

Software Safety Requirements and Architecture

Lane Assistance

**Document Version: 1.0**



# Document history

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| Date | Version | Editor | Description |
| 03.11.2018 | 1.0 | Nathan Greco | First Draft |
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# Purpose

The software requirements and architecture define the structure of the software and the requirements include those defined in both the functional and technical safety concepts to ensure the final developed system satisfies ISO 26262.

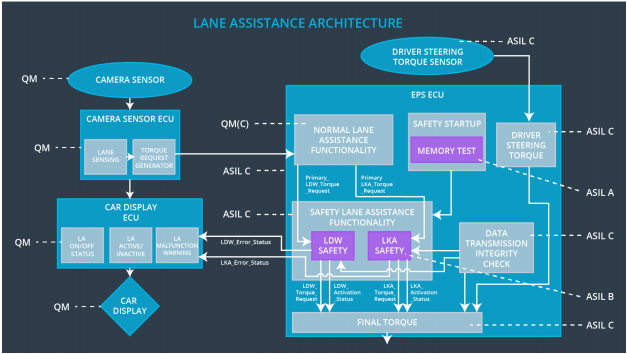
# Inputs to the Software Requirements and Architecture Document

## Technical safety requirements

Technical Safety Requirements related to Functional Safety Requirement 01-01 are:

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| **ID** | **Technical Safety Requirement** | **ASIL** | **Fault Tolerant Time Interval** | **Architecture Allocation** | **Safe State** |
| Technical  Safety  Requirement  01 | The LDW safety component must check the magnitude of the torque command against a min/max threshold | D | 100 ms | LDW System | LDW Disabled with visual indication |
| Technical  Safety  Requirement  02 | The LDW safety component must check the frequency of the torque command against a min/max threshold | D | 100 ms | LDW System | LDW Disabled with visual indication |
| Technical  Safety  Requirement  03 | The LDW safety component must continuously check that valid road lanes have been detection and a vehicle position identified | QM | 500 ms | LDW System | LDW Disabled with visual indication |
| Technical  Safety  Requirement  04 | The LKA safety component must continuously check that the actual torque command is does not exceed a delay from the command | C | 100 | LKA System | LKA Disabled with visual indication |
| Technical  Safety  Requirement  05 | The LKA safety component must continuously check that valid road lanes have been detection and a vehicle position identified | QM | 500 ms | LDW System | LDW Disabled with visual indication |

## Refined Architecture Diagram from the Technical Safety Concept



**Figure 1** – Detailed system architecture with ASIL ratings

# Software Requirements

**Lane Departure Warning (LDW) Amplitude Malfunction Software Requirements:**

**[Instructions: Fill in the software safety requirements for the LDW amplitude malfunction technical safety requirements. We have provided the associated technical safety requirements. Hint: The software safety requirements were discussed in the text from the software and hardware lesson.**

**OPTIONAL:**

**CHALLENGE ONE**

**Develop software safety requirements for the Lane Departure Warning (LDW) frequency function and modify the system architecture as needed.**

**CHALLENGE TWO**

**Develop software safety requirements for the Lane Keeping Assistance (LKA) function and modify the system architecture as needed.**

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| **ID** | **Technical Safety Requirement** | **ASIL** | **Fault Tolerant Time Interval** | **Allocation to Architecture** | **Safe State** |
| Technical  Safety  Requirement  01 | The LDW safety component shall ensure that the amplitude of the LDW\_Torque\_Request sent to the Final Electronic Power Steering Torque component is below Max\_Torque\_Amplitude |  |  |  |  |

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| ID | Software Safety Requirement | ASIL | Allocation Software Elements | Safe State |
| Software  Safety  Requirement  01-01 |  |  |  |  |
| Software Safety Requirement 01-02 |  |  |  |  |
| Software Safety Requirement 01-03 |  |  |  |  |

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| **ID** | **Technical Safety Requirement** | **ASIL** | **Fault Tolerant Time Interval** | **Allocation to Architecture** | **Safe State** |
| Technical  Safety  Requirement  02 | The validity and integrity of the data transmission for LDW\_Torque\_Request signal shall be ensured |  |  |  |  |

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| **ID** | **Software Safety Requirement** | **ASIL** | **Allocation Software Elements** | **Safe State** |
| Software Safety Requirement 02-01 |  |  |  |  |
| Software Safety Requirement 02-02 |  |  |  |  |

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| **ID** | **Technical Safety Requirement** | **ASIL** | **Fault Tolerant Time Interval** | **Allocation to Architecture** | **Safe State** |
| Technical  Safety  Requirement  03 | As soon as a failure is detected by the LDW function, it shall deactivate the LDW feature and the LDW\_Torque\_Request shall be set to zero |  |  |  |  |

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| **ID** | **Software Safety Requirement** | **ASIL** | **Allocation Software Elements** | **Safe State** |
| Software Safety Requirement03-01 |  |  |  |  |
| Software Safety Requirement03-02 |  |  |  |  |
| Software Safety Requirement03-03 |  |  |  |  |
| Software Safety Requirement03-04 |  |  |  |  |
| Software Safety Requirement03-05 |  |  |  |  |

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| **ID** | **Technical Safety Requirement** | **ASIL** | **Fault Tolerant Time Interval** | **Allocation to Architecture** | **Safe State** |
| Technical  Safety  Requirement  04 | As soon as the LDW function deactivates the LDW feature, the LDW Safety software block shall send a signal to the car display ECU to turn on a warning light |  |  |  |  |

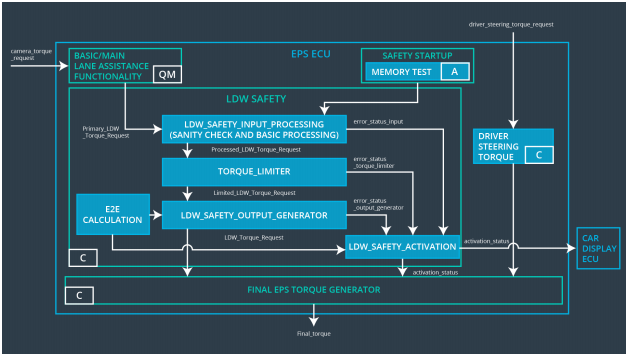
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| **ID** | **Software Safety Requirement** | **ASIL** | **Allocation Software Elements** | **Safe State** |
| Software Safety Requirement 04-01 |  |  |  |  |

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| **ID** | **Technical Safety Requirement** | **ASIL** | **Fault Tolerant Time Interval** | **Allocation to Architecture** | **Safe State** |
| Technical  Safety  Requirement  05 | Memory test shall be conducted at start up of the EPS ECU to check for any faults in memory |  |  |  |  |

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| **ID** | **Software Safety Requirement** | **ASIL** | **Allocation Software Elements** | **Safe State** |
| Software Safety Requirement 05-01 |  |  |  |  |
| Software Safety Requirement 05-02 |  |  |  |  |
| Software Safety Requirement 05-03 |  |  |  |  |
| Software Safety Requirement 05-04 |  |  |  |  |

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# Refined Architecture Diagram

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**Figure 2** – EPS ECU software system architecture