driver shall load the code that accesses the flash hardware (internal erase / write routines) to RAM whenever an erase or write job is started.</p> <p>This feature shall be statically configurable on/off (pre-compile configuration).</p>
<b>Rationale:</b>	During an erase / write operation on a flash bank, read access to this bank (and therefore execution of code located in this bank) is not possible.
<b>Use Case:</b>	The flash bank containing the flash access routines is also the bank currently addressed for an erase / write operation.
<b>Dependencies:</b>	--
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	This is only necessary if the erase / write routines are located in the same bank that shall be erased or reprogrammed.

#### 4.1.2.2.17 [BSW12194] Execute flash access code from RAM

<b>Initiator:</b>	DC
<b>Date:</b>	25.05.2005
<b>Short Description:</b>	Execute flash access code from RAM
<b>Type:</b>	Changed (after discussion in 26 <sup>th</sup> SPAL meeting)
<b>Importance:</b>	High
<b>Description:</b>	<p>The flash driver shall execute the code that accesses the flash hardware (internal erase / write routines) from RAM. This requirement is only applicable if the flash access code has been loaded to RAM.</p> <p>The flash driver has to ensure, that this code execution is not interrupted. Therefore the runtime of this routine shall be kept as short as possible.</p>
<b>Rationale:</b>	During an erase / write operation on a flash bank, read access to this bank (and therefore execution of code located in this bank) is not possible.
<b>Use Case:</b>	The flash bank containing the flash driver code is also the bank currently addressed for an erase / write operation.
<b>Dependencies:</b>	Code execution from RAM must be possible on the target platform. <a href="#">[BSW12193]</a> Load flash access code to RAM on job start
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--

#### 4.1.2.2.18 [BSW13300] Remove flash access code from RAM

<b>Initiator:</b>	DC
<b>Date:</b>	25.05.2005
<b>Short Description:</b>	Remove flash access code from RAM
<b>Type:</b>	Changed
<b>Importance:</b>	High
<b>Description:</b>	<p>The flash driver shall remove the code that accesses the flash hardware (internal erase / write routines) from RAM after the current erase or write job has been finished or canceled.</p> <p>Removing the flash access code from RAM is only necessary if the flash driver has loaded that code to RAM during start of an erase / write job. If the FAC has been loaded to RAM during initialization the flash driver shall not remove the code from RAM.</p> <p>This feature shall be statically configurable on/off (pre-compile configuration).</p>
<b>Rationale:</b>	The flash access code shall be removed from RAM to avoid possibly harmful operations (flash erase / write) outside of the flash driver's operation.
<b>Use Case:</b>	The flash access code for erasing the flash memory is loaded at the beginning of an erase job and unloaded after the erase job has finished to prevent further (unwanted) erasure of flash memory.
<b>Dependencies:</b>	[BSW12193] Load flash access code to RAM on job start
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--

### 4.1.3 Non-functional requirements

#### 4.1.3.1 [BSW12145] Flash driver job processing execution time

<b>Initiator:</b>	DC
<b>Date:</b>	14.06.2004
<b>Short Description:</b>	Flash driver job processing execution time
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	The job processing function of the flash driver shall process only as much data as the flash hardware can handle in one step (particularly write operation) or as much as a defined user limit (particularly read operation).
<b>Rationale:</b>	Minimize processor load, reduce blocking times.
<b>Use Case:</b>	E.g. the job processing function performs the writing of one byte and the reading of max. 8 bytes during one call.
<b>Dependencies:</b>	--
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--

#### 4.1.3.2 [BSW12083] Use HIS specification as basis

<b>Initiator:</b>	CAS
<b>Date:</b>	27.05.2004
<b>Short Description:</b>	Use HIS specification as basis
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	Use HIS specification as basis for specifying the Flash driver
<b>Rationale:</b>	Reuse of specification
<b>Use Case:</b>	--
<b>Dependencies:</b>	--
<b>Conflicts:</b>	Different interface because of different use case (application vs. flash loader) and supply mode (source code vs. binary), same (comparable) functionality.
<b>Supporting Material:</b>	--

## 4.2 External Flash Driver

### 4.2.1 Functional Overview

The external Flash driver provides services for initialization and reading, writing, erasing the internal Flash memory. It has the same functional scope as an internal flash driver.

### 4.2.2 Functional Requirements

#### 4.2.2.1 General

##### 4.2.2.1.1 [BSW12147] Functional scope

<b>Initiator:</b>	DC
<b>Date:</b>	14.06.2004
<b>Short Description:</b>	Functional scope
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	For an external flash driver the same requirements shall apply like for an internal flash driver.
<b>Rationale:</b>	Make no functional differences between internal and external flash memory. Keep the functional scope the same.
<b>Use Case:</b>	The STAR12 has internal flash memory. Other microcontrollers are using only external flash memory. On both types of microcontrollers the same NVRAM Manager shall be used.
<b>Dependencies:</b>	Requirements on internal flash driver
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--

#### 4.2.2.2 Configuration

##### 4.2.2.2.1 [BSW12182] External flash driver static configuration

<b>Initiator:</b>	WP4.2.2.1.12
<b>Date:</b>	20.07.2004
<b>Short Description:</b>	External flash driver static configuration
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	In addition to the basic configuration parameters the external flash driver shall allow the static configuration of the following parameters: <ul style="list-style-type: none"> <li>1. Expected hardware flash ID</li> <li>2. Maximum read access blocking time ("suspend time")</li> </ul>
<b>Rationale:</b>	Basic configuration
<b>Use Case:</b>	→ 1: <a href="#">[BSW12107]</a> Check Flash type → 2: <a href="#">[BSW12184]</a> Limit read access blocking times
<b>Dependencies:</b>	--
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--

### 4.2.2.3 Fault operation

#### 4.2.2.3.1 [BSW12107] Check Flash type

<b>Initiator:</b>	WP4.2.2.1.12
<b>Date:</b>	07.07.2004
<b>Short Description:</b>	Check Flash type
<b>Type:</b>	Changed (reformulated CAS requirement)
<b>Importance:</b>	High
<b>Description:</b>	The external flash driver shall check within it's initialization function if the configured flash type matches with the hardware flash ID. A detected mismatch shall be reported to the Error Manager.  This check is only to be provided if the flash hardware provides a flash ID.
<b>Rationale:</b>	Avoid use of wrong configuration for programming
<b>Use Case:</b>	--
<b>Dependencies:</b>	Expected flash type: see <a href="#">[BSW12182]</a> External flash driver static configuration
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	Requirements Specification CAS LLD – Configuration Tool: RS_LLD_CONFIG/ 7.11

### 4.2.3 Non-Functional Requirements (Qualities)

#### 4.2.3.1 [BSW12184] Limit read access blocking times

<b>Initiator:</b>	Bosch
<b>Date:</b>	20.07.2004
<b>Short Description:</b>	Limit read access blocking times
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	The flash driver shall limit the read access blocking times to the configured time (Maximum read access blocking time).
<b>Rationale:</b>	Avoid blocking the scheduling and the interrupts of the whole system.
<b>Use Case:</b>	Bosch EDC16: blocking time shall be maximum 40µs.
<b>Dependencies:</b>	<a href="#">[BSW12194]</a> Execute flash access code from RAM <a href="#">[BSW12182]</a> External flash driver static configuration
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--

#### 4.2.3.2 [BSW12148] Common Flash API

<b>Initiator:</b>	DC
<b>Date:</b>	14.06.2004
<b>Short Description:</b>	Common Flash API
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	The external flash driver shall have a semantically identical API as an internal flash driver.
<b>Rationale:</b>	Ease Memory Abstraction. Keep handling of internal and external flash memory similar.
<b>Use Case:</b>	One ECU uses the STAR12 with internal flash memory. Another ECU uses a controller with only external flash memory. On both microcontrollers the same upper layer (NVRAM Manager, Flash/EEPROM emulation) shall be used.
<b>Dependencies:</b>	Requirements on internal flash driver.
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--

#### 4.2.3.3 [BSW12149] Microcontroller independency

<b>Initiator:</b>	DC
<b>Date:</b>	14.06.2004
<b>Short Description:</b>	Microcontroller independency
<b>Type:</b>	New
<b>Importance:</b>	High
<b>Description:</b>	The source code of the external flash driver shall be independent from the underlying microcontroller.
<b>Rationale:</b>	Reuse of external flash driver across multiple microcontrollers
<b>Use Case:</b>	The same external flash driver for a flash device can be used on a NEC V850 and on a MPC563 without any modification.
<b>Dependencies:</b>	--
<b>Conflicts:</b>	--
<b>Supporting Material:</b>	--

## 5 References

### 5.1 Deliverables of AUTOSAR

- [1] List of Basic Software Modules  
AUTOSAR\_BasicSoftwareModules.pdf
- [2] Layered Software Architecture  
AUTOSAR\_LayeredSoftwareArchitecture.pdf
- [3] General Requirements on Basic Software Modules  
AUTOSAR\_SRS\_General.pdf
- [4] General Requirements on SPAL  
AUTOSAR\_SRS\_SPAL\_General.pdf

### 5.2 Related standards and norms

- [5] HIS Flash Driver Specification  
[www.automotive-his.de/results/flash\\_programming/  
HIS\\_FlashDriver\\_v130.pdf](http://www.automotive-his.de/results/flash_programming/HIS_FlashDriver_v130.pdf)