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| 2018-10-31 | |  | | Initial Release | | | | | | | | | | | | | | | |  |  |
|  | |  | |  | | | | | | | | | | | | | | | |  |  | **Prepared/Approved by:**  Oemer Uerek (OUEREK) | | | | | |
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| **STANDARD NOTES:**  **FOR CURRENT RELEASE STATUS, SEE THE WERS ENGINEERING NOTICE.**  **CONTROL ITEM – THE ALSO IDENTIFIES CRITICAL CHARACTERISTICS DESIGNATED BY THE**  **CROSS FUNCTIONAL TEAMS DEVELOPING THE PRODUCT. THESE, AND ADDITIONAL CRITICAL**  **CHARACTERISTICS IDENTIFIED BY PROCESS REVIEWS, MUST APPEAR ON THE CONTROL PLANS**  **ACCORDING TO ISO/TS 16949. THESE CONTROL PLANS REQUIRE PRODUCT ENGINEERING APPROVAL.** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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# Introduction

## Purpose

The Feature Document (FD) document specifies **what** a feature (or feature group) provided by a Ford vehicle shall do and answers basic questions such as:

* What should the Feature function do (customer perspective)?
* How does the system communicate with the customer?
* How does the system co-operate with other vehicle features / systems?
* Under which conditions the feature shall work.

It should also provide reasoning **why** to have the feature.

To get more information about the concept this template is based on look [at the Requirements Engineering@EESE wiki pages](http://wiki.ford.com/display/RequirementsEngineering/How+to+write+a+Feature++Document?src=contextnavpagetreemode)

## Scope

The following set of features from the [Global Feature & Function List](https://www.vsemweb.ford.com:443/tc/launchapp?-attach=true&-s=226TCSession&-o=ZmZNi0JHx3NrTDAAAAAAAAAAAAA) is described in this FD.

| **Feature ID** | **Feature Name** | **Owner** | **Reference** |
| --- | --- | --- | --- |
| F000030 | Autolamps | Oemer Uerek (OUEREK) | [VSEM Feature Dictionary Link](https://www.vsemweb.ford.com:443/tc/launchapp?-attach=true&-s=226TCSession&-o=VISNkM_Xx3NrTDAAAAAAAAAAAAA) |

Table 1: Features described in this FD

## Audience

The FD is written by the feature owner of a feature. All Stakeholders, i.e., all people who have a valid interest in the feature should read and, if possible, review the FD. It needs to be guaranteed, that all stake holders have access to the currently valid version of the FD.

The following table lists all stakeholders, who should be involved in the creation and maintenance of this FD. Refer to the [Roles & Responsibilities page](http://wiki.ford.com/display/RequirementsEngineering/Roles+in+RE?src=contextnavpagetreemode) in the in the [Ford RE Wiki](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Engineering+@+Ford) for a list of common Ford roles and responsibilities.

### Stakeholder List

A stakeholder list will be added to this document in the future.

## Document Organization

### Document Context

Refer to the [Specification Structure page](http://wiki.ford.com/pages/editpage.action?pageId=104990081) in the [Ford RE Wiki](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Engineering+@+Ford) to understand how the FD relates to other Ford Requirements Documents and Specifications.

### Document Structure

The structure of this document is explained below:

**Section 1** – Introduction how to use this document including responsibilities and requisite documents. Explains the terminology. Gives a clarification of the definitions, concepts and abbreviations used in the document.

**Section 2** – Feature Description. States briefly the background and the purpose of the feature.

**Section 3** – Feature Context, which defines the boundaries of the feature.

**Section 4** – Feature Modeling. Contains optional subchapters for Scenarios, Use cases and state charts describing the functional behavior of the feature.

**Section 5** – Feature Requirements. Lists functional and non-functional requirements of the feature.

**Section 6** – Functional Decomposition. List of function (blocks) the feature will be decomposed into

**Section 7** – List with open topics and known issues

**Section 8** – Revision history including a list of new or modified requirements. The requirements in this document are tagged, and this section contains different types of tables listing all, new, or changed requirements by their title and page no.

## References

### Ford documents

List here all Ford internal documents, which are directly related to the feature.

| **Reference** | **Doc. ID** | **Title** | **Revision** |
| --- | --- | --- | --- |
|  | ESJU5T-17D547-BA | ES Windscreen Transmissivity Compensation | V1.1 |
|  |  |  |  |

### External documents and publications

The list of external documents should include e.g. relevant standards.

| **Reference** | **Doc. ID** | **Title** | **Revision** |
| --- | --- | --- | --- |
|  |  |  |  |
|  |  |  |  |

## Terminology

*<Terms, concepts and abbreviations used in the document can be defined and illustrated here. Note that changes to terms and/or concepts described in this section tend to cause major updates to this document.>*

### Definitions

*<The tables below have feature specific definitions and abbreviations. For additional, non-feature specific terms please refer to the* [*RE Glossary*](http://wiki.ford.com/display/RequirementsEngineering/Glossary?src=contextnavpagetreemode)*>*

| Definition | Description |
| --- | --- |
| Underpass | Underpasses are all kinds of routes which run throughout or under objects. They are always covered above. Alleys are no underpasses. |
| Long Underpass | Underpass with a length of >35m to drive through |
| Tunnel | Same as “Long Underpass” |
| Short Underpass | Underpass with a length of >0m and <=35m |
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Table 2: Definitions used in this document

### Abbreviations

| Abbr. | Stands for | Description |
| --- | --- | --- |
| FD | Feature Document | The document describing, collecting and developing the functional behavior of a system in a vehicle. |
| RLS | Rain Light Sensor | A windscreen mounted rain and exterior light sensing device with two separate light sensing diodes |
| RSM | Rain Sensor Module | Ford internal module name, function same as RLS |
| RDS | Radio Data System | Distribution of information via radio broadcast |
| IPC | Instrument Panel Cluster | The cluster provides several information like vehicle speed but also vehicle status information, error messages etc. |
| ASO | Automotive Safety Office | Part of the Ford Environmental and Safety Engineering Staff |

Table 3: Abbreviations used in this document

### Notation

#### Requirements Templates

Each requirement (including goals and use cases) in the document shall start with the following headline which gives a unique ID and a Title, followed by a description of the requirement (see below).

The headline shall be formatted by using the header styles “Goal”, “Requirement” or “Use Case”. The requirement ID should be prefixed and suffixed with 3 hash characters. This will ease the import to VSEM (refer to ["How to import specifications into VSEM as separate requirements"](http://wiki.ford.com/display/RequirementsEngineering/How+to+import+specifications+into+VSEM+as+separate+requirements?src=contextnavpagetreemode)) and enables indexing.

###<Goal ID>### <Title>

<Description>

###<Req ID>### <Title>

<Description>

The guideline “[How to write better requirements](http://wiki.ford.com/display/RequirementsEngineering/How+to+write+better+requirements?src=contextnavpagetreemode)” shows how to structure the textual description of a requirement.

###<UseCase ID>### <Title>

<Use Case Template>

For specifying Use Cases refer to the [Use Case template](http://wiki.ford.com/display/RequirementsEngineering/Use+Case+Template?src=contextnavpagetreemode) in the [Ford RE Wiki](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Engineering+@+Ford) This should replace the free-formatted textual description. Refer also to the [Use Case guideline](http://wiki.ford.com/display/RequirementsEngineering/How+to+write+Use+Cases?src=contextnavpagetreemode) in the [Ford RE Wiki](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Engineering+@+Ford)>

#### Identification of requirements

The unique requirement ID given in the headline of any requirement follows the requirement throughout the development process. The requirement ID format follows a well-defined syntax.

All identifiers in a FRD shall be composed of 5 parts:

* A leading letter F (= Feature).
* Followed by an abbreviation of the feature
* Followed by a letter indicating the category of requirement (whether it is a Goal (=G), a Use Case (=U) or a Requirement (=R))
* Ending with the actual requirement number
* Ending with a requirement version number and a requirement revision letter.

*Example:*

*F\_PCL\_R0004\_V1A* This is the fourth requirement on feature level for the feature Power Child Lock. It is the first version and revision of the requirement.

#### Requirements Attributes

Additionally attributes can be added to each requirement. This helps to classify requirements. A [list of available attributes](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes?src=contextnavpagetreemode) is given in the RE Wiki.

The following template allows documentation of the attributes per requirement.

###<Legacy ID>\_Attr###

|  |  |
| --- | --- |
| **Rationale** | |
|  | |
| **Acceptance Criteria** | **Verification Method)** |
|  |  |
| **Notes** | |
|  | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Type** | |  | | **Source** |  |
| **Priority** | |  | | **Owner** |  |
| **Stability** | |  | | **ASIL Level** |  |
| **Change Log** | | | | | |
| **Version** | **Date** | **Author** | **Change** | | |
| 1 |  |  | Initial version | | |

# FEATURE DESCRIPTION

## Feature Overview

The Autolamps feature controls the vehicle headlamps by switching the headlamps on or off automatically based on ambient light and weather conditions. This ensures adequate exterior lighting to increase vision, visibility and safety.

Autolamps is a convenience feature. In some market regions Autolamps is required by legal requirements.

## Feature Variants

There are two feature variants of Autolamps. It depends on the market region which Autolamps variant is offered. See chapter tbd.

### Basic Autolamps

Basic Autolamps switches the vehicle headlamps on or off automatically depending on the ambient light level and weather conditions.

If the ambient light conditions are below a defined threshold for a specified time, the feature switches the headlamps on. If the ambient light conditions exceed a defined threshold for a specified time, the feature switches the headlamps off.

If the windshield wipers operate for a certain time with a certain rate, the feature switches the headlamps on regardless of the ambient light conditions. This ensures visibility in adverse weather conditions.

If the windshield wipers are inactive for a certain time or active below a certain frequency, the feature switches headlamps off if the Autolamps feature doesn’t request headlamps activation due to low ambient light conditions.

### Advanced Autolamps

In addition to the Basic Autolamps functionality, “Advanced Autolamps” provides extended capabilities to detect or predict underpasses and distinguish between short and long underpasses (see chapter 4.1).

By its predictive capabilities Advanced Autolamps is able to either suppress unnecessary activation of headlamps or trigger an immediate activation of headlamps when a tunnel is detected. This behaviour shall ensure a quick reaction time as well as a robust switching behaviour avoiding any flickering or frequent, unintended light switching.

## Constraints

The Autolamps feature must comply with all global regulations, affecting the control of the headlamps, such as:

* ECE R48 S06 (Europe)
* GB4785 (China)

These regulations today contain performance requirements for switching headlamps on and off, based on outside ambient light level and timing.

Other input sources such as date, location etc. are not prohibited.

Further legal requirements can be expected for the future. The Ford experts (e.g. ASO) need to be contacted for the latest revision of applicable regulations.

## Assumptions & Dependencies

### Feature Limitations

#### Windscreen Transmissivity Compensation

Sensors detecting the outside exterior light level are typically located in the interior of the vehicle. The measured ambient light level will be lower than the real value due to the impact of the windscreen transmissivity.

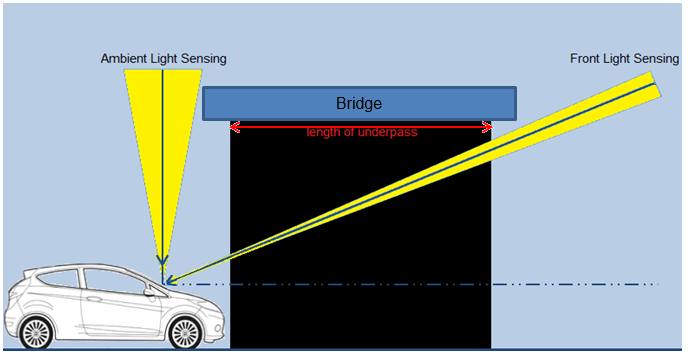
Windscreen transmissivities vary between different vehicle programs and windscreen variants which can cause different Autolamps behaviors. The windscreen influence is mainly caused by thickness, color and by orientation/angle. To reduce the windscreen influence to a minimum, the windscreen transmissivity must be compensated.

See chapter 1.5 for related requirements and documents.

#### Prediction of Short and Long Underpasses

The predictive capability of Advanced Autolamps depends on the technology being used. Typically, a windscreen mounted light sensing device is used. Its capabilities for distinction between short and long underpasses are technically limited, such the prediction of the underpass length depends on many external factors that are not detected by the typically used windscreen mounted light sensing devices.

Currently available of the art technologies allow a robust detection up to about 40m. From user perspective, this range is sufficient. With that range a suppression of headlamps activation is possible for underpasses with a length of around 40m. For longer underpasses a prediction is not required, as the activation of headlamps meets customer expectation today.



Bridge

Figure 1: Working principle of a Rain Light Sensor based Autolamps feature

Figure 1 illustrates an example of a technical solution for Advanced Autolamps using a windscreen mounted Light Sensor. This device measures the ambient light brightness from two directions. See chapter 2.4.2 “Prospects” for alternative solutions.

From a customer’s point of view Advanced Autolamps can behave differently for the same underpass when passing it at varying ambient light conditions. In some cases, headlamps might be switched on and in other cases it might stay off. Potential influences are:

* Twilight condition reduces the detection of ambient light at the end of an underpass
* The lateral angle the vehicle enters the underpass (e.g. underpass behind a curve)
* The tilt angle the vehicle enters the underpass (e.g. ramp or hill)

#### Very bright underpasses

Autolamps controls headlamps based on the exterior light level. Some underpasses are very bright due to a high illumination or a glass roof. The ambient light level inside the underpass might be above the headlamps deactivation threshold. In such a case Autolamps would request headlamps to be switched off after a specified time.

### Prospects

Additional inputs for Advanced Autolamps can be:

* GPS location, date, time, weather conditions, vehicle dynamics, other light sensing devices
* Camera system (ambient light sensing and object classification)

The additional data can either be gained by the own vehicle´s devices or received from other connected vehicles or from infrastructure. The camera based system could be used to detect scenarios e.g. driving through an alley, approaching a short or long underpass to control headlamps appropriate to the situation.

A further enhancement could be a self-learning Smart Auto-lamps feature which would use conventional inputs along with smart information gathered from ambient light and driving situations which have been experienced earlier. This would control headlamps in a smart way by predicting expected ambient light changes which may require e.g. switching headlamps on quicker or delaying their deactivation.

An example would be a multiple tunnel sequence where Smart Auto-lamps would request headlamps to turn on at or before entry of the first tunnel and then trigger headlamp deactivation when exiting occurs after the last tunnel. This would avoid a multiple switching of headlamps in between multiple tunnels close to each other.

## Safety Goals

Autolamps is designed as a convenience feature. The driver must be able to override Autolamps at any time via a control that can be operated easily and immediately, without the use of menus.

# FEATURE CONTEXT

## Feature Context Diagram

Driver

Power Mode

Ambient Light Level

Wiper Status (as rain indicator)

Host Vehicle

Wiping

Ambient Light Conditions

* Power Mode
* Vehicle Speed (currently not needed)

## External Influences

| **Influence** | **Direction** | **Range** | **Description** |
| --- | --- | --- | --- |
| Power Mode | Input | OFF, ACC, RUN | Power mode of host vehicle |
| Autolamps Selection | Input | OFF, AUTO | Enable / disable Autolamps feature |
| Wiper Status | Input | INT, LOW, HIGH | Indicator for rain status |
| Ambient Light Conditions | Input | 0 .. 100,000 lux | Ambient light level |
| Vehicle Speed | Input | 0 .. 255 | Speed in kph of host vehicle |

Table 4: External influences on Autolamps

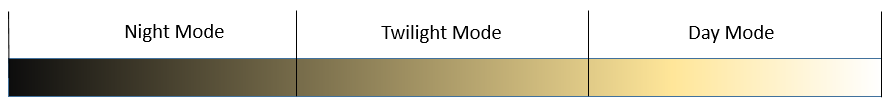
# FEATURE MODELING

## Scenarios

### Day Mode

In the Autolamps Day Mode the vehicle headlamps shall be off.

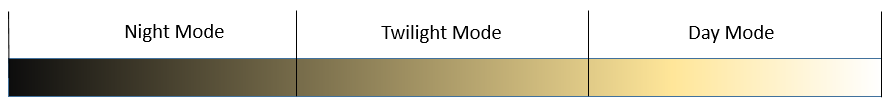
This mode shall be entered when the ambient light conditions exceed a defined threshold for a specified time.



### Night Mode

In the Autolamps Night Mode the vehicle headlamps shall be on.

This mode shall be entered when the ambient light conditions are below a defined threshold for a specified time.

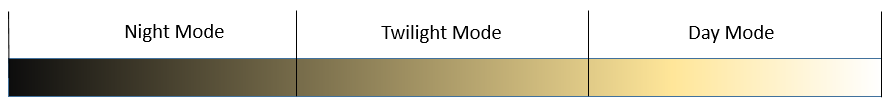


### Twilight Mode

Twilight Mode is between Day Mode and Night Mode and is used to build up a hysteresis. A hysteresis is required to avoid a frequent switching or even flickering of headlamps caused by minor ambient light level changes when the ambient light level is in between Day and Night Mode.

In the Autolamps Twilight Mode the headlamps shall be on or off based on the following criteria:

* After a transition from Day Mode to Twilight Mode, headlamps shall stay off
* After a transition from Night Mode to Twilight Mode, headlamps shall stay on
* If Twilight Mode is entered after leaving a tunnel where dipped was on, headlamps shall stay on
* If Twilight Mode is entered the first time after system power on (e.g. after an ignition cycle), headlamps shall be switched on



### Underpass Detection (Advanced Autolamps only)

See chapter 1.6.1 for the definition of “Underpass” within this document.

When entering an underpass at day conditions, Advanced Autolamps shall determine the length of the underpass and calculate the expected time to exit the underpass.

Depending on the underpass length and time to pass it may be necessary to either activate headlamps or to suppress the activation regardless of the ambient light level. This shall ensure vision for the driver and visibility for the vehicle on the one the hand, avoid unnecessary headlamps switching due to short-term ambient light level changes on the other hand.

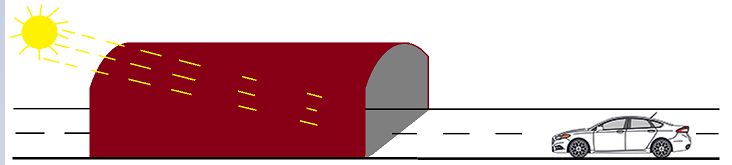
#### Long Underpass

Advanced Autolamps shall classify an underpass as a long underpass (tunnel) when its length is about 40m or more (e.g. bridge with 4-6 lanes crossing above).

Long underpasses (e.g. tunnels) always require the activation of headlamps when the ambient light level inside is below the specified light threshold to activate headlamps.

Advanced Autolamps shall switch headlamps on immediately (means: without additional delay), latest when the vehicle enters the tunnel.

Example:



Length >= 40m

Figure 2: Vehicle approaching a tunnel (Long Underpass)

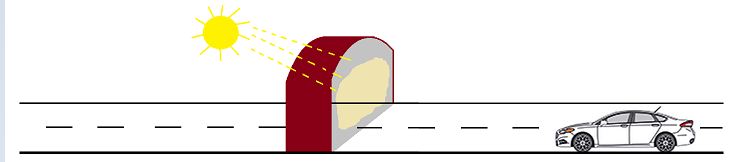
As long as the vehicle is in the tunnel, headlamps shall stay active.

When the vehicle leaves the tunnel, headlamps shall be switched off after a specified time when the ambient light level is above the threshold. If the ambient light level is below the specified, headlamps shall stay on.

#### Short Underpass

Advanced Autolamps shall classify an underpass as a short underpass (e.g. bridge), when its length is less than 40m (+10m / -0m tolerance).

Even if the ambient light thresholds fall down below the headlamps activation threshold while driving through the underpass, headlamps are requested to stay off to avoid a frequent activation and deactivation. The change of the ambient light level while driving through a short underpass shall be intepreted as a short-term ambient light level change.

Example:

Length <40 m

Figure 3: Vehicle approaching bridge (Short Underpass)

Short-term ambient light level changes can also occur while driving through alleys or during other scenarios with changing light conditions (e.g. caused by shadows). Those situations also require a robust Autolamps behaviour avoiding frequent switching of headlamps.

Note: The headlamps activation inhibit shall ensure Autolamps feature robustness still fulfilling legal requirements.

The requirement is intepreted for long-term ambient light level changes and not for short-term noises.

### Alley Situations

At conditions with rapidly changing light conditions (e.g. vehicle drives through an alley), Autolamps is expected to provide a robust behaviour by avoiding a frequent switching of headlamps.

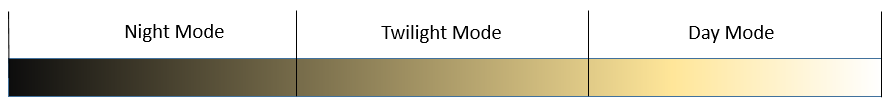
Short-term changes shall be filtered such that the headlamps stay on or off without being influenced by rapidly changing input signals.

### Ambient Light Level Variation

The measured ambient light level is continuously subject to variation due to factors like sun position, vehicle position, vehicle direction, cloudage, buildings, trees, etc.

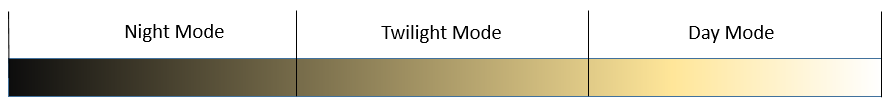
In Day and Night Modes the variation has usually no significant impact to Autolamps. In these modes the ambient light level stays at very low or high levels. A variation of the measured ambient light level can cause entering the hysteresis area (Twilight Mode) at most with still no visible impact to the customer. Headlamps stay at the previous status.

Example for variation occurring at Day Mode (headlamps stay off):



In Twilight Mode (typically due to dusk or dawn), variation is more critical as the measured light level is already within the hysteresis area.

While entering Twilight Mode from a previous Day or Night Mode doesn’t cause any switching of headlamps, the reverse order, entering Day or Night Mode from previous Twilight Mode can cause a headlamps status change depending on the previous headlamps status (see chapter 4.1.3 for reference).



The level of variation is higher when the vehicle is moving at dusk or dawn conditions (deep sun position) with changing light conditions (e.g. landscape with alternation of free fields, big building, trees etc.).

Autolamps is expected to be robust against those variations or noises. It shall be able to filter the measured ambient light level to detect:

* Whether the ambient light level is in a static condition (Day or Night Mode)
* Whether there is a trend for a continuously increasing or decreasing ambient light level indicating a dawn or dusk situation.
  + If Autolamps detects a dawn situation, headlamps shall be switched off when the ambient light level is above a defined threshold for a specified time. Any reactivation caused by variations or noises shall be filtered to avoid multiple activations/deactivations of headlamps.
  + If Autolamps detects a dusk situation, headlamps shall be switched on when the ambient light level is below a defined threshold for a specified time. Any deactivation caused by variations or noises shall be filtered to avoid multiple activations/deactivations of headlamps.

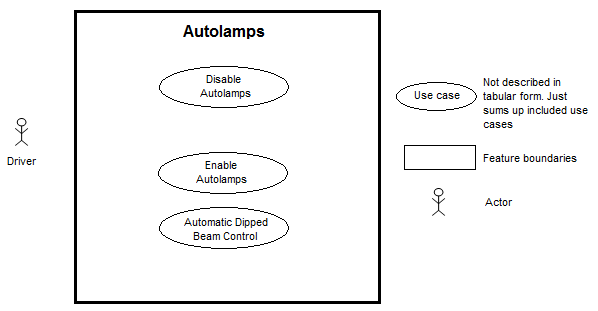
### Unknown Ambient Light Level

When the system is powered the first time, it may take some time until the ambient light information is available. To avoid an unintended activation and deactivation of headlamps, the headlamps shall stay off for a specified time until a valid ambient light information is available. Depending on the vehicle specification and configuration, Daytime Running Lamps may be switched on during that time.

If the ambient light level cannot be detected, headlamps shall be switched on (failsafe mode).

## Use Cases

### Use Case Diagram



### Actors

| Actor | Description |
| --- | --- |
| Driver | Driver of the vehicle |

Table 5: Feature Actors

### Use Case Specifications

###F\_AL\_U0001\_v1A### Generic Autolamps - Deactivation

|  |  |  |
| --- | --- | --- |
| **Actors** |  | Driver |
| **Description** |  | Driver disables Autolamps |
| **Pre-condition** |  | Autolamps is configured |
|  |  | Autolamps is enabled |
| **Post-condition** |  | Autolamps is disabled |
| **Main flow** | M1 | Driver disables Autolamps via the headlamp switch |
|  | M2 | System disables Autolamps and shows status on headlamp switch |

###F\_AL\_U0002\_v1A### Generic Autolamps - Activation

|  |  |  |
| --- | --- | --- |
| **Actors** |  | Driver |
| **Description** |  | Driver enables Autolamps |
| **Pre-condition** |  | Autolamps is configured |
|  |  | Autolamps is disabled |
| **Post-condition** |  | Autolamps is enabled |
| **Main flow** | M1 | Driver enables Autolamps via the headlamp switch or via switching ignition on (vehicles compliant to ECE R48 S06) |
|  | M2 | System enables Autolamps and shows status on the headlamp switch |
| **Exception flows** |  | Autolamps detects system failure |
|  |  | Autolamps switches headlamps on permanently while ignition is on |
|  |  | System indicates headlamps on status via telltale LED in IPC |

###F\_BAL\_U0001\_v1A### Basic Autolamps - Headlamps On

|  |  |  |
| --- | --- | --- |
| **Actors** |  | Driver |
| **Description** |  | While the driver uses the vehicle, the ambient light level falls below a defined threshold for a specified time (e.g. due to entering a dark tunnel, driving at dusk conditions) |
| **Pre-condition** |  | Vehicle is equipped with Basic Autolamps |
|  |  | Ignition is on |
|  |  | Autolamps enabled (see use case “Autolamps - Activation”) |
|  |  | Ambient light level is high (Day Mode) |
|  |  | Headlamps are off |
| **Post-condition** |  | Ambient light level is low (Night Mode) |
|  |  | Headlamps are on |
| **Main flow**  (Dusk) | M1 | Vehicle approaches an area with slowly decreasing ambient light level (e.g. at dusk) |
|  | M2 | Autolamps detects dusk condition. Ambient light level decreases below **[BAL\_On\_Threshold\_Slow]** for at least **[BAL\_On\_Delay\_Slow]** |
|  | M3 | Autolamps switches headlamps on |
|  | M4 | Driver parks vehicle after some time |
|  | M5 | Driver switches ignition off |
|  | M6 | System disables Autolamps and switches headlamps off |
| **Alternative flow 1**  (Enter long underpass) | A1.1 | Vehicle enters a long underpass (e.g. tunnel) |
|  | A1.2 | Autolamps detects suddenly reduced ambient light level below  **[BAL \_On\_Threshold\_Fast]** for at least **[BAL\_On\_Delay\_Fast]** |
|  | A1.3 | Autolamps switches on headlamps |
|  | A1.4 | Driver parks vehicle after some time |
|  | A1.5 | Driver switches ignition off |
|  | A1.6 | System disables Autolamps and switches headlamps off |
| **Alternative flow 2**  (Enter short underpass) | A2.1 | Vehicle approaches a short underpass (e.g. bridge) |
|  | A2.2 | Autolamps detects suddenly reduced ambient light condition below  **[BAL\_On\_Threshold\_Fast]** for at least **[BAL\_On\_Delay\_Fast]** |
|  | A2.3 | Autolamps switches on headlamps |
|  | A2.4 | Driver parks vehicle after some time |
|  | A2.5 | Driver switches ignition off |
|  | A2.6 | System disables Autolamps and switches headlamps off |
| **Exception flows** |  | Autolamps detects system failure |
|  |  | Autolamps switches headlamps on permanently while ignition is on |
|  |  | System indicates headlamps on status via telltale LED in IPC |

###F\_BAL\_U0002\_v1A### Basic Autolamps - Headlamps Off

|  |  |  |
| --- | --- | --- |
| **Actors** |  | Driver |
| **Description** |  | While the driver uses the vehicle, the ambient light level increases above a defined threshold for a specified time (e.g. due to exiting a dark tunnel, driving at dawn conditions) |
| **Pre-condition** |  | Vehicle is equipped with Basic Autolamps |
|  |  | Ignition is on |
|  |  | Autolamps enabled (see use case “Autolamps - Deactivation”) |
|  |  | Ambient light level is low (Night Mode) |
|  |  | Headlamps are on |
| **Post-condition** |  | Ambient light level is high (Day Mode) |
|  |  | Headlamps are off |
| **Main flow**  (Dawn) | M1 | Vehicle approaches an area with slowly increasing ambient light level (e.g. at dawn) |
|  | M2 | Autolamps detects slowly increased ambient light condition above **[BAL\_Off\_Threshold\_Slow]** for at least **[BAL\_Off\_Delay\_Slow]** |
|  | M3 | Autolamps switches off headlamps |
|  | M4 | Driver parks vehicle after some time |
|  | M5 | Driver switches ignition off |
|  | M6 | System disables Autolamps |
| **Alternative flow 1**  (Exit underpass) | A1.1 | Vehicle exits an underpass |
|  | A1.2 | Autolamps detects suddenly increased ambient light level above **[BAL\_Off\_Threshold\_Fast]** for at least **[BAL\_Off\_Delay\_Fast]** |
|  | A1.3 | Autolamps switches off headlamps |
|  | A1.4 | Driver parks vehicle after some time |
|  | A1.5 | Driver switches ignition off |
|  | A1.6 | System disables Autolamps |
| **Exception flows** |  | Autolamps detects system failure |
|  |  | Autolamps switches headlamps on permanently while ignition is on |
|  |  | System indicates headlamps on status via telltale LED in IPC |

###F\_AAL\_U0001\_v1A### Advanced Autolamps - Headlamps On

|  |  |  |
| --- | --- | --- |
| **Actors** |  | Driver |
| **Description** |  | While the driver uses the vehicle, the ambient light level falls below a defined threshold for a specified time (e.g. due to entering a dark tunnel, driving at dusk conditions) |
| **Pre-condition** |  | Vehicle is equipped with Advanced Autolamps |
|  |  | Ignition is on |
|  |  | Autolamps enabled (see use case “Autolamps - Activation”) |
|  |  | Ambient light level is high (Day Mode) |
|  |  | Headlamps are off |
| **Post-condition** |  | Ambient light level is low (Night Mode) |
|  |  | Headlamps are on |
| **Main flow**  (Dusk) | M1 | Vehicle approaches an area with slowly decreasing ambient light level (e.g. at dusk) |
|  | M2 | Autolamps detects slowly reduced ambient light level below  **[AAL\_On\_Threshold\_Slow]** for at least **[AAL\_On\_Delay\_Slow]** |
|  | M3 | Autolamps switches on headlamps |
|  | M4 | Driver parks vehicle after some time |
|  | M5 | Driver switches ignition off |
|  | M6 | System disables Autolamps and switches headlamps off |
| **Alternative flow 1**  (Enter long underpass) | A1.1 | Vehicle enters a long underpass (e.g. tunnel) |
|  | A1.2 | Autolamps detects suddenly reduced ambient light level below **[AAL\_On\_Threshold\_Fast]** |
|  | A1.3 | Autolamps predicts that the decreased ambient light level will persist for at least **[Tunnel\_Length]** or for at least **[Tunnel\_Pass\_Time]** |
|  | A1.4 | Autolamps switches on headlamps latest after **[AAL\_On\_Delay\_Fast]** |
|  | A1.5 | Driver parks vehicle after some time |
|  | A1.6 | Driver switches ignition off |
|  | A1.7 | System disables Autolamps and switches headlamps off |
| **Alternative flow 2**  (Enter short underpass) | A2.1 | Vehicle enters a short underpass (e.g. bridge) |
|  | A2.2 | Autolamps detects suddenly reduced ambient light level below **[AAL\_On\_Threshold\_Fast]** |
|  | A2.3 | Autolamps predicts that ambient light condition will persist for max. **[Tunnel\_Length]** or for max. **[Tunnel\_Pass\_Time]** |
|  | A2.4 | Autolamps keeps headlamps off |
|  | A2.4 | Driver parks vehicle after some time |
|  | A2.5 | Driver switches ignition off |
|  | A2.6 | System disables Autolamps |
| **Exception flows** |  | Autolamps detects system failure |
|  |  | Autolamps switches headlamps on permanently while ignition is on |
|  |  | System indicates headlamps on status via telltale LED in IPC |

###F\_AA\_U0002\_v1A### Advanced Autolamps - Headlamps Off

|  |  |  |
| --- | --- | --- |
| **Actors** |  | Driver |
| **Description** |  | While the driver uses the vehicle, the ambient light level increases above a defined threshold for a specified time (e.g. due to exiting a dark tunnel, driving at dawn conditions) |
| **Pre-condition** |  | Vehicle is equipped with Advanced Autolamps |
|  |  | Ignition is on |
|  |  | Autolamps enabled (see use case “Autolamps - Activation”) |
|  |  | Ambient light level is low (Night Mode) |
|  |  | Headlamps are on |
| **Post-condition** |  | Ambient light level is high (Day Mode) |
|  |  | Headlamps are off |
| **Main flow**  (Dawn) | M1 | Vehicle approaches an area with slowly increasing ambient light brightness (e.g. at dawn) |
|  | M2 | Autolamps detects slowly increased ambient light level above  **[AAL\_Off\_Threshold\_Slow]** for at least **[AAL\_Off\_Delay\_Slow]** |
|  | M3 | Autolamps switches off headlamps |
|  | M4 | Driver parks vehicle after some time |
|  | M5 | Driver switches ignition off |
|  | M6 | System disables Autolamps |
| **Alternative flow 1**  (Exit underpass) | A1.1 | Vehicle exits an underpass (e.g. tunnel exit into bright ambient light condition) |
|  | A1.2 | Autolamps detects suddenly increased ambient light level above **[AAL\_Off\_Threshold\_Fast]** for at least **[AAL\_Off\_Delay\_Fast]** |
|  | A1.3 | Autolamps switches off headlamps |
|  | A1.4 | Driver parks vehicle after some time |
|  | A1.5 | Driver switches ignition off |
|  | A1.6 | System disables Autolamps |
|  | A1.7 |  |
| **Exception Flows** |  | Autolamps detects system failure |
|  |  | Autolamps switches headlamps on permanently while ignition is on |
|  |  | System indicates headlamps on status via telltale LED in IPC |

## Operating Modes / States

This section shall give an overview of the operating modes of the feature.



Figure 7: Autolamps Modes

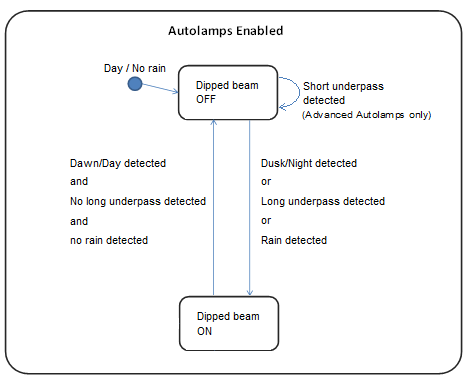


Figure 8: Switching of Headlamps

# FEATURE REQUIREMENTS

## Legal Requirements

###F\_AL\_R0001\_v1A### Generic Autolamps - Legal Requirement Priority

Legal requirements have the highest priority. In case of a clash between legal and functional requirements the legal requirements must be followed.

###F\_AL-R0001\_Attr###

|  |  |
| --- | --- |
| **Rationale** | |
| Prioritization of legal requirements | |
| **Acceptance Criteria** | **Verification Method** |
| No violation of legal requirements | Vehicle test |
| **Notes** | |
|  | |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Type** | | | Legal | | **Source** | ASO |
| **Priority** | | | Mandatory | | **Owner** | Oemer Uerek |
| **Stability** | | | Reviewed | | **ASIL Level** |  |
| **Change Log** | | | | | | |
| **Version** | **Date** | **Author** | | **Change** | | |
|  |  | |  |  | | |

###F\_AL\_R0002\_v1A### Generic Autolamps - Applicable Legal Requirements

Autolamps feature behaviour shall be compliant to the latest applicable requirements which may depend for different regions. For current status of applicable legal requirements, the ASO shall be contacted.

###F\_AL-R0002\_Attr###

|  |  |
| --- | --- |
| **Rationale** | |
| Application of latest legal requirements | |
| **Acceptance Criteria** | **Verification Method** |
| Vehicle homologated according to latest legal requirements | Vehicle test |
| **Notes** | |
| There is no specific test for compliance demonstration. Different test set-ups cam ne proposed and used as far as aligned with responsible proving authorities (e.g. TÜV, INTA etc.) | |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Type** | | | Legal | | **Source** | ASO |
| **Priority** | | | Mandatory | | **Owner** | Oemer Uerek |
| **Stability** | | | Reviewed | | **ASIL Level** |  |
| **Change Log** | | | | | | |
| **Version** | **Date** | **Author** | | **Change** | | |
|  |  |  | |  | | |

###F\_AL\_R0003\_v1A### Generic Autolamps - Legal Compliance Demonstration

The compliance to the legal requirements shall be demonstrated via a suitable test set-up. This test set-up shall be an accepted test by the Ford Homologation Team and by the authorities supporting the homologation tests.

###F\_AL-R0003\_Attr###

|  |  |
| --- | --- |
| **Rationale** | |
| Compliance testing | |
| **Acceptance Criteria** | **Verification Method** |
| Vehicle level test performed and passed via a vehicle level test set-up accepted by the authorities. | Vehicle test |
| **Notes** | |
| There is no specific test for compliance demonstration. Different test set-ups cam ne proposed and used as far as aligned with responsible proving authorities (e.g. TÜV, INTA etc.) | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Type** | | Legal | | **Source** | ASO |
| **Priority** | | Mandatory | | **Owner** | Oemer Uerek |
| **Stability** | | Reviewed | | **ASIL Level** |  |
| **Change Log** | | | | | |
| **Version** | **Date** | **Author** | **Change** | | |
|  |  |  |  | | |

## Functional Requirements

### Generic Autolamps Requirements

###F\_AL\_R0004\_v1A### Generic Autolamps - Power Mode

Autolamps shall be available when ignition status is set to “RUN”.

###F\_AL-R0004\_Attr###

|  |  |
| --- | --- |
| **Rationale** | |
| Power mode dependency | |
| **Acceptance Criteria** | **Verification Method** |
| Specific test case in Feature Test Procedure Specification passed | System test |
| **Notes** | |
|  | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Type** | | Functional | | **Source** | CGEA 1.3 |
| **Priority** | | Mandatory | | **Owner** | Oemer Uerek |
| **Stability** | | Approved | | **ASIL Level** |  |
| **Change Log** | | | | | |
| **Version** | **Date** | **Author** | **Change** | | |
|  |  |  |  | | |

###F\_AL\_R0005\_v1A### Generic Autolamps - Activation and Deactivation

The user shall be able to enable or disable Autolamps via the designated HMI.

###F\_AL-R0005\_Attr###

|  |  |
| --- | --- |
| **Rationale** | |
| Feature activation and deactivation | |
| **Acceptance Criteria** | **Verification Method** |
| Specific test case in Feature Test Procedure Specification passed | System test |
| **Notes** | |
|  | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Type** | | Functional | | **Source** | CGEA 1.3 |
| **Priority** | | Mandatory | | **Owner** | Oemer Uerek |
| **Stability** | | Approved | | **ASIL Level** |  |
| **Change Log** | | | | | |
| **Version** | **Date** | **Author** | **Change** | | |
|  |  |  |  | | |

###F\_AL\_R0006\_v1A### Generic Autolamps - Manual Override

The user must be able to override Autolamps at any time by switching headlamps on or off manually via a control that can be operated easily, intuitively and immediately.

###F\_AL-R0006\_Attr###

|  |  |
| --- | --- |
| **Rationale** | |
| Manual headlamps control | |
| **Acceptance Criteria** | **Verification Method** |
| Specific test case in Feature Test Procedure Specification passed | System test |
| **Notes** | |
|  | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Type** | | Functional | | **Source** |  |
| **Priority** | | Mandatory | | **Owner** | Oemer Uerek |
| **Stability** | | Approved | | **ASIL Level** |  |
| **Change Log** | | | | | |
| **Version** | **Date** | **Author** | **Change** | | |
|  |  |  |  | | |

###F\_AL\_R0007\_v1A### Generic Autolamps - Error Handling

If Autolamps is enabled and a failure is detected affecting correct ambient light level measurement or correct headlamps control, the headlamps shall be switched on and stay on until the failure disappears and full Autolamps functionality is given.

###F\_AL-R0007\_Attr###

|  |  |
| --- | --- |
| **Rationale** | |
| Fail safe mode: Activation of headlamps | |
| **Acceptance Criteria** | **Verification Method** |
| Specific test case in Feature Test Procedure Specification passed | System test |
| **Notes** | |
|  | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Type** | | Functional | | **Source** |  |
| **Priority** | | Mandatory | | **Owner** | Oemer Uerek |
| **Stability** | | Approved | | **ASIL Level** |  |
| **Change Log** | | | | | |
| **Version** | **Date** | **Author** | **Change** | | |
|  |  |  |  | | |

###F\_AL\_R0008\_v1A### Generic Autolamps - Light Wavelength

Autolamps shall perform ambient light level measurement for the light wavelength typical for daylight conditions visible for the human eye without UV- or IR-light impact.

###F\_AL-R0008\_Attr###

|  |  |
| --- | --- |
| **Rationale** | |
| Ambient light sensing according to human eye perception | |
| **Acceptance Criteria** | **Verification Method** |
| Light sensing device sensitive for daylight wavelength | TDR / DV |
| **Notes** | |
|  | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Type** | | Functional | | **Source** |  |
| **Priority** | | Mandatory | | **Owner** | Oemer Uerek |
| **Stability** | | Approved | | **ASIL Level** |  |
| **Change Log** | | | | | |
| **Version** | **Date** | **Author** | **Change** | | |
|  |  |  |  | | |

### Basic Autolamps Requirements

###F\_BAL\_R00001\_v1A### Basic Autolamps - Headlamps On at Start

Autolamps shall switch headlamps on when the first measured ambient light level is below **[BAL\_Start\_Threshold]**.

###F\_BAL-R00001\_Attr###

|  |  |
| --- | --- |
| **Rationale** | |
| Headlamps activation at dark ambient light conditions | |
| **Acceptance Criteria** | **Verification Method** |
| Specific test case in Feature Test Procedure Specification passed | Vehicle test |
| **Notes** | |
| Legal requirements defining a different behaviour have higher priority than this requirement. | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Type** | | Functional | | **Source** |  |
| **Priority** | | Mandatory | | **Owner** | Oemer Uerek |
| **Stability** | | Approved | | **ASIL Level** |  |
| **Change Log** | | | | | |
| **Version** | **Date** | **Author** | **Change** | | |
|  |  |  |  | | |

###F\_BAL\_R0002\_v1A### Basic Autolamps - Headlamps On Slow

Autolamps shall switch headlamps on when the measured ambient light level decreases with not more than **[BAL\_Slow\_Time]** (or via another method indicating a slow ambient light level decrease)to an ambient light level below **[BAL\_On\_Threshold\_Slow]** and stays below for **[BAL\_On\_Delay\_Slow].**

###F\_BAL-R0002\_Attr###

|  |  |
| --- | --- |
| **Rationale** | |
| Headlamps activation during dusk situation (change from day to night mode) | |
| **Acceptance Criteria** | **Verification Method** |
| Specific test case in Feature Test Procedure Specification passed | Vehicle test |
| **Notes** | |
| Legal requirements defining a different behaviour have higher priority than this requirement. | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Type** | | Functional | | **Source** |  |
| **Priority** | | Mandatory | | **Owner** | Oemer Uerek |
| **Stability** | | Approved | | **ASIL Level** |  |
| **Change Log** | | | | | |
| **Version** | **Date** | **Author** | **Change** | | |
|  |  |  |  | | |

###F\_BAL\_R0003\_v1A### Basic Autolamps - Headlamps On Fast

Autolamps shall switch headlamps on when the measured ambient light level decreases with more than **[BAL\_Slow\_Time]** (or via another method indicating a fast ambient light level decrease)to an ambient light level below **[BAL\_On\_Threshold\_Fast]** and stays below for **[BAL\_On\_Delay\_Fast]**.

###F\_BAL-R0003\_Attr###

|  |  |
| --- | --- |
| **Rationale** | |
| Headlamps activation during sudden decrease of ambient light level (e.g. tunnel) | |
| **Acceptance Criteria** | **Verification Method** |
| Specific test case in Feature Test Procedure Specification passed | Vehicle test |
| **Notes** | |
| Legal requirements defining a different behaviour have higher priority than this requirement. | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Type** | | Functional | | **Source** |  |
| **Priority** | | Mandatory | | **Owner** | Oemer Uerek |
| **Stability** | | Approved | | **ASIL Level** |  |
| **Change Log** | | | | | |
| **Version** | **Date** | **Author** | **Change** | | |
|  |  |  |  | | |

###F\_BAL\_R0004\_v1A### Basic Autolamps - Headlamps Off at Start

Autolamps shall switch headlamps off when the first measured ambient light level is equal or more than **[BAL\_Start\_Threshold]**.

###F\_BAL-R0004\_Attr###

|  |  |
| --- | --- |
| **Rationale** | |
| Headlamps deactivation at bright conditions | |
| **Acceptance Criteria** | **Verification Method** |
| Specific test case in Feature Test Procedure Specification passed | Vehicle test |
| **Notes** | |
| Legal requirements defining a different behaviour have higher priority than this requirement. | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Type** | | Functional | | **Source** |  |
| **Priority** | | Mandatory | | **Owner** | Oemer Uerek |
| **Stability** | | Approved | | **ASIL Level** |  |
| **Change Log** | | | | | |
| **Version** | **Date** | **Author** | **Change** | | |
|  |  |  |  | | |

###F\_BAL\_R0005\_v1A### Basic Autolamps - Headlamps Off Slow

Autolamps shall switch headlamps off when the measured ambient light level increases with not more than **[BAL\_Slow\_Time]** (or via another method indicating a slow ambient light level increase)to an ambient light level above **[BAL\_Off\_Threshold\_Slow]** and stays above for **[BAL\_Off\_Delay\_Slow].**

###F\_BAL-R0005\_Attr###

|  |  |
| --- | --- |
| **Rationale** | |
| Headlamps activation during dawn situation (change from night to day mode) | |
| **Acceptance Criteria** | **Verification Method** |
| Specific test case in Feature Test Procedure Specification passed | Vehicle test |
| **Notes** | |
| Legal requirements defining a different behaviour have higher priority than this requirement. | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Type** | | Functional | | **Source** |  |
| **Priority** | | Mandatory | | **Owner** | Oemer Uerek |
| **Stability** | | Approved | | **ASIL Level** |  |
| **Change Log** | | | | | |
| **Version** | **Date** | **Author** | **Change** | | |
|  |  |  |  | | |

###F\_BAL\_R0006\_v1A### Basic Autolamps - Headlamps Off Fast

Autolamps shall switch headlamps off when the measured ambient light level increases with more than **[BAL\_Slow\_Time]** (or via another method indicating a fast ambient light level increase)to an ambient light level above **[BAL\_Off\_Threshold\_Fast]** and stays above for **[BAL\_Off\_Delay\_Fast].**

###F\_BAL-R0006\_Attr###

|  |  |
| --- | --- |
| **Rationale** | |
| Headlamps activation during sudden decrease of ambient light level (e.g. tunnel) | |
| **Acceptance Criteria** | **Verification Method** |
| Specific test case in Feature Test Procedure Specification passed | Vehicle test |
| **Notes** | |
| Legal requirements defining a different behaviour have higher priority than this requirement. | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Type** | | Functional | | **Source** |  |
| **Priority** | | Mandatory | | **Owner** | Oemer Uerek |
| **Stability** | | Approved | | **ASIL Level** |  |
| **Change Log** | | | | | |
| **Version** | **Date** | **Author** | **Change** | | |
|  |  |  |  | | |

###F\_BAL\_R0007\_v1A### Basic Autolamps - Rain Light On

When headlamps are off due to a high ambient light level, Autolamps shall switch headlamps on when the vehicle is driven during rain for at least **[WiperManualOnTimer\_Cfg]**.

###F\_BAL-R0007\_Attr###

|  |  |
| --- | --- |
| **Rationale** | |
| Headlamps activation to ensure visibility in rain situation | |
| **Acceptance Criteria** | **Verification Method** |
| Specific test case in Feature Test Procedure Specification passed | Vehicle test |
| **Notes** | |
|  | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Type** | | Functional | | **Source** | CGEA1.3 BCM Functional Specification |
| **Priority** | | Mandatory | | **Owner** | Oemer Uerek |
| **Stability** | | Approved | | **ASIL Level** |  |
| **Change Log** | | | | | |
| **Version** | **Date** | **Author** | **Change** | | |
|  |  |  |  | | |

###F\_BAL\_R0008\_v1A### Basic Autolamps - Rain Light Off

When headlamps were on due to Rain Light Autolamps shall switch headlamps off when the headlamps activation is not requested by Autolamps due to ambient light level and when vehicle has left rain conditions since **[WiperOffTimer\_Cfg]**.

###F\_BAL-R0008\_Attr###

|  |  |
| --- | --- |
| **Rationale** | |
| Headlamps deactivation at dry and bright ambient light conditions | |
| **Acceptance Criteria** | **Verification Method** |
| Specific test case in Feature Test Procedure Specification passed | Vehicle test |
| **Notes** | |
|  | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Type** | | Functional | | **Source** | CGEA1.3 BCM Functional Specification |
| **Priority** | | Mandatory | | **Owner** | Oemer Uerek |
| **Stability** | | Approved | | **ASIL Level** |  |
| **Change Log** | | | | | |
| **Version** | **Date** | **Author** | **Change** | | |
|  |  |  |  | | |

### Advanced Autolamps Requirements

###F\_AAL\_R00001\_v1A### Advanced Autolamps - Headlamps On at Start

Autolamps shall switch headlamps on when the first measured ambient light level is below **[AAL\_Start\_Threshold]**.

###F\_AAL-R00001\_Attr###

|  |  |
| --- | --- |
| **Rationale** | |
| Headlamps activation at dark ambient light conditions | |
| **Acceptance Criteria** | **Verification Method** |
| Specific test case in Feature Test Procedure Specification passed | Vehicle test |
| **Notes** | |
| Legal requirements defining a different behaviour have higher priority than this requirement. | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Type** | | Functional | | **Source** |  |
| **Priority** | | Mandatory | | **Owner** | Oemer Uerek |
| **Stability** | | Approved | | **ASIL Level** |  |
| **Change Log** | | | | | |
| **Version** | **Date** | **Author** | **Change** | | |
|  |  |  |  | | |

###F\_AAL\_R0002\_v1A### Advanced Autolamps - Headlamps On Slow

Autolamps shall switch headlamps on when the measured ambient light level decreases with not more than **[AAL\_Slow\_Time]** (or via another method indicating a slow ambient light level decrease)to an ambient light level below **[AAL\_On\_Threshold\_Slow]** and stays below for **[AAL\_On\_Delay\_Slow].**

###F\_AAL-R0002\_Attr###

|  |  |
| --- | --- |
| **Rationale** | |
| Headlamps activation during dusk situation (change from day to night mode) | |
| **Acceptance Criteria** | **Verification Method** |
| Specific test case in Feature Test Procedure Specification passed | Vehicle test |
| **Notes** | |
| Legal requirements defining a different behaviour have higher priority than this requirement. | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Type** | | Functional | | **Source** |  |
| **Priority** | | Mandatory | | **Owner** | Oemer Uerek |
| **Stability** | | Approved | | **ASIL Level** |  |
| **Change Log** | | | | | |
| **Version** | **Date** | **Author** | **Change** | | |
|  |  |  |  | | |

###F\_AAL\_R0003\_v1A### Advanced Autolamps - Headlamps On Fast

When detecting a sudden or fast ambient light value decrease (e.g. when vehicle enters a tunnel) below **[AAL\_On\_Threshold\_Fast]** for at least **[AAL\_On\_Delay\_Fast]**, Autolamps shall switch headlamps on when Advanced Autolamps predicts that ambient light condition will persist a low ambient light level for at least **[Tunnel\_Length]** or for at least **[Tunnel\_Pass\_Time]** or due to another method indicating e.g. the entry into a tunnel or garage.

###F\_AAL-R0003\_Attr###

|  |  |
| --- | --- |
| **Rationale** | |
| Headlamps activation during sudden decrease of ambient light level (e.g. tunnel) | |
| **Acceptance Criteria** | **Verification Method** |
| Specific test case in Feature Test Procedure Specification passed | Vehicle test |
| **Notes** | |
| Legal requirements defining a different behaviour have higher priority than this requirement. | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Type** | | Functional | | **Source** |  |
| **Priority** | | Mandatory | | **Owner** | Oemer Uerek |
| **Stability** | | Approved | | **ASIL Level** |  |
| **Change Log** | | | | | |
| **Version** | **Date** | **Author** | **Change** | | |
|  |  |  |  | | |

###F\_AAL\_R0004\_v1A### Advanced Autolamps - Headlamps Suppression

When detecting a sudden or fast ambient light value decrease (e.g. when vehicle enters a tunnel) below

**[AAL\_ On\_Threshold\_Fast]** for at least **[AAL\_On\_Delay\_Fast]**, Advanced Autolamps shall suppress headlamps activation when Advanced Autolamps predicts that ambient light condition will persist a low ambient light level for not more than **[Tunnel\_Length]** and for not more than **[Tunnel\_Pass\_Time]**.

Note: This requirement is not a violation against the legal requirements as the suppression shall make the Autolamps feature robust against short-term ambient light changes causing a frequent headlamps activation/deactivation (e.g. due to alleys, shadows, short underpasses etc.). However, the application of this requirement needs to be confirmed by ASO.

###F\_AAL-R0004\_Attr###

|  |  |
| --- | --- |
| **Rationale** | |
| Headlamps activation during sudden decrease of ambient light level (e.g. tunnel) | |
| **Acceptance Criteria** | **Verification Method** |
| Specific test case in Feature Test Procedure Specification passed | Vehicle test |
| **Notes** | |
| Legal requirements defining a different behaviour have higher priority than this requirement. | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Type** | | Functional | | **Source** |  |
| **Priority** | | Mandatory | | **Owner** | Oemer Uerek |
| **Stability** | | Approved | | **ASIL Level** |  |
| **Change Log** | | | | | |
| **Version** | **Date** | **Author** | **Change** | | |
|  |  |  |  | | |

###F\_AAL\_R0005\_v1A### Advanced Autolamps - Tunnel Length Detection Time

Advanced Autolamps shall detect the underpass length and calculate the time to exit the underpass based on distance to tunnel exit and vehicle speed within 1s after having entered the tunnel.

###F\_AAL-R0005\_Attr###

|  |  |
| --- | --- |
| **Rationale** | |
| Headlamps activation during sudden decrease of ambient light level (e.g. tunnel) | |
| **Acceptance Criteria** | **Verification Method** |
| Specific test case in Feature Test Procedure Specification passed | Vehicle test |
| **Notes** | |
| Legal requirements defining a different behaviour have higher priority than this requirement. | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Type** | | Functional | | **Source** |  |
| **Priority** | | Mandatory | | **Owner** | Oemer Uerek |
| **Stability** | | Approved | | **ASIL Level** |  |
| **Change Log** | | | | | |
| **Version** | **Date** | **Author** | **Change** | | |
|  |  |  |  | | |

###F\_AAL\_R0006\_v1A### Advanced Autolamps - Headlamps Off at Start

Autolamps shall switch headlamps off when the first measured ambient light level is equal or more than **[AAL\_Start\_Threshold]**.

###F\_AAL-R0006\_Attr###

|  |  |
| --- | --- |
| **Rationale** | |
| Headlamps deactivation at bright conditions | |
| **Acceptance Criteria** | **Verification Method** |
| Specific test case in Feature Test Procedure Specification passed | Vehicle test |
| **Notes** | |
| Legal requirements defining a different behaviour have higher priority than this requirement. | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Type** | | Functional | | **Source** |  |
| **Priority** | | Mandatory | | **Owner** | Oemer Uerek |
| **Stability** | | Approved | | **ASIL Level** |  |
| **Change Log** | | | | | |
| **Version** | **Date** | **Author** | **Change** | | |
|  |  |  |  | | |

###F\_AAL\_R0007\_v1A### Advanced Autolamps - Headlamps Off Slow

Autolamps shall switch headlamps off when the measured ambient light level increases with not more than **[AAL\_Slow\_Time]** (or via another method indicating a slow ambient light level increase)to an ambient light level above **[AAL\_Off\_Threshold\_Slow]** and stays above for **[AAL\_Off\_Delay\_Slow].**

###F\_AAL-R0007\_Attr###

|  |  |
| --- | --- |
| **Rationale** | |
| Headlamps activation during dawn situation (change from night to day mode) | |
| **Acceptance Criteria** | **Verification Method** |
| Specific test case in Feature Test Procedure Specification passed | Vehicle test |
| **Notes** | |
| Legal requirements defining a different behaviour have higher priority than this requirement. | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Type** | | Functional | | **Source** |  |
| **Priority** | | Mandatory | | **Owner** | Oemer Uerek |
| **Stability** | | Approved | | **ASIL Level** |  |
| **Change Log** | | | | | |
| **Version** | **Date** | **Author** | **Change** | | |
|  |  |  |  | | |

###F\_AAL\_R0008\_v1A### Advanced Autolamps - Headlamps Off Fast

Autolamps shall switch headlamps off when the measured ambient light level increases with more than **[AAL\_Slow\_Time]** (or via another method indicating a fast ambient light level increase)to an ambient light level above **[AAL\_Off\_Threshold\_Fast]** and stays above for **[AAL\_Off\_Delay\_Fast].**

###F\_AAL-R0008\_Attr###

|  |  |
| --- | --- |
| **Rationale** | |
| Headlamps activation during sudden decrease of ambient light level (e.g. tunnel) | |
| **Acceptance Criteria** | **Verification Method** |
| Specific test case in Feature Test Procedure Specification passed | Vehicle test |
| **Notes** | |
| Legal requirements defining a different behaviour have higher priority than this requirement. | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Type** | | Functional | | **Source** |  |
| **Priority** | | Mandatory | | **Owner** | Oemer Uerek |
| **Stability** | | Approved | | **ASIL Level** |  |
| **Change Log** | | | | | |
| **Version** | **Date** | **Author** | **Change** | | |
|  |  |  |  | | |

###F\_AAL\_R0009\_v1A### Advanced Autolamps - Rain Light On

When headlamps are off due to a high ambient light level, Autolamps shall switch headlamps on when the vehicle is driven during rain for at least **[WiperManualOnTimer\_Cfg]**.

###F\_AAL-R0009\_Attr###

|  |  |
| --- | --- |
| **Rationale** | |
| Headlamps activation to ensure visibility in rain situation | |
| **Acceptance Criteria** | **Verification Method** |
| Specific test case in Feature Test Procedure Specification passed | Vehicle test |
| **Notes** | |
|  | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Type** | | Functional | | **Source** | CGEA1.3 BCM Functional Specification |
| **Priority** | | Mandatory | | **Owner** | Oemer Uerek |
| **Stability** | | Approved | | **ASIL Level** |  |
| **Change Log** | | | | | |
| **Version** | **Date** | **Author** | **Change** | | |
|  |  |  |  | | |

###F\_AAL\_R0010\_v1A### Advanced Autolamps - Rain Light Off

When headlamps were on due to Rain Light Autolamps shall switch headlamps off when the headlamps activation is not requested by Autolamps due to ambient light level and when vehicle has left rain conditions since **[WiperOffTimer\_Cfg]**.

###F\_AAL-R0010\_Attr###

|  |  |
| --- | --- |
| **Rationale** | |
| Headlamps deactivation at dry and bright ambient light conditions | |
| **Acceptance Criteria** | **Verification Method** |
| Specific test case in Feature Test Procedure Specification passed | Vehicle test |
| **Notes** | |
|  | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Type** | | Functional | | **Source** | CGEA1.3 BCM Functional Specification |
| **Priority** | | Mandatory | | **Owner** | Oemer Uerek |
| **Stability** | | Approved | | **ASIL Level** |  |
| **Change Log** | | | | | |
| **Version** | **Date** | **Author** | **Change** | | |
|  |  |  |  | | |

## Quality of Service Requirements

### Performance

###F\_AL\_R0009\_v1A### Generic Autolamps - Common Behaviour

The performance of Autolamps shall not vary due to vehicle type specific characteristics.

###F\_AL-R0009\_Attr###

|  |  |
| --- | --- |
| **Rationale** | |
| Allow X-carline common behaviour | |
| **Acceptance Criteria** | **Verification Method** |
| All applicable tests according to Feature Test Procedure Specification passed | Vehicle test |
| **Notes** | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Type** | | Functional | | **Source** |  |
| **Priority** | | Mandatory | | **Owner** | Oemer Uerek |
| **Stability** | | Approved | | **ASIL Level** |  |
| **Change Log** | | | | | |
| **Version** | **Date** | **Author** | **Change** | | |
|  |  |  |  | | |

###F\_AL\_R0010\_v1A### Generic Autolamps – Compensation of Noise Factors

Autolamps shall compensate any influence falsifying a correct ambient light level measurement outside the vehicle. If e.g. the light sensing device is packaged inside the vehicle behind a glass, the glass transmissivity shall be compensated.

###F\_AL-R00010\_Attr###

|  |  |
| --- | --- |
| **Rationale** | |
| Achievement of correct ambient light level measurement | |
| **Acceptance Criteria** | **Verification Method** |
| All noise factors affecting Autolamps performance are identified and compensated | TDR / DV |
| **Notes** | |
|  | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Type** | | Functional | | **Source** | New requirement |
| **Priority** | | Mandatory | | **Owner** | Oemer Uerek |
| **Stability** | | Draft | | **ASIL Level** | n/a |
| **Change Log** | | | | | |
| **Version** | **Date** | **Author** | **Change** | | |
|  |  |  |  | | |

### Reliability

###F\_AL\_R0011\_v1A### Generic Autolamps - Accuracy

Autolamps shall control headlamps according to ambient light level information with a maximum variance of 10% to a cosine corrected reference lux meter positioned on a horizontal surface on the top of windscreen centerline.

###F\_AL-R0011\_Attr###

|  |  |
| --- | --- |
| **Rationale** | |
| Provide reliable measurement data | |
| **Acceptance Criteria** | **Verification Method** |
| Specific test case in Feature Test Procedure Specification passed | Vehicle test |
| **Notes** | |
|  | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Type** | | Functional | | **Source** |  |
| **Priority** | | Mandatory | | **Owner** | Oemer Uerek |
| **Stability** | | Approved | | **ASIL Level** |  |
| **Change Log** | | | | | |
| **Version** | **Date** | **Author** | **Change** | | |
|  |  |  |  | | |

###F\_AL\_R0012\_v1A### Generic Autolamps - Robustness

Autolamps shall provide a smart and robust behaviour to avoid frequent switching of headlamps especially at twilight conditions. By detecting the ambient light condition such as dusk, dawn or constant light level, Autolamps shall filter variance causing e.g. a reactivation of headlamps during dawn or anew deactivation at dusk. By doing This requirement is not applicable to underpass or alley situations.

###F\_AL-R0012\_Attr###

|  |  |
| --- | --- |
| **Rationale** | |
| Avoid multiple switching of headlamps due to variance | |
| **Acceptance Criteria** | **Verification Method** |
| Specific test case in Feature Test Procedure Specification passed | Vehicle test |
| **Notes** | |
|  | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Type** | | Functional | | **Source** |  |
| **Priority** | | Mandatory | | **Owner** | Oemer Uerek |
| **Stability** | | Approved | | **ASIL Level** |  |
| **Change Log** | | | | | |
| **Version** | **Date** | **Author** | **Change** | | |
|  |  |  |  | | |

### Safety

There are no specific safety aspects to be considered.

### Security

No are no specific security aspects to be considered.

## Parameter Requirements

All parameters are shown with default values and must be configurable within the specified range.

### General

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter Name** | **Description** | **Range** | **Unit** | **Default Value** | **Requirement** |
| WiperManualOnTimer\_Cfg | Delay time to activate headlamps due to rain situation | 0..60 | seconds | 10 | ###F\_BAL\_R0007\_v1A### Basic Autolamps - Rain Light On  ###F\_AAL\_R0009\_v1A### Advanced Autolamps - Rain Light On |
| WiperOffTimer\_Cfg | Delay time to deactivate headlamps due to passed rain situation | 0..60 | seconds | 30 | ###F\_BAL\_R0008\_v1A### Basic Autolamps - Rain Light Off  ###F\_AAL\_R0010\_v1A### Advanced Autolamps - Rain Light Off |

### Basic Autolamps

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter Name** | **Description** | **Range** | **Unit** | **Default Value** | **Requirement** |
| BAL\_Start\_Threshold | Ambient light level threshold to define initial headlamps status when Autolamps is enabled | 0..8000 | lux | 3400 | ###F\_BAL\_R00001\_v1A### Basic Autolamps - Headlamps On at Start  ###F\_BAL\_R00004\_v1A### Basic Autolamps - Headlamps Off at Start |
| BAL\_On\_Threshold\_Slow | Ambient light level threshold below which headlamps shall be switched on when ambient light level decreases slowly (e.g. dusk scenario) | 0..8000 | lux | 1600 | ###F\_BAL\_U0001\_v1A### Basic Autolamps - Headlamps On  ###F\_BAL\_R0002\_v1A### Basic Autolamps - Headlamps On Slow |
| BAL\_On\_Threshold\_Fast | Ambient light level threshold below which headlamps shall be switched on when ambient light level decreases quickly (e.g. when entering a tunnel) | 0..8000 | lux | 1100 | ###F\_BAL\_U0001\_v1A### Basic Autolamps - Headlamps On  ###F\_BAL\_R0003\_v1A### Basic Autolamps - Headlamps On Fast |
| BAL\_Off\_Threshold\_Slow | Ambient light level threshold above which headlamps shall be switched off when ambient light level increases slowly (e.g. dawn scenario) | 0..8000 | lux | 3400 | ###F\_BAL\_U0002\_v1A### Basic Autolamps - Headlamps Off  ###F\_BAL\_R0005\_v1A### Basic Autolamps - Headlamps Off Slow |
| BAL\_Off\_Threshold\_Fast | Ambient light level threshold below which headlamps shall be switched off when ambient light level increases quickly (e.g. when leaving a tunnel) | 0..8000 | lux | 2800 | ###F\_BAL\_U0002\_v1A### Basic Autolamps - Headlamps Off  ###F\_BAL\_R0006\_v1A### Basic Autolamps - Headlamps Off Fast |
| BAL\_On\_Delay\_Slow | Delay time to activate headlamps when ambient light level decreases slowly (e.g. dusk scenario) | 0..60 | seconds | 60 | ###F\_BAL\_U0001\_v1A### Basic Autolamps - Headlamps On  ###F\_BAL\_R0002\_v1A### Basic Autolamps - Headlamps On Slow |
| BAL\_On\_Delay\_Fast | Delay time to activate headlamps when ambient light level decreases quickly (e.g. when entering a tunnel) | 0..30 | seconds | 1.5 | ###F\_BAL\_U0001\_v1A### Basic Autolamps - Headlamps On  ###F\_BAL\_R0003\_v1A### Basic Autolamps - Headlamps On Fast |
| BAL\_Off\_Delay\_Slow | Delay time to deactivate headlamps when ambient light level increases slowly (e.g. dawn scenario) | 0..60 | seconds | 60 | ###F\_BAL\_U0002\_v1A### Basic Autolamps - Headlamps Off  ###F\_BAL\_R0005\_v1A### Basic Autolamps - Headlamps Off Slow |
| BAL\_Off\_Delay\_Fast | Delay time to deactivate headlamps when ambient light level increases quickly (e.g. when leaving a tunnel) | 0..60 | seconds | 15 | ###F\_BAL\_U0002\_v1A### Basic Autolamps - Headlamps Off  ###F\_BAL\_R0006\_v1A### Basic Autolamps - Headlamps Off Fast |
| BAL\_Slow\_Time | Ambient light level change rate below which a change is interpreted as a “slow” change and above which it is interpreted as a “quick” or “fast” change | 0..1000 | lux/second | 50 | ###F\_BAL\_R0002\_v1A### Basic Autolamps - Headlamps On Slow  ###F\_BAL\_R0003\_v1A### Basic Autolamps - Headlamps On Fast  ###F\_BAL\_R0005\_v1A### Basic Autolamps - Headlamps Off Slow  ###F\_BAL\_R0006\_v1A### Basic Autolamps - Headlamps Off Fast |

### Advanced Autolamps

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter Name** | **Description** | **Range** | **Unit** | **Default Value** | **Requirement** |
| AAL\_Start\_Threshold | Ambient light level threshold to define initial headlamps status when Autolamps is enabled | 0..8000 | lux | 3200 | ###F\_AAL\_R00001\_v1A### Advanced Autolamps - Headlamps On at Start  ###F\_AAL\_R0006\_v1A### Advanced Autolamps - Headlamps Off at Start |
| AAL\_On\_Threshold\_Slow | Ambient light level threshold below which headlamps shall be switched on when ambient light level decreases slowly (e.g. dusk scenario) | 0..8000 | lux | 1800 | ###F\_AAL\_R0002\_v1A### Advanced Autolamps - Headlamps On Slow |
| AAL\_On\_Threshold\_Fast | Ambient light level threshold below which headlamps shall be switched on when ambient light level decreases quickly (e.g. when entering a tunnel) | 0..8000 | lux | 1400 | ###F\_AAL\_U0001\_v1A### Advanced Autolamps - Headlamps On  ###F\_AAL\_R0003\_v1A### Advanced Autolamps - Headlamps On Fast |
| AAL\_Off\_Threshold\_Slow | Ambient light level threshold above which headlamps shall be switched off when ambient light level increases slowly (e.g. dawn scenario) | 0..8000 | lux | 3400 | ###F\_AA\_U0002\_v1A### Advanced Autolamps - Headlamps Off  ###F\_AAL\_R0007\_v1A### Advanced Autolamps - Headlamps Off Slow |
| AAL\_Off\_Threshold\_Fast | Ambient light level threshold below which headlamps shall be switched off when ambient light level increases quickly (e.g. when leaving a tunnel) | 0..8000 | lux | 2800 | ###F\_AA\_U0002\_v1A### Advanced Autolamps - Headlamps Off  ###F\_AAL\_R0008\_v1A### Advanced Autolamps - Headlamps Off Fast |
| AAL\_On\_Delay\_Slow | Delay time to activate headlamps when ambient light level decreases slowly (e.g. dusk scenario) | 0..60 | seconds | 60 | ###F\_AAL\_U0001\_v1A### Advanced Autolamps - Headlamps On  ###F\_AAL\_R0002\_v1A### Advanced Autolamps - Headlamps On Slow |
| AAL\_On\_Delay\_Fast | Delay time to activate headlamps when ambient light level decreases quickly (e.g. when entering a tunnel) | 0..30 | seconds | 1.5 | ###F\_AAL\_U0001\_v1A### Advanced Autolamps - Headlamps On  ###F\_AAL\_R0003\_v1A### Advanced Autolamps - Headlamps On Fast  ###F\_AAL\_R0004\_v1A### Advanced Autolamps - Headlamps Suppression |
| AAL\_Off\_Delay\_Slow | Delay time to deactivate headlamps when ambient light level increases slowly (e.g. dawn scenario) | 0..60 | seconds | 60 | ###F\_AA\_U0002\_v1A### Advanced Autolamps - Headlamps Off^  ###F\_AAL\_R0007\_v1A### Advanced Autolamps - Headlamps Off Slow |
| AAL\_Off\_Delay\_Fast | Delay time to deactivate headlamps when ambient light level increases quickly (e.g. when leaving a tunnel) | 0..60 | seconds | 15 | ###F\_AA\_U0002\_v1A### Advanced Autolamps - Headlamps Off  ###F\_AAL\_R0008\_v1A### Advanced Autolamps - Headlamps Off Fast |
| AAL\_Slow\_Time | Ambient light level change rate below which a change is interpreted as a “slow” change and above which it is interpreted as a “quick” or “fast” change | 0..1000 | lux/second | 50 | ###F\_AAL\_R0002\_v1A### Advanced Autolamps - Headlamps On Slow  ###F\_AAL\_R0007\_v1A### Advanced Autolamps - Headlamps Off Slow  ###F\_AAL\_R0008\_v1A### Advanced Autolamps - Headlamps Off Fast |
| Tunnel\_Length | Maximum allowed length of an underpass for suppression of headlamps activation due to interpretation as “short underpass” | 0..60 | meter | 40 | ###F\_AAL\_U0001\_v1A### Advanced Autolamps - Headlamps On  ###F\_AAL\_R0003\_v1A### Advanced Autolamps - Headlamps On Fast  ###F\_AAL\_R0004\_v1A### Advanced Autolamps - Headlamps Suppression |
| Tunnel\_Pass\_Time | Maximum allowed time for passing an underpass with suppression of headlamps activation | 0..500 | seconds | 180 | ###F\_AAL\_U0001\_v1A### Advanced Autolamps - Headlamps On  ###F\_AAL\_R0003\_v1A### Advanced Autolamps - Headlamps On Fast  ###F\_AAL\_R0004\_v1A### Advanced Autolamps - Headlamps Suppression |

## Other Requirements

### Manufacturing Requirements

No specific feature requirements applicable

### Service and Aftersales Requirements

###F\_AL\_R0013\_v1A### Generic Autolamps – Disabling by Service

Autolamps shall allow disabling itself via configuration by service tools.

###F\_AL-R0013\_Attr###

|  |  |
| --- | --- |
| **Rationale** | |
| Allow diagnostic service actions | |
| **Acceptance Criteria** | **Verification Method** |
| Specific test case in Feature Test Procedure Specification passed | Vehicle test |
| **Notes** | |
|  | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Type** | | Functional | | **Source** |  |
| **Priority** | | Mandatory | | **Owner** | Oemer Uerek |
| **Stability** | | Approved | | **ASIL Level** |  |
| **Change Log** | | | | | |
| **Version** | **Date** | **Author** | **Change** | | |
|  |  |  |  | | |

###F\_AL\_R00014\_v1A### Generic Autolamps - Maintenance

Autolamps shall be free of maintenance.

|  |  |
| --- | --- |
| **Rationale** | |
| Avoid maintenance work | |
| **Acceptance Criteria** | **Verification Method** |
| TDR passed | TDR |
| **Notes** | |
|  | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Type** | | Functional | | **Source** |  |
| **Priority** | | Mandatory | | **Owner** | Oemer Uerek |
| **Stability** | | Approved | | **ASIL Level** |  |
| **Change Log** | | | | | |
| **Version** | **Date** | **Author** | **Change** | | |
|  |  |  |  | | |

### Process Requirements

No specific feature requirements applicable

*USER MANUAL*

# Functional Decomposition

## Functional Architecture

## 

## List of Functions

|  |  |  |
| --- | --- | --- |
| **Function Name** | **Description** | **Function Document** |
| Headlamp Switch Evaluation | Evaluates information from headlamp switch which is the HMI for customer requests | See VSEM |
| Light Level Measurement | Evaluates data collected from light sensing device to provide the ambient light level | See VSEM |
| Autolamps Control | Provides the Autolamps headlamps status recommendation to the system based on ambient light conditions and customer requests | See VSEM |
| Headlamp Control | Controls vehicle headlamps according to Autolamps recommendation and user request | See VSEM |

# Open Topics / Known Issues

| ID | Issue Description | e-Tracker Reference | Status | Solution |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |

# REVISION HISTORY

*<A new version number is assigned to a document with a given revision each time it is checked in to Team Center (TCSE). After release of a revision, the document cannot be edited and no new versions can be created on that revision. Any further document update requires creation of a new revision.>*

| Revision | Version | Date | Description | Approved by | Responsible |
| --- | --- | --- | --- | --- | --- |
| 001 |  |  | Initial version | ouerek | ouerek |