|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | | |  |
|  |  | | |  |
|  | Digital Scent | | |  |
|  | (G1VAB) | | |  |
|  |  | | |  |
|  |  | | |  |
| Document Type | **Feature Document (FD)** | | |  |
| Template Version | **6.1a** | | |  |
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|  | | | | |
| Document Approval | | | | |
| Person | Role | | Email Confirmation | Date |
|  |  | |  |  |
|  |  | |  |  |

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**Important Note**

You need to use the RE specification macros provided by the “RE\_SpecificationMacroTemplate.dotm” (refer to “Utilities” on [page “Specification Templates” in the RE Wiki](http://wiki.ford.com/display/RequirementsEngineering/Specification+templates)) to allow seamless VSEM import of the specification content. **Use only these RE specification macros to create requirements** in this specification. Refer to “[How to use the Specification Templates](http://wiki.ford.com/display/RequirementsEngineering/How+to+use+the+Specification+Templates?src=contextnavpagetreemode)” on how to enable and use the macros and the requirements templates in this specification.

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# Introduction

## Document Purpose

A Feature Document (FD) document specifies **what** the feature shall do and how it shall behave from customer perspective. It should also provide reasoning and background **why** we have the feature in the vehicle.

The FD also serves as an Item Definition as defined by ISO26262 for those features, which follow the Ford Functional Safety process.

To get more information about the concept of feature, function and component level abstraction refer to the [Ford RE Wiki](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Engineering+for+SW+Enabled+Features). For details on the Ford Functional Safety (ISO26262) process refer to the [Ford Functional Safety Sharepoint](https://pd3.spt.ford.com/sites/GlobalFunctionalSafety/Pages/default.aspx).

## Document Scope

This Feature Document (FD) specifies the following features:

|  |  |  |  |
| --- | --- | --- | --- |
| **Feature ID** | **Feature Name** | **Owner** | **Reference** |
| G1VAB | Digital Scent | Ma ShuHan | <Add VSEM Link> |
|  |  |  |  |

Table 1: Features described in this FD

## Document Audience

The FD is written by the feature owner of PMT2 team,China,REC 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 stakeholders have access to the currently valid version of the FD.

**#Hint:** The FD template has the IP Classification “Proprietary” by default. IP Classification “Confidential” might be required in some cases, e.g. by Ford Functional Safety.

**#Macro:** [Add Ins -> Edit Document Properties macro](http://wiki.ford.com/display/RequirementsEngineering/How+to+use+the+Specification+Templates#HowtousetheSpecificationTemplates-EditDocProperties) (select “Proprietary” for “Document Classification”)

### Stakeholder List

For the latest list of stakeholder of the feature and their influence refer to <Put VSEM Link here>.

**#Hint:** Refer to [Ford RE Wiki – Stakeholder List](http://wiki.ford.com/display/RequirementsEngineering/Stakeholder+Analysis) on how to create a stakeholder list. The stakeholder list should be stored in VSEM in the pseudo folder “General Data Artifacts” of the corresponding feature.

## Document Organization

### Document Context

Refer to the [Specification Structure page](http://wiki.ford.com/display/RequirementsEngineering/Specification+templates) in the [Ford RE Wiki](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Engineering+for+SW+Enabled+Features) 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, feature variants and corresponding regions and markets. Also includes input requirements, assumptions and constraints.

**Section 3** – Feature Context describes all external entities, which have an influence on the feature.

**Section 4** – Feature Modeling. Contains Use Case, Driving Scenarios, State Charts to describe the functional behavior of the feature.

**Section 5** – Safety. Lists System Behaviors and Safety Goals of the feature.

**Section 6** – Feature Requirements. Lists functional and non-functional requirements of the feature.

**Section 7** – Architecture. Shows the coarse architecture, which the feature requirements are deployed to. Describes the elements and the boundary of the feature as well as the decomposition and distribution of associated functions.

**Section 8** – List of Open Conerns

**Section 9** – Document Change 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.

**Section 10** – Appendix

**#Hint:** All sections are mandatory, unless explicitly marked by the tag “#Classification” as “optional” or as applicable e.g. to certain domains like “Functional Safety”.

## Document Conventions

### Requirements Templates

Refer to “[How to use the Specification Templates](http://wiki.ford.com/display/RequirementsEngineering/How+to+use+the+Specification+Templates?src=contextnavpagetreemode)” on how to use the specification templates and the VBA macros to create/edit the requirements in the specifications.

The VBA macro enable the import of the specification to VSEM (refer to ["How to import specifications into VSEM as separate requirements"](http://wiki.ford.com/pages/viewpage.action?pageId=104991616&src=contextnavpagetreemode)).

#### 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 FD shall be composed of 4 parts:

* A leading prefix, which indicates the type of requirement (R=Requirement, UC=Use Case, SC=Scenario, …)
* A prefix, which indicates the abstraction level (F=Feature, FNC=Function, CMP = component).
* Followed by a name, indicating the scope, which the requirement belongs to (e.g. feature or function name )
* Ending with the actual requirement number

*Example:*

*R\_F\_AutoLamps\_00004* This is the fourth requirement on feature level for the feature Autolamps.

#### Requirements Attributes

The templates provided by *Specification\_Macros.dotm* define a list of attributes for each requirement. This helps to classify the requirement. The attributes are explained at [RE Wiki - Requirements Attributes](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes?src=contextnavpagetreemode).

## References

### Ford Documents

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

| **Reference** | **Title** | **Doc. ID** | **Document Location** | **Revision** |
| --- | --- | --- | --- | --- |
| e.g. [ARL\_xyz] | e.g. “Attribute requirements List of the feature” |  |  |  |
|  |  |  |  |  |

Table 2: Ford internal Documents

### External Documents and Publications

The list of external documents could include books, reports and online sources.

**#Hint:** You may refer to [IEEE Citation Reference](http://www.ieee.org/documents/ieeecitationref.pdf) on how to format a reference.

| **Reference** | **Document / Publication** | **Document Location** |
| --- | --- | --- |
| [bbb] |  |  |
|  |  |  |

Table 3: External documents and publications

## Glossary

**#Hint**: Terms, concepts and abbreviations used in the document shall 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.

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)

### Definitions

| **Definition** | **Description** |
| --- | --- |
|  |  |
|  |  |
|  |  |

Table 4: Definitions used in this document

### Abbreviations

| **Abbr.** | **Stands for** | **Description** |
| --- | --- | --- |
|  |  |  |
|  |  |  |
|  |  |  |

Table 5: Abbreviations

### Parameters / Values

| **Name** | **Description** | **Range / Resolution** |
| --- | --- | --- |
|  |  |  |
|  |  |  |
|  |  |  |

Table 6: Parameters / Values used in this document

# Feature Overview

## Purpose and Description of Feature

**#Hint:** Some descriptive text to explain the purpose and functionality of the feature.

Digital Scent is a feature that can provide a certain density and type of scent to the cabin to provide comfortness to customer.

There should be 3 scent available for the module, and 3 different density.

The feature shall have the capability to add more scent in the future.

All control will be via IVI, the only hard button on the module is the cartridge replace button.

## Feature Variants

**#Hint:** List all known variants of the feature applying to current and upcoming programs. Reference each variant by a descriptive name. If no variant exists, state “No Feature Variants”. The “Variant Description” table column should give a short informative text, which describes the variant of the feature.

Requirements in chapter “Feature Requirements”, which do not apply for all variants, should clearly state, which variants they are applicable for.

|  |  |  |
| --- | --- | --- |
| Variant Name | Variant Description | Remarks |
|  |  |  |
|  |  |  |
|  |  |  |

Table 7: Feature Variants

### Regions & Markets

**#Hint:** Description of purpose and functionality of the feature. If there is no variant, give feature name in first column.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Market /**  **Region**  Variant Name | **North America** | **South America** | **Europe** | **Middle East / Africa** | **Asia / Pacific** | **China** |
|  | Optional | Optional | Optional | Optional | Optional | Optional |

Table 8: Regions & Markets

## Input Requirements/Documents

**#Hint:** List relevant documents or requirements, which should be considered when considered when specifying the requirements in chapter “Feature Requirements” of this document. When finalizing the spec, the feature owner should check, if all inputs have been properly considered by derived/outgoing requirements.

|  |  |  |  |
| --- | --- | --- | --- |
| **Reference**  (Reference as listed in ch. “References) | **Section/Requirement** | **Description** | **Derived Requirement**  (optional – reference to requirement in ch. “Feature Requirements”) |
| **Attribute Requirements** | | | |
|  | <Example:  id + title of attribute requirement> | <Example: “attribute requirement(s) of feature xyz”> | <If you reference a requirement in this column, that requirement should have a trace link in its [“Source”/”Source Req.” attribute](http://wiki.ford.com/display/RequirementsEngineering/Requirements+Attributes) field referring back to the input requirement (or to a requirement inside the input document) given in this table row> |
|  |  |  |  |
| **Ford Engineering Standards** | | | |
|  | ES-MJ7B-S060C37&S060C38-AA | Component requirement for Digital Scent Module & Cartridge |  |
|  |  |  |  |
| **Legal Regulations** | | | |
|  | <Example: some paragraph from ECE or FMVSS> |  |  |
|  |  |  |  |
| **Industry Standards** | | | |
|  | <Example: some ISO/IEEE/SAE or other standard> |  |  |
|  |  |  |  |
| **Other Sources** | | | |
|  | <Example: some stakeholder document> |  |  |
|  |  |  |  |

Table 9: Input Requirements/Documents

## Lessons Learned

**#Hint:** Additional information and lessons learned from previous development or related features. A typical source for Lessons Learned is the FMA Quality History.

**#Functional Safety:** In context of Functional Safety Lessons Learned and similar information will be used to check the completeness of the Functional Safety Goals and assumptions in the Hazard Analysis and Risk Assessment (HARA).

**#Link:** [Ford Functional Safety Sharepoint](https://pd3.spt.ford.com/sites/GlobalFunctionalSafety/Pages/default.aspx)

## Assumptions

**#Classification**: Optional

**#Hint:** A list of known assumptions concerning the effects of the feature’s behavior on other features or elements (i.e., dependencies) as well as assumptions on the behavior expected by the feature (e.g. known limitations). During the course of the feature development most of those assumptions are typically either converted into actual requirements or discarded at some point – such that this chapter remains mostly empty. For assumptions, which are relevant for the Functional Safety process refer to chapter 6.2 “Safety Assumptions”

# Feature Context

## Feature Context Diagram

**#Hint:** High level diagram of feature interactions with the environment, people or other feature or other external entities.

**#Link:** [RE Wiki - Context Diagram](http://wiki.ford.com/pages/viewpage.action?pageId=107676234&src=contextnavpagetreemode)

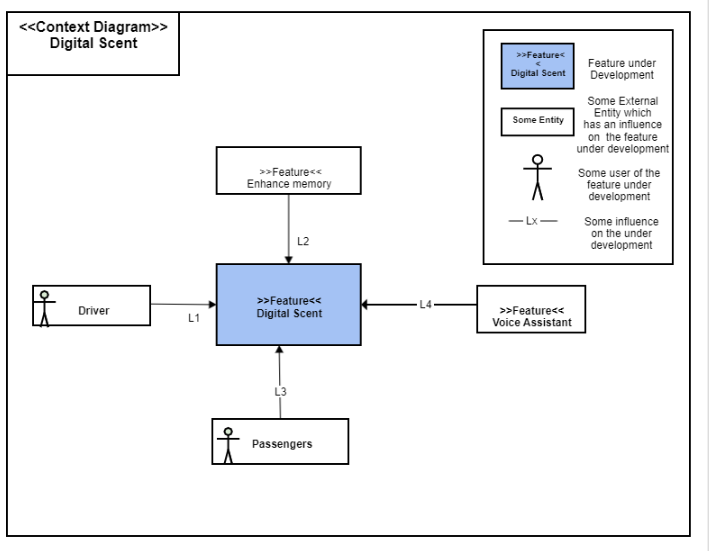


Figure 1: Sample Context Diagram

## List of Influences

|  |  |  |
| --- | --- | --- |
| **ID** | **External Entity** | **Influence Description** |
| I1,l3 | Driver/Passengers | User Request to activate / deactivate the feature |
| I2 | Enhance memory | IVI save the setting data of digital scent by user |
| I4 | Voice Assistant | It’s a service which could help the user to control IVI by voice, User could enable/disable the digital scent by voice command |

Table 10: List of Influences

# Feature Modeling

## Operation Modes and States

**#Classification:** Optional (Mandatory for Functional Safety)

**#Link:** [RE Wiki – State Charts](http://wiki.ford.com/display/RequirementsEngineering/State+Charts?src=contextnavpagetreemode)

**#Hint:** State Charts are a popular means to express feature behavior in terms of states and modes. An advantage of this state machine like approach is that consistency can be easily verified.

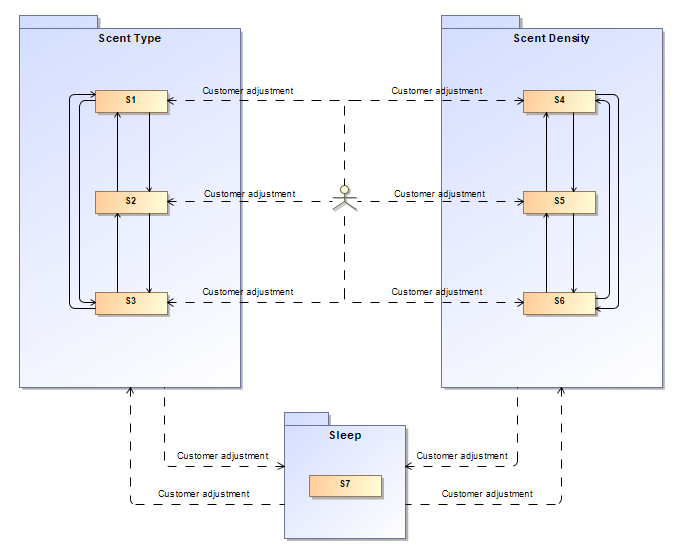


Figure 2: Feature Operation Modes and States Diagram

|  |  |  |
| --- | --- | --- |
| **State** | **Description** | **Requirements Reference** |
| Scent1 S1 | The Scent installed in Channel 1 |  |
| Scent2 S2 | The Scent installed in Channel 2 |  |
| Scent3 S3 | The Scent installed in Channel 3 |  |
| Density1 S4 | Low Density |  |
| Density2 S5 | Medium Density |  |
| Density3 S6 | Heavy Density |  |
| Digital Scent off S7 | Scent System shut off |  |

Table 11: Operation Modes and States

## Use Cases

**#Classification:** Optional

**#Link:** [RE Wiki – Use Cases](http://wiki.ford.com/display/RequirementsEngineering/Use+Cases+Overview?src=contextnavpagetreemodehttp://wiki.ford.com/display/RequirementsEngineering/Use+Cases?src=contextnavpagetreemode)

### Use Case Diagram

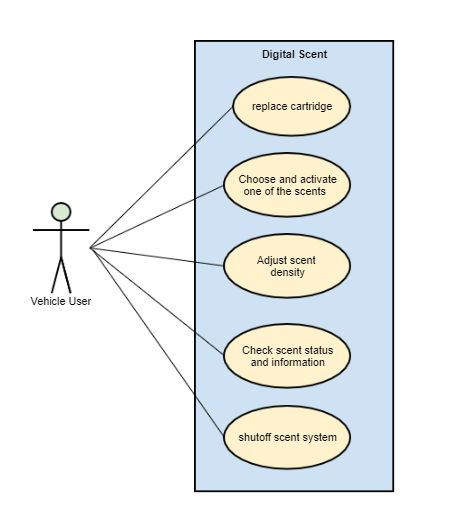


Figure 3: Use Case Diagram

### Actors

| Actor | Description |
| --- | --- |
| Vehicle User | Driver or Passenger using the digital scent feature within the vehicle. |
|  |  |
|  |  |

Table 12: List of Actors

### Use Case Descriptions

**#Classification:** Optional

**#Macro:** [Add Ins -> Add Requirement macro](http://wiki.ford.com/display/RequirementsEngineering/How+to+use+the+Specification+Templates#HowtousetheSpecificationTemplates-AddNewRequirement) (select “Use Case” as type)

###UC\_F\_DigitalScent\_00001### Choose and activate one of the scents

|  |  |  |
| --- | --- | --- |
| **Actors** |  | Driver and passengers |
| **Purpose** |  | User wants to activate a certain scent in the vehicle, He can select a kind of scent in the IVI , and can also do this via voice. |
| **Pre-Conditions** |  | 1         Ignition on  2       Vehicle dynamic/static |
| **Main Flow** | M1 | The user enter into Digital Scent screen |
|  | M2 | The user selects one of the scent type on IVI |
|  | M3 | Scent 1 : highlight Scent 1 picture in the IVI . change the background to scent 1 related image. Scent 2: highlight Scent 2 picture in the IVI . change the background to scent 2 related image. Scent 3: highlight Scent 3 picture in the IVI . change the background to scent 3 related image. |
| **Alternative Flow 1** |  | If digital Scent state is in unnormal condition(over temperature, low voltage…), it will not output any scent. |
| **Alternative Flow 2** |  | User says “Activate Scent 1/2/3 “ ,“I want some scent” switch to M3 |
| **Post Conditions** |  |  |

###UC\_F\_DigitalScent\_00002### Replace cartridge

|  |  |  |
| --- | --- | --- |
| **Actors** |  | Driver and passengers |
| **Purpose** |  | Users change cartridge when the previous one is empty or other condition. |
| **Pre-Conditions** |  |  |
| **Main Flow** | M1 | User push the cartridge replace button |
|  | M2 | The cartridge tray door opens and rotate out |
|  | M3 | Customer take out the previous cartridge and put new cartridge in |
|  | M4 | User close the tray |
|  |  |  |
| **Post Conditions** |  |  |

###UC\_F\_DigitalScent\_00003### Digital Scent shut off

|  |  |  |
| --- | --- | --- |
| **Actors** |  | Driver and passengers |
| **Purpose** |  | Users want to shutoff the system |
| **Pre-Conditions** |  | Ignition on  Vehicle dynamic/static |
| **Main Flow** | M1 | User push the shut off button on the IVI screen |
|  | M2 | The Module turn off |
|  |  |  |
|  |  |  |
| **Alternative Flow 1** |  | <IVI account not log in>  IVI notifies user to login |
| **Alternative Flow 2** |  | User says " shut-off the scent" " I don’t want scent anymore“ |
| **Post Conditions** |  |  |
| **Exceptions** |  | NA |

###UC\_F\_DigitalScent\_00004### Digital Scent Density Adjust

|  |  |  |
| --- | --- | --- |
| **Actors** |  | Driver and passengers |
| **Purpose** |  | User like the scent to be more subtle or stronger. He can adjust the intensity in the IVI, but can also do this via voice. |
| **Pre-Conditions** |  | Ignition on  Vehicle dynamic/static |
| **Main Flow** | M1 | User selects a scent type |
|  | M2 | User adjust the intensity value |
| **Alternative Flow 1** |  | <IVI account not log in>  IVI notifies user to login |
| **Alternative Flow 2** |  | If the scent system is OFF, it will not output the scent, just save the setting. |
| **Alternative Flow 3** |  | User says “adjust the intensity to 1/2/3, high/medium/low” |
| **Post Conditions** |  | IVI shows updated setting of digital scent, if the scent is on , it will output the scent with the new intensity value |
| **Exceptions** |  | NA |

###UC\_F\_DigitalScent\_00005### Digital Scent checking Status

|  |  |  |
| --- | --- | --- |
| **Actors** |  | Driver and passengers |
| **Purpose** |  | User want to check which kind of scent is activated or other basic information of the scent.  User want to see the remaining life of her scent cartridges and order additional replacements if needed |
| **Pre-Conditions** |  | Ignition on  Vehicle dynamic/static |
| **Main Flow** | M1 | The user enter into the fragrance device management system in IVI |
| **Post Conditions** |  | Show remaining scent life of each cartridge,  Show authentication information of each cartridge  Show current scent and diffusion speed |
| **Exceptions** |  | NA |

## Driving and Operation Scenarios

**#Classification:** Optional (Mandatory for Functional Safety)

**#Macro:** [Add Ins -> Add Requirement macro](http://wiki.ford.com/display/RequirementsEngineering/How+to+use+the+Specification+Templates#HowtousetheSpecificationTemplates-AddNewRequirement) (select “Scenario” as type)

**#Functional Safety:** Driving and operating scenarios which impact the functionality of the feature can be used to check, if the situation analysis in the HARA is complete

**#Link:** [RE Wiki – Driving Scenarios](http://wiki.ford.com/display/RequirementsEngineering/Driving+Scenarios?src=contextnavpagetreemode)

## Decision Tables

**#Classification:** Optional

**#Link:** [RE Wiki – Decision Tables](http://wiki.ford.com/display/RequirementsEngineering/Decision+Table).

**#Hint:** Use decision table, if behavior is not state based (in that case prefer state chart from ch. 4.1) and based purely on current inputs.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Input 1** | **Input 2** | **Input 3** | **Input 4** | **Output** |
| Value I1 | Value I2 |  |  | Value O1 |
|  |  |  |  |  |

Table 13: Sample Decision Table

# Feature Requirements

**#Macro:** [Add Ins -> Add Requirement macro](http://wiki.ford.com/display/RequirementsEngineering/How+to+use+the+Specification+Templates#HowtousetheSpecificationTemplates-AddNewRequirement) (select “Requirement” as type)

**#Hint**: Include functional requirements specifying quality, performance and availability of the functionality. The subsections of this chapter help not to forget aspects, which are typically relevant on feature level. It is not possible and not required to always strictly classify a requirement according to the subsections.

**#Functional Safety:** In general, safety requirements are not listed here. However, it is possible that later in the development process, a non-safety requirement becomes a safety requirement. In such a case it may remain on this list.

**#Link:** [RE Wiki – How to write good requirements](http://wiki.ford.com/display/RequirementsEngineering/How+to+write+better+requirements?src=contextnavpagetreemode).

## Functional Requirements

**#Hint:** Functional requirements specify the functionality of the feature, i.e., what the feature shall do. Functional requirements should not only specify the normal flow/behavior, but also exceptional cases/error handling.

**#Functional Safety:** Additionally, assumed capabilities of the actuators could be specified. (Capabilities of the actuators are used to identify the effect of the malfunctioning behavior in HARA and to classify the hazardous events).

*###DigitalScent-F-R\_0001:###Digital Scent Mood Setting*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Description** | | | | |
| After user select a kind of mood, such like forest rejuvenation mood, user can define their favorite way,  Such as, user can switch on/off the scent, switch on/off seat massage. Details refer to HMI requirements. | | | | |
| **Rationale** | | | | |
|  | | | | |
| **Acceptance Criteria** | | | | **DVM** |
|  | | | |  |
| **Notes** | | | | |
|  | | | | |
| **Type** | Functional | **Source** |  | |
| **Priority** | Mandatory | **ASIL** | N/A | |
| **Stability** | Draft | **Known Conflicts** | none | |

*###DigitalScent-F-R\_0001:###Digital Scent Mood*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Description** | | | | |
| The scent system will read the speed of the vehicle, and give different kind of rejuvenation and waking up mode. | | | | |
| **Rationale** | | | | |
|  | | | | |
| **Acceptance Criteria** | | | | **DVM** |
|  | | | |  |
| **Notes** | | | | |
| When the vehicle is static or dynamic, the scene on IVI is different.  Details is TBD | | | | |
| **Type** | Functional | **Source** |  | |
| **Priority** | Mandatory | **ASIL** | N/A | |
| **Stability** | Draft | **Known Conflicts** | none | |

*###**DigitalScent-F-R\_0002:###Digital Scent States*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Description** | | | | |
| Digital Scent shall be in one of the following operational states:   * Digital Scent Activated (feature controls scent system to output scent) * Digital Scent Deactivated (close the scent system) | | | | |
| **Rationale** | | | | |
|  | | | | |
| **Acceptance Criteria** | | | | **DVM** |
|  | | | |  |
| **Notes** | | | | |
| **User could activate or deactivate the feature by the button in IVI or by Voice, such as “open the digital scent”** | | | | |
| **Type** | Functional | **Source** |  | |
| **Priority** | Mandatory | **ASIL** | N/A | |
| **Stability** | Draft | **Known Conflicts** | none | |

*###DigitalScent-F-R\_0003:###Digital Scent Cartridge life*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Description** | | | | |
| IVI shows the scent life of each cartridge   * If the scent life is below 10%, it will shows in a conspicuous color. * Ford Cloud will push some purchase recommendation to IVI if the scent life is below 10%, push purchase recommendation once a day when the digital scent is in activated state. (If the online mall is ready, it should be linked to the online mall) | | | | |
| **Rationale** | | | | |
|  | | | | |
| **Acceptance Criteria** | | | | **DVM** |
|  | | | |  |
| **Notes** | | | | |
|  | | | | |
| **Type** | Functional | **Source** |  | |
| **Priority** | Mandatory | **ASIL** | N/A | |
| **Stability** | Draft | **Known Conflicts** | none | |

*###DigitalScent-F-R\_0004:###Digital Scent Cartridge warning*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Description** | | | | |
| Each scent(cartridge) have an ID and can be recognized by the system, IVI will shows cartridge authentication warning in the two case below   * A non-authenticated cartridge is inserted * When the user checked the cartridge status, and IVI check a cartridge is not authenticated | | | | |
| **Rationale** | | | | |
|  | | | | |
| **Acceptance Criteria** | | | | **DVM** |
|  | | | |  |
| **Notes** | | | | |
| **User could activate or deactivate the feature by the button in IVI** | | | | |
| **Type** | Functional | **Source** |  | |
| **Priority** | Mandatory | **ASIL** | N/A | |
| **Stability** | Draft | **Known Conflicts** | none | |

*###**DigitalScent-F-R\_0004:### Digital Scent Error Detection*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Description** | | | | |
| IVI shall detect scent system related errors, it shall show a message to the user, how to possibly cure the error. | | | | |
| **Rationale** | | | | |
|  | | | | |
| **Acceptance Criteria** | | | | **DVM** |
|  | | | |  |
| **Notes** | | | | |
| **Error1: Scent System Controller Power Error**  **Error2: Scent System Controller connection Error**  **Error3: No available cartridge in Scent System controller**  **Error4: Over temperature(Cabin)**  **Error5: Over temperature(Module)**  The user message might refer to the “trouble shooting” section of the user manual. | | | | |
| **Type** | Functional | **Source** |  | |
| **Priority** | Mandatory | **ASIL** | N/A | |
| **Stability** | Draft | **Known Conflicts** | none | |

*###DigitalScent-F-R\_0004:### Scent Activate Time(TBD)*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Description** | | | | |
|  | | | | |
| **Rationale** | | | | |
| User expects immediated feedback, if his/her request has been processed. | | | | |
| **Acceptance Criteria** | | | | **DVM** |
|  | | | |  |
| **Notes** | | | | |
|  | | | | |
| **Type** | Functional | **Source** | HMI team | |
| **Priority** | Mandatory | **ASIL** | N/A | |
| **Stability** | Draft | **Known Conflicts** | none | |

## Non-Functional Requirements

***#Hint:*** *Non-functional requirements specify quality attributes in addition to the pure functional behavior given by the functional requirements. Examples for quality attributes: Performance (e.g. data throughput), timing (if not already included in the functional requirements), security (e.g. how secure does an algorithm have to be), reliability (e.g. mean time between failure) or maintainability.*

### Safety

**#Classification:** Optional (Remove, if not used

**#Hint:** Only those safety requirements, which are not related to Functional Safety (ISO26262) should go here. For Functional Safety refer to chapter 6 “Functional Safety”.

Not Applied

### Security

**#Classification:** Optional (Remove, if not used

Not Applied

### Reliability

**#Classification:** Optional (Remove, if not used

Digital Scent is no different than any other entertainment feature of the vehicle, so should comply the general reliability requirement.

## HMI Requirements

**#Hint:** Requirements in this section could specify details of e.g. the icons, the GUI or the sounds.

1. Customer should enter the control panel with less than two layer from the Home screen.
2. HMI should be able to provide notice to customer when an error state occurs, via voice or popup or alarm.
3. HMI should be designed to have the ability to reflect the scent mode, provide attractive, intuitive feedback to customer.
4. HMI should provide enough information for customer, including scent density, percentage, scent type.
5. HMI should have a help screen including the necessary help information for customer.

## Other Requirements

### Design Requirements

***#Hint:*** *Requirements of a Logical Function should be typically agnostic of their SW/HW implementation*. If for *specific reasons the function owner needs to define explicitly design constraints on the solution, it can be done in this chapter.*

The module should have a robust design, considering all kind of aspect and test methods.

The module should able to switch between 3 different scent, and have 3 different scent level.

Module should have the capability to extend more scent type in the future.

Should have verification method to verify the cartridge are genuine or not.

### Manufacturing Requirements

The module should be Bailment to IP or console depend on the install location.

### Service Requirements

***#Hint:*** *Requirements in this section could specify, e.g. what needs to be considered, if individual ECUs are* *replaced or new SW is flashed to ECUs (parameter set in non-volatile memory might get inconsistent and needs also to be updated).*

If possible, the Module should have OTA capability to ensure the future extend capability, if constrained by cost, then must ensure a robust verification on the module SW.

IVI must be OTA available to ensure future extend ability.

The IVI shall store the last three error signal (error state, when) in engineering mode.

#### Cloud Connectivity Data Analytics Requirements

**#Hint:** All features must consider opportunity for prognostics using cloud connectivity and data analytics. Use the Feature Data Analytics Creation Tool to identify the list of data elements that could help with the following:

* Confirm customer usage of the feature
* Early identification of feature failure modes and causes
* Data elements that help with feature reductive design

**#Link:** Feature Data Analytics Creation Tool (work in progress, no link available yet).

HMI should be able to manage the new added scent via cloud update(picture, calibration value, etc.)

### After Sales Requirements

**#Hint:** Requirements in this section could specify, e.g. input for the Owner’s Manual could be gathered.

There should be 3 default scent for all vehicle, but more scent selectable in the dealer shop or on-line shop(IVI or mobile app such as Lincoln way and Ford pass),

### Process requirements

**#Hint:** Requirements in this section are relevant for the development process of the feature, e.g. ISO26262 compliance.

The development of the feature should follow GPDS process.

# Functional Safety

**#Classification**: Functional Safety only

**#Hint:** This section is dedicated to the Ford Functional Safety (ISO26262) process. For details of this process refer **#Link:** [Ford Functional Safety Sharepoint](https://pd3.spt.ford.com/sites/GlobalFunctionalSafety/Pages/default.aspx)

**#Contact:** [*RE Wiki Roles & Responsibilites page – Role: Application Functional Safety Engineer*](http://wiki.ford.com/display/RequirementsEngineering/Default+Contacts+for+Stakeholder+Roles#ApplicationFunctionalSafetyEngineer)

Not applicable

# CyberSecurity

**#Classification**: Cybersecurity only – Otherwise remove substructure and state “not applicable”.

Not applicable

# Architecture

## Functional Architecture

**#Classification:** Mandatory for Functional Safety – otherwise optional

**#Hint**: This section depicts the coarse Functional Architecture. This architectural step is needed to find the right functional partitioning for the function level. The function shown here are those, which are specified on function level. Either SysML activity diagrams or Data Flow Diagrams could be used to depict such a Functional Architecture. For bigger features, which are decomposed in a hierarchical manner down to atomic functions (and which do not follow the Functional Safety process), a function tree could be given here.

**#Links:**

* Functional Decomposition: [RE Wiki – Functional Decomposition](http://wiki.ford.com/display/RequirementsEngineering/Functional+Decomposition)
* SysML - Activity Diagrams or [RE Wiki - Data Flow Diagrams](http://wiki.ford.com/display/RequirementsEngineering/Data+Flow+Diagram?src=contextnavpagetreemodehttp://wiki.ford.com/display/RequirementsEngineering/Data+Flow+Diagram?src=contextnavpagetreemode)
* Data Flow Diagram: [RE Wiki – Data Flow Diagram](http://wiki.ford.com/display/RequirementsEngineering/Functional+Decomposition)



Figure 4: Functional Boundary Diagram

### Logical Functions

**#Hint:** The functions shown in the Functional Architecture should be listed and described in the table below

| Function Name | Description | Comments |
| --- | --- | --- |
| HMI interface | Touch screen interface and voice control interface |  |
| Multi-Contour Seat Control | Control seat massage |  |
| Data Collection&Upload | Upload user data to cloud |  |
| Fragrance Control | Control the fragrance module and feedback status |  |
| In Car Temperature | In car temperature come from AC module |  |
| Cartridge Authentication | Authenticate the insert cartridge |  |
| Digital Scent Control | Central arbitrator of digital scent |  |
|  |  |  |

Table 14: List of Functions

# Open Concerns

**#Hint:** The following list presents open concerns, which have to be discussed or clarified over the course of the on-going requirements engineering.

| ID | Concern Description | e-Tracker / Reference | Responsible | Status | Solution |
| --- | --- | --- | --- | --- | --- |
| 1 |  |  |  |  |  |
| 2 |  |  |  |  |  |
| 3 |  |  |  |  |  |
| 4 |  |  |  |  |  |
| 5 |  |  |  |  |  |
| 6 |  |  |  |  |  |
| 7 |  |  |  |  |  |
| 8 |  |  |  |  |  |
| 9 |  |  |  |  |  |

Table 15: Open Concerns

# Revision History

| Revision | Date | Description | Approved by | Responsible |
| --- | --- | --- | --- | --- |
| A |  | Initial version |  | Sma26 |
|  |  |  |  |  |

## Template Revisions

*#Important: Do not change this section*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Version | Rev. | Date | Description | Responsible |
| 0 | 6 | 2015-05-26 | * Chapter “Feature Overview” and made a 2nd level heading. * Chapter “Feature Modeling” divided into 3 subchapter (“Scenarios”, “Use Cases”, “State Machines”) for different modeling methods | Jbaden1 |
| 0 | 7 | 2015-05-27 | * Table of Content updated * Template Revision History chapter added | Jbaden1 |
| 0 | 8 | 2015-07-02 | * Section “Unsettled Issues” added | Alevin7 |
| 0 | 9 | 2015-08-04 | * Section “Feature Variants” added * Section “Feature Boundary Diagram” renamed to “Feature Context Diagram” * Document Properties adapted to match needs of VBA macros | Jbaden1, Awegman1 |
| 1 | 0 | 2015-09-11 | * Section “Feature Variants” reworked * Feature Goals removed. Only “Safety Goals“ chapter remains. * Heading 2 formatting issues corrected. * Requirements / Use Cases Listing removed from traceability chapter. * Formatting of attribute table in Notation chapter corrected * Open Topics / Known Issues chapter moved to the end | Jbaden1 |
| 1 | 1 | 2015-11-16 | * Table-Styles removed (for smooth VSEM import) * Some clean-up of sections “Purpose” and “Audience” | Awegman1, jbaden1 |
| 1 | 2 | 2016-02-26 | * Minor corrections based on lessons learned from CC and PCL pilot (e.g. section market/regions) and discussion with Functional Safety Team (purpose of feature) * Footer corrected * Boundary diagram interface chapter renamed to influences. | Jbaden1 |
| 1 | 3 | 2016-02-26 | * Minor corrections after review with Whitney Keith from Functional Safety team | Jbaden1 |
| 1 | 4 | 2016-03-10 | * Some cleanup of meta-data in Word Properties | Jbaden1 |
| 1 | 5 | 2016-03-10 | * Footer formatting corrected (Issue 19) * Results from review with Functional Safety Team incorporated (Issue 20). | jbaden1 |
| 1 | 6 | 2016-04-18 | * Scenario Template added | Jbaden1 |
| 1 | 7 | 2016-04-18 | * Chapter “Operation Modes and States” moved before “Use Case” section. | Jbaden1 |
| 1 | 8 | 2016-04-18 | * Broken Wiki links repaired. | Jbaden1 |
| 2 | 0 | 2016-05-19 | * Adapted to Specification\_Macros.dotm V2.0 * Requirements Templates chapter (ch. 1.7.1) no longer has an attribute table, but refers directly to the Wiki.. | Jbaden1 |
| 2 | 1 | 2016-06-10 | * Table for Context Diagram modified (lists external entities and Influence Description only) | Jbaden1 |
| 2 | 2 | 2016-07-08 | * Template version added to footer * Several hints added to the various sections * Findings from Functional Safety Team incorporated. * RE\_SafetyRequirement style added | Jbaden1 |
| 2 | 3 | 2016-09-21 | * Update from Functional Safety Team incorporated (“Lessons Learned”, “System Behaviors for HARA”) | Jbaden1 |
| 2 | 4 | 2016-11-15 | * Update from Functional Safety Team incorporated (“Lessons Learned”, “System Behaviors for HARA”) * Explanatory notes made more formal | Jbaden1 |
| 3 |  |  | Skipped to synchronize with Specification\_Macros.dotm |  |
| 4 |  |
| 5 | 0 | 2017-01-13 | * Meta data updated for specification macros, version 3.1 * SW Unit chapter removed for the time being * Green boxes added for user hints | Jbaden1 |
| 5 | 1 | 2017-01-18 | * Minor editorial changes | Jbaden1 |
| 6 | 0 | 2017-02-03 | * CR48: Chapter 6 renamed from “Safety” to “Functional Safety”. New sub-chapter “Safety” introduced in Non-Functional Requirements section | Jbaden1 |
| 6 | 0 | 2017-04-28 | * CR7: “RequirementsTraceability” chapter removed | Jbaden1 |
| 6 | 0 | 2017-11-15 | * CR32/53: New Cover Sheet + Disclaimer replaces FAP-150 like ones. * CR75: Some rewording -> Terminology to Glossary, Notation -> Document Conventions * CR49: Rename “Assumptions & Constraints” to “Assumptions” * CR74: Safety Assumptions added to chapter 6. * CR58: Add function allocation column to Logical Architecture chapter | Jbaden1 |
| 6 | 0 | 2018-01-31 | * CR63: Updated links to Functional Safety Sharepoint | Jbaden1 |
| 6 | 0 | 2018-07-24 | * CR69: Add FSR to FeatureDoc * CR64: Add new section "Design Requirements" to Function Spec and Feature Spec | Jbaden1 |
| 6 | 0 | 2018-08-06 | * CR53: some corrections for metada and formatting | Jbaden1 |
| 6 | 0 | 2018-09-28 | * Broken links to RE Wiki repaired | Jbaden1 |
| 6 | 0 | 2018-10-31 | * Cover sheet and footer more GIS like. Functional Safety team feedback incorporated:   + New subsections “Functional Safety Requirements, (Decomposed) FSRs and Parameters / Values   + Removal of “Logical Architecture” | Jbaden1 |
| 6 | 0 | 2018-12-12 | * FSR template removed, now as a macro in the Specification\_Macros.dotm | Jbaden1 |
| 6 | 0a | 2019-05-23 | * Re-introduce “Logical Architecture” (for Functional Safety) | Jbaden1 |
| 6 | 0b | 2019-06-26 | * Chapter “Logical Elements” in “Logical Architecture” section added (FuSa CR 15136240) | Jbaden1 |
| 6 | 0c | 2019-03-22 | * Chapter “Decomposed FSRs” renamed to “ASIL Decomposition of Functional Safety Requirements” and moved beneath Chapter “Functional Safety Requirements”. Explanatory text improved. | Jbaden1 |
| 6 | 0c | 2019-04-05 | * Some wording in ASIL decomposition table modified. Description of fields in that table improved. | Jbaden1 |
| 6 | 0c | 2019-06-24 | * “Input Requirements” section modified (table approach as for the other RE templates). * “References” and “Glossary” chapter moved to the “Introduction” chapter. | Jbaden1 |
| 6 | 0c | 2019-07-02 | * "Important" box added on cover sheet which points to the macros | Jbaden1 |
| 6 | 0c | 2019-07-02 | * Subsection “Error Handling” removed form chapter “Feature Requirements”->”Functional Requirements” (teams are free to create their own substructure of that section). Note tells author not to forget about error handling. * Hint for chapter “Feature Variants” improved reworded upon request from Functional Safety Team. | Jbaden1 |
| 6 | 0c | 2019-05-11 | * Copyright notice shortened and moved to cover sheet and added to footer (to be compliant [with Ford copyright guidelines](http://www.fgti.ford.com/client/NewFGTI/CopyrightNotice.html)) * Term “Disclaimer” no longer used for what is actually only a copyright notice | Jbaden1 |
| 6 | 0c | 2019-22-11 | * Chapter “Input Requirements/Documentst: minor modifications (examples added), Word comment removed” | Jbaden1 |
| 6 | 0c | 2019-12-05 | * Upstream Documents section added to “Input Requirements/Documents” table * Custom style table formatting removed * Hint on system behaviors modified as requested from FuSa team | Jbaden1 |
| 6 | 0c | 2019-12-09 | * Term “Upstream Documents” replaced by “Attribute Requirements” in “Input Requirements/Documents” table * ASIL Decomposition table replaced by a version, which get not corrupted during VSEM import. | Jbaden1 |
| 6 | 0c | 2019-12-10 | * In ch. “Functional Safety Requirements” Word reference Id by Word reference text replaced.. | Jbaden1 |
| 6 | 1a | 2020-02-12 | * New chapter “Cybersecurity” added. | Jbaden1 |
| 6 | 1a | 2020-03-03 | * All User Hints formatted using style “RE\_UserHint” to enable automatic removal by a macro. | Jbaden1 |
| 6 | 1a | 2020-03-04 | * Chapter “Cloud Connectivity Data Analytics Requirements” added upon request by D. Crockett/J. Rawlings | Jbaden1 |
| 6 | 1a | 2020-03-09 | * Missing doc property “LatestSigMappingID” and “LatestAisInterfaceID” added * doc property “CopyrightDate” re-formatted to text and copyright date field in footer corrected * Version numbering re-initialized as 0.1 * Init value of version/revision date set to “yyyy/mm/dd” instead of “yyyy-mm-dd” to be in line with the “Edit Document Property” dialog * type of document property for latest IDs changed to number instead of text | Jbaden1 |

# Appendix