Document Title	Requirements on OCU Driver
Document Category	Requirement specification (RS)
Document UID	614
Document Status	published
Part of AUTOSAR Standard	Classic Platform
Part of Standard Release	R26-11

Document Change History

Date	Release	Changed by	Description
2026-11-26	R26-11	AUTOSAR Release Management	• No content changes
2025-11-27	R25-11	AUTOSAR Release Management	• Editorial changes
2024-11-27	R24-11	AUTOSAR Release Management	• Editorial changes
2023-11-23	R23-11	AUTOSAR Release Management	• Editorial changes
2022-11-24	R22-11	AUTOSAR Release Management	• No content changes
2021-11-25	R21-11	AUTOSAR Release Management	• No content changes
2020-11-30	R20-11	AUTOSAR Release Management	• No content changes
2019-11-28	R19-11	AUTOSAR Release Management	• No content changes • Changed Document Status from Final to published
2018-10-31	4.4.0	AUTOSAR Release Management	• Editorial changes
2017-12-08	4.3.1	AUTOSAR Release Management	• Editorial changes

△

2016-11-30	4.3.0	AUTOSAR Release Management	• Add section 3 Requirements Tracing
2015-07-31	4.2.2	AUTOSAR Release Management	• Editorial changes
2014-10-31	4.2.1	AUTOSAR Release Management	• Editorial changes
2013-10-31	4.1.2	AUTOSAR Release Management	• Editorial changes
2013-03-15	4.1.1	AUTOSAR Release Management	• Initial Release

Disclaimer

This work (specification and/or software implementation) and the material contained in it, as released by AUTOSAR, is for the purpose of information only. AUTOSAR and the companies that have contributed to it shall not be liable for any use of the work.

The material contained in this work is protected by copyright and other types of intellectual property rights. The commercial exploitation of the material contained in this work requires a license to such intellectual property rights.

This work may be utilized or reproduced without any modification, in any form or by any means, for informational purposes only. For any other purpose, no part of the work may be utilized or reproduced, in any form or by any means, without permission in writing from the publisher.

The work has been developed for automotive applications only. It has neither been developed, nor tested for non-automotive applications.

The word AUTOSAR and the AUTOSAR logo are registered trademarks.

Table of Contents

1 Scope of Document 5

2 How to read this document 6
2.1 Document Conventions . . . 6
2.2 Requirements Guidelines . . . 7

3 Acronyms and abbreviations 8

4 Requirements Specification 9
4.1 Functional Overview . . . 9
4.2 Functional Requirements . . . 10
4.2.1 Configuration . . . 10
4.2.2 Initialization . . . 11
4.2.3 Normal Operation . . . 11
4.2.4 Shutdown Operation . . . 14
4.3 Non-Functional Requirements (Qualities) . . . 14

5 References 15

A Change history of AUTOSAR traceable items 16
A.1 Traceable item history of this document according to AUTOSAR Release R65-11 . . . 16
A.1.1 Added Requirements in R26-11 . . . 16
A.1.2 Changed Requirements in R26-11 . . . 16
A.1.3 Deleted Requirements in R26-11 . . . 16
A.2 Traceable item history of this document according to AUTOSAR Release R25-11 . . . 16
A.2.1 Added Requirements in R25-11 . . . 16
A.2.2 Changed Requirements in R25-11 . . . 16
A.2.3 Deleted Requirements in R25-11 . . . 16
A.3 Traceable item history of this document according to AUTOSAR Release R24-11 . . . 16
A.3.1 Added Requirements in R24-11 . . . 16
A.3.2 Changed Requirements in R24-11 . . . 17
A.3.3 Deleted Requirements in R24-11 . . . 17
A.4 Traceable item history of this document according to AUTOSAR Release R23-11 . . . 17
A.4.1 Added Requirements in R23-11 . . . 17
A.4.2 Changed Requirements in R23-11 . . . 17
A.4.3 Deleted Requirements in R23-11 . . . 17

1 Scope of Document

This document specifies requirements on the Output Compare Unit Driver.

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 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].

- The representation of requirements in AUTOSAR documents follows the table specified in [6].
- In requirements, the following specific semantics are used

The key words “MUST”, “MUST NOT”, “REQUIRED”, “SHALL”, “SHALL NOT”, “SHOULD”, “SHOULD NOT”, “RECOMMENDED”, “MAY”, and “OPTIONAL” in this document are to be interpreted as follows.

Note that the requirement level of the document in which they are used modifies the force of these words.

- MUST: This word, or the adjective “LEGALLY REQUIRED”, means that the definition is an absolute requirement of the specification due to legal issues.
- MUST NOT: This phrase, or the phrase “MUST NOT”, means that the definition is an absolute prohibition of the specification due to legal issues.
- SHALL: This phrase, or the adjective “REQUIRED”, means that the definition is an absolute requirement of the specification.
- SHALL NOT: This phrase means that the definition is an absolute prohibition of the specification.
- SHOULD: This word, or the adjective “RECOMMENDED”, means 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”, means 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, SHALL 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, SHALL 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 Guidelines

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)
- Initialization
- 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

The glossary below includes acronyms and abbreviations relevant to OCU Driver that are not included in the AUTOSAR Glossary [2]. Acronyms and abbreviations that have a local scope are not contained in the AUTOSAR glossary. These must appear in a local glossary.

Acronym	Description
OCU	Output Compare Unit
OCU channel	Represents a logical entity composed of a free running counter a comparison threshold and the action that is done as a result of the comparison process.
Compare threshold.	Target value that is compared with the content of the counter each time the counter increases by one unit.
Free running counter	A counter that runs from a minimum to a maximum value and restarts automatically to the minimum after reaching the maximum value.
DMA	Direct memory access
SPAL	Standard Peripheral Abstraction Layer

Abbreviation	Description
STD	Standard
UNINIT	Uninitialized (= not initialized)

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

4 Requirements Specification

This chapter describes all requirements driving the work to define the OCU Driver.

4.1 Functional Overview

The driver provides a means to compare two values and act automatically upon compare match, allowing therefore speeding up software processes.

This specification specifies the functionality, API and the configuration of the AUTOSAR Basic Software module Output Compare driver (OCU).

Each OCU channel is linked to hardware OCU which belongs to the microcontroller.

The driver provides services for initialization and control of the microcontroller internal OCU peripheral. The OCU module can generate HW signals to drive external devices.

The picture below shows the typical representation of an OCU channel.

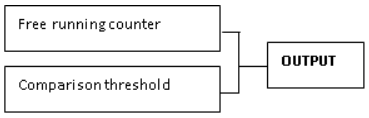


Figure 4.1: Output Compare Channel

The 'output' is the action that is actually done upon compare match. A software action and/or a hardware action can be performed according to the configuration.

4.2 Functional Requirements

4.2.1 Configuration

[SRS_Ocu_00002] The OCU driver shall support the following basic static configurations per channel ⌈

Description:	The OCU driver shall support the following basic static configurations per channel: Mandatory parameters • Symbolic name for channel / channel ID. • Maximum value of the counter • count resolution/frequency • Notification function(s) • Default value of the threshold • Assigned hardware channel. Optional parameters • Count direction • Output signal (internal signal or port pin, if provided by hardware). The default output level (value after reset) shall be available. – OCU_LOW/OCU_HIGH, • Hardware event(s) triggered by the channel (if supported by HW). – The hardware resource ID: (e.g OCU_ADC, OCU_DMA) – For each hardware resource the adequate number. e.g: ADC_chn1. • Optional clock settings if supported by hardware. In addition, the OCU driver shall allow the configuration OCU-peripheral specific settings if supported by hardware.
Rationale:	To allow different usage for each channel
Dependencies:	–

⌋

4.2.2 Initialization

[SRS_Ocu_00004] After initialization of the OCU driver, all notifications shall be disabled ⌈

Description:	After initialization of the OCU driver, all notifications shall be disabled. All channels shall be stopped. (No counting running). In case a channel has an associated output pin, this pin shall be set to the default value defined in the configuration of the channel.
Rationale:	To prevent unwanted events after initialization.
Use Case:	–
Dependencies:	–
Supporting Material:	–

⌋

[SRS_Ocu_00005] The OCU Driver shall provide the functionality to de-initialize OCU driver ⌈

Description:	The OCU Driver shall provide the functionality to de-initialize OCU driver.
Rationale:	It is necessary to reset the driver specific resources (SFRs, variables ...) before a valid initialization can be done.
Use Case:	De-initialization is needed before re-initialization with a valid configuration (post-build) during ECU runtime.
Dependencies:	–
Supporting Material:	–

⌋

4.2.3 Normal Operation

[SRS_Ocu_00006] The OCU driver shall provide a notification for an OCU channel when the current value of the counter matches the threshold ⌈

Description:	The OCU driver shall provide a notification for an OCU channel when the current value of the counter matches the threshold. The notification should be triggered under the following conditions: • The notification function configured as non null pointer • and only if notifications are enabled
Rationale:	Upon comparison matches on a channel, an action must be performed. The module that will perform the action needs to be informed.
Use Case:	Upper layers perform actions synchronized to a reference, which is represented by the current value of the threshold

▽

△

Dependencies:	–

⌋

[SRS_Ocu_00007] The OCU driver shall allow enabling /disabling notifications for an OCU channel during runtime ⌈

Description:	The OCU driver shall allow enabling /disabling notifications for an OCU channel during runtime. The following options shall be available for each selected channel: • disable notification • enable notification on compare match (current value of the counter equals threshold value)
Rationale:	Prevents from invoking unwanted notifications (interrupts) and allows selecting the exact point in the execution flow of the software when the first or next notification may arise.
Use Case:	When the channel counter matches the defined threshold, the upper layer is informed to perform a task and can change the current value of the threshold
Dependencies:	–

⌋

[SRS_Ocu_00008] The OCU driver shall provide services for starting and stopping a channel ⌈

Description:	The OCU driver shall provide services for starting and stopping a channel. Stopping the channel means no more actions shall be triggered. Starting a channel means allowing the configured actions to be performed.
Rationale:	Allow for software to control operations individually on each channel.
Use Case:	An H-bridge is connected to the pin of a channel. The pin must start driving the bridge only when this one is ready to operate.
Dependencies:	–

⌋

[SRS_Ocu_00009] The OCU driver shall provide a synchronous service for reading the value of the counter ⌈

Description:	The OCU driver shall provide a synchronous service for reading the value of the counter.
Rationale:	The counter value of a channel corresponds to physical information (time, pressure, angular position...) which is used by the upper layer for various purposes.
Use Case:	The upper layer reads the current value of the counter and computes the corresponding physical value.
Dependencies:	–

⌋

[SRS_Ocu_00010] The OCU driver shall provide services to modify the value of the threshold of a channel ⌈

Description:	The OCU driver shall provide services to modify the value of the threshold of a channel. This service shall allow to write for the threshold: • an absolute value • or a relative value: with respect to the current counter value • or a relative value: with respect to the current threshold value. Relative value setting needs hardware support.
Rationale:	Provide the upper layer with a means to change dynamically the comparison threshold of a channel to adapt to the running software.
Use Case:	Update the next comparison threshold with a relative value when the counter rolls over.
Dependencies:	–
Supporting Material:	–

⌋

[SRS_Ocu_00011] The OCU driver shall provide a synchronous service to set the state of the output pin attached to a channel ⌈

Description:	The OCU driver shall provide a synchronous service to set the state of the output pin attached to a channel. This service shall take as a
Rationale:	According to different phases of a system (SHUTDOWN, IDLE...) the output pin must have a known state (LOW or HIGH)
Use Case:	Initialize the pin associated to a channel to the relevant level.
Dependencies:	–

⌋

[SRS_Ocu_00012] The OCU driver shall provide a service to set the action that will be performed by the pin attached to a channel upon comparison match ⌈

Description:	The OCU driver shall provide a service to preset the action that will be performed by the pin attached to a channel upon compare match if supported by HW. This service shall take as parameters: • OCU channel • Pin action upon comparison (if supported by HW). Possible values of the pin action shall be OCU_HIGH, OCU_LOW, OCU_TOGGLE, OCU_DISABLE.
Rationale:	The output pin of a channel must behave in accordance with the system needs.
Use Case:	Generate pulses at the output pin of a channel.
Dependencies:	–

▽

△

Supporting Material:	–

⌋

[SRS_Ocu_00013] The OCU Driver shall allow configuring the same counter base and timing to be used by several channels ⌈

Description:	The OCU Driver shall allow configuring the same counter base and timing to be used by several channels, if this functionality is supported by hardware. This will allow using several channels in a group. The configuration shall provide the following parameters • OCU channels to group
Rationale:	Allow synchronizing different actions which have the same reference.
Use Case:	Drive synchronously a pair of switches that are part of an H-bridge.
Dependencies:	–
Supporting Material:	–

⌋

[SRS_Ocu_00014] All units used within the API services of the OCU driver shall be of unit ticks ⌈

Description:	All units used within the API services of the OCU driver shall be of unit ticks.
Rationale:	Conversions between the physical units (of the threshold and counter) and ticks shall be part of the ECU Abstraction Layer.
Use Case:	–
Dependencies:	–

⌋

4.2.4 Shutdown Operation

None.

4.3 Non-Functional Requirements (Qualities)

There is no non-functional requirement for the OCU Driver.

5 References

[1] Standardization Template
AUTOSAR_FO_TPS_StandardizationTemplate

[2] Glossary
AUTOSAR_FO_TR_Glossary

A Change history of AUTOSAR traceable items

A.1 Traceable item history of this document according to AUTOSAR Release R65-11

A.1.1 Added Requirements in R26-11

none

A.1.2 Changed Requirements in R26-11

none

A.1.3 Deleted Requirements in R26-11

none

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

A.2.1 Added Requirements in R25-11

none

A.2.2 Changed Requirements in R25-11

none

A.2.3 Deleted Requirements in R25-11

none

A.3 Traceable item history of this document according to AUTOSAR Release R24-11

A.3.1 Added Requirements in R24-11

none

A.3.2 Changed Requirements in R24-11

none

A.3.3 Deleted Requirements in R24-11

none

A.4 Traceable item history of this document according to AUTOSAR Release R23-11

A.4.1 Added Requirements in R23-11

none

A.4.2 Changed Requirements in R23-11

none

A.4.3 Deleted Requirements in R23-11

none