

Item definition (Example)

Front Lights Manager

Purpose of this document

The purpose of this document is to be the input for the “Hazard Analysis and Risk Assessment” (HARA) needed to be compliant with the ISO26262 standard. To ensure safety, all activities of the safety life cycle have to be planned to avoid systematic failures.

Therefore, this document describes the assumption on the **Front Lights Manager (FLM)** item you should develop.

An additional purpose of this document is to define and describe the item, its functionality, dependencies on, and interaction with, the driver, the environmental conditions, external measure, the boundary of the item and interfaces to other items as well as assumption concerning other elements at the vehicle level. In this document, the requirements and recommendations for establishing the definition of the item, including its functionality, interfaces, environmental conditions, legal requirements and known hazards will be handled.

Purpose of the item

Please describe in this chapter the purpose of the item. Consider laws, standards and regulations in order to describe sufficiently the purpose of the item

The purposes of the item are the following:

- All vehicles level parts that contribute to illuminate the front lights (DRL, low beam, high beam and fog light) will be considered as the system

Functional behavior

The general feature of a front light manager (FLM) is to drive properly the bulbs and/or the LED, required for cars, placed in the front of the vehicle: DRL, low beam, high beams, and fog lights.

Function	Operating elements	Turn-on Conditions	Turn-off conditions
Low beam Low beam indicator on HMI	Light switch (LS)	KL15 ON AND LS ON	Light switch OFF OR KL15 OFF
DRL	LS	KL15 ON AND LS OFF	KL15 OFF OR Low beam ON
High beam (ON) High beam indicator on HMI	High beam lever on the steering wheel (HBLSW)	KL15 ON AND LS ON AND HBLSW ON	KL15 OFF OR LS OFF OR HBLSW OFF
High beam (passing) High beam indicator on HMI	High beam lever on the steering beam	KL15 ON AND HBLSW passing	KL15 OFF

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Fog lights Fog lights indicator on HMI	Fog lights switch (FLS)	KL15 ON AND Light switch ON AND Fog lights switch ON	KL15 OFF OR Fog lights switch OFF OR Light switch OFF
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The low beam can be turned on by a light switch while signal KL15 is activated via Ignition Key. Any malfunction of the low beam lamps shall be indicated to the driver.

As an additional function, the daytime running light (DRL) is available as part of the FLM system.

Moreover, FLM manages high beam and fog lights.

All relevant normative regulations available for the low beam, DRL, high beam, and fog lights functions are to be applied.

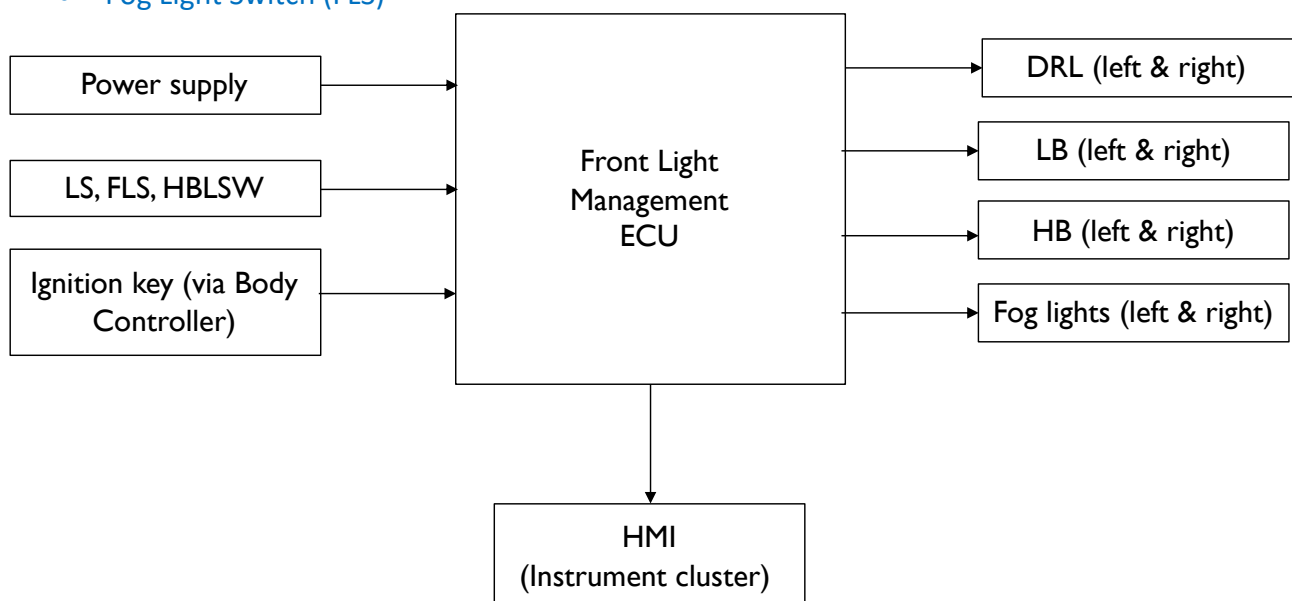
Functional block diagram

Please describe the interaction with external systems or items and/or interfaces to other elements outside the boundary of your item. Please consider the combination of “sensor-logic-actuator” and choose functional names for these elements regarding your item.

The item shall be marked.

The following figure shows the assumed system architecture including system elements like:

- Front Light Management ECU
- Ignition Key (via Body Controller)
- Power Supply
- DRL, left and right
- Light Switch (LS)
- High beam lever on the steering wheel (HBLSW)
- Fog Light Switch (FLS)



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The technical interfacing of system elements with FLM ECU is assumed as shown in figure and table

System element	Interface to FLM ECU
Light switch position (LS)	DIO
High beam lever on the steering wheel (HBLSW)	DIO
Fog Lights switch (FLS) position	DIO
Ignition Key position (KL15) (via Body Controller)	CAN interface
Low beam lamp driver (left)	PWM
Low beam lamp driver (right)	PWM
Daytime running lights lamp drivers (left and right)	PWM
High beam lights lamps drivers (left and right)	PWM
Fog lights lamp drivers (left and right)	PWM
Power supply	Analog

Assumptions:

As a starting point, the following configuration of the system is assumed:

- Implementation of FLM on one ECU
- Activation of low beam lights via a switch which provides one output that is a digital input for the FLM ECU (more complex hardware diagnostics of sensors should be provided, like the use of multiple digital outputs from LS with a logic table to validate the status)
- Emergency light functionality is provided by independent hardware
- All memories (volatile and non-volatile) is protected against reversible transient faults. It is assumed that mechanisms like ECC are available
- Hardware means for memory partitioning, like MPU or MMU, are available
- The microcontroller is considered as a Safety Element out of Context (SEooC), hence the analysis of failure modes of the microcontroller is performed and safety measures are defined and implemented. This analysis is based on data provided by the supplier (safety manual) and the requirements of ISO26262.

Boundaries of the system responsibility and interfaces

Please describe the boundary of the system responsibility, interaction with external systems or items and interfaces to other elements outside your item in combination with the block diagram above

The system is in charge to light up the vehicle's front lights. It reads data from the can bus (KL15), and the positions of LS, FLS, and HBLSW to determine what bulbs or LEDs, between DRL, low beam, high beam and fog lights have to be turned on.

Other sources of hazards, which influence the safety and reliability of the item

Please describe other sources (not E/E) of hazards, which influence the safety and reliability of the item

Vibrations leading to mechanical damage, vandalic acts, collision with debris during the driving

Functional requirements

Please describe all already noted functional safety requirements, this is normally output of H&R.

DRLs have to stay turned on when the KL15 is on. The only exception is when the low beam is turned on. In this case, DRLs are turned off.

The high beam has to turn on when LS is on and HBLSW is on or anytime HBLSW is held in the "passing" position.

Other requirements

Other environmental requirements which can influence your item

Law, directive and standard

List the laws, directives and standard which have to be considered

External measure to minimizing risks

Which external measures can be taken in order to minimize the risk:

- The vehicle operator is required by law to be properly trained and to obtain a driving license, so he/she verifies, before start driving, that the lamps are all working properly.