VEONEER STANDARD

Veoneer Product Development System (VPDS)

VS100

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Introduction

Veoneer is a major global supplier to the world's automotive vehicle industry. To be able to deliver the right products in the right time and at the right quality consistently we need a structured development process for this, involving a cross-functional team. An increasing amount of our business also demands the ability to coordinate our development activities between different Veoneer regions across the world. This standard establishes a framework with common, global requirements to be used in the local VPDS (Veoneer Product Development System) work.
Corporate requirements and guidelines are also provided in:

- Veoneer Business and Development Processes site
- VPDS Training Module with guidelines and recommendations
- eVPDS PLM system for project data and document management

1 Purpose

VPDS is a structured process and guideline to minimize the risks when performing multi-disciplinary activities that allow Veoneer to meet or exceed our customer's expectations on launches of new or modified products/processes, while meeting our design, manufacturing, quality, timing, cost and environmental goals.

2 Scope

To define a framework of activities to be undertaken and verified in a development project, clearly defined in five phases from project initiation through to product launch. This procedure identifies the minimum tasks to be performed to achieve the lowest risk when no previous knowledge exists. This framework is identified as a workflow with standard named tasks in five phases and the required order where necessary.

The VS100 is used when making a new product application to meet customer requirements and a targeted SOP date.

This standard is not applicable to process/product transfers within or between Veoneer plants. For this, VS406 shall be applied. It is applicable for transfers from external sources such as other OEMs, competitors, customers, or suppliers.

For platform-based development of products or systems based on Veoneer requirements the VS108 "New Product Development" shall be used.

If the product(s) being developed in the VS100 project are derivatives of a Veoneer product being developed to VS108, the VS108 and VS100 projects shall be synchronized.

For development of a system of system to meet customer requirements and a targeted SOP date, the VS160 (Veoneer System Development System) shall be used. In case of

projects, which are in relation to a VS160 project, the dependencies between the project milestones shall be considered.

VPDS must also include specific customer needs when required. VPDS can also be applied to other changes indirectly affecting the product design changes. Examples are major manufacturing process changes or supplier changes requiring a cross-functional project team.

VPDS projects are supported by component development projects. Component Development projects for purchased components will be managed and performed according to the Component Development Process (CDP). The Component Development Process augments VS100/VS108 processes.

Safety critical VPDS projects developed in compliance with ISO 26262 are supported by VS132 (Functional Safety Management) and the use of a safety plan that is aligned with the project plan and associated milestones.
Security related VPDS projects developed in compliance with ISO/SAE 21434 requires the use of a security plan that is aligned with the project plan and associated milestones.

3 Responsibility

The TCC Site Director/ Manager (TCC Head) is responsible that this procedure is observed and responsible to ensure that Tollgate Review Boards, TRB, are implemented. The TRB consists of leaders from the local functional management team. It is the responsibility of the Project Management Office with support of the TCC Head to ensure that a Project Manager (PM) is appointed for each VPDS project.

For all **global projects**, the Global Tollgate Review Board (GTRB) is responsible to approve each tollgate. The GTRB consists of global functional leaders. The GTRB will be led by the TG chairman. The global tollgate is held in accordance with VS100 Appendix D.

3.1 Escalation

In the event that the Project Manager (PM) or individual members of the project team needs to escalate an issue, they present the issue to the TRB for review and resolution. These escalation issues can be done prior to or during a normal Tollgate meeting. Escalations regarding safety-related anomalies include supplemental communication protocols as defined in VS132.

4 Definitions

VPDS

VPDS is a process for product development to be used when defined milestones with SOP (Start of Production) exist to support a customer commitment. VPDS could also be applied to manufacturing or supply base changes affecting the products. The product to be used in a VPDS project must be approved for VPDS usage in a Product Road Map.

eVPDS
eVPDS is the IT tool to use for managing the project data and documents for all VPDS projects. It is an integrated part or the Veoneer PLM system. Examples of required data are key milestones, task approval, issue management, status assessments, task deliverables, and team members.

The eVPDS project in PLM becomes the design authority for the parts that are generated as a result of the project.

VPDS workflow
The VPDS workflow describes how the VPDS tasks are related to each other. The VPDS workflow is separated into 5 phases. This standard makes references to a workflow that provides the least amount of risk, regardless of product type. The workflow, in its most recent version, exists in the Veoneer Business and Development Processes site and eVPDS.

Tollgate, TG
A TG is a significant event marking the progression of the VPDS project. TG requires TRB approval to pass.

Major Milestone, MM
A MM is a significant event within a VPDS project phase. MM requires management review and approval to pass. The management level for MM is decided by the TRB.

VPDS phase
A phase is a period between two tollgates. There are five phases which make up VPDS, starting with phase 0.

Project Manager, PM
The PM leads the cross-functional project team, CFT, and is responsible to meet all project targets and complete the overall planning and reporting to TRB. PM assigns tasks to team members. The PM is responsible to verify that the organization has provided the required resources for safety and security activities and that a functional safety manager and a cyber security manager have been appointed to each safety-critical project and security – related project.

Functional Safety Manager, FSM
The FSM is responsible for planning and coordinating safety activities and tracking the progress of those activities throughout the product development phases.

Cyber Security Manager, CSM
The CSM is responsible for planning and coordinating security activities and tracking the progress of those activities throughout the product development phases.

Change Leader
The PM acts as Change Leader (VS007) until the project is approved at Tollgate 4

VPDS tasks

A VPDS task is an activity that must be performed as part of the VPDS process. In addition to the tasks referenced in this standard, additional tasks can be added as part of local VPDS workflow requirements. Each individual project can also have tasks added or deleted as approved by the TRB.

Detailed task descriptions with common scope, input and output, guideline and reference to corporate and regional procedures exist in the Veoneer Business and Development Processes site. Updates to these task descriptions may only be made by the process owner of the corporate function being responsible for this process (as indicated in the flowchart).

The tasks have a standard name and numbering according to the principle: *phase number. running number*. The running number is never reused for new tasks once it has been deleted.

Task Performer
The task performer is a person with a specific role who is responsible to complete a VPDS task. This person is assigned by the PM based on regional or local requirements for the specific role.

Process Owner
The process owner for a VPDS task is the corporate function representative, responsible for how to perform the VPDS task. This includes defining the process, requirements or guidelines for how to work with the task and what defines a completed task.

VPDS Project
VPDS project starts with MM 0.0 after a VPM3 decision in the VPM process. After TG0 the project continues until TG 4.

Veoneer Pursuit Management
The VPM meeting is responsible for the approval of the project proposals prior to start of VPDS. This follows a VPM process with milestones where VPM 3 is the last one. At VPM 3, the VPM team makes the decision on whether to start a VPDS project and communicates the decision to the appointed Technical Competence Center.

Tollgate Review Board, TRB
This team reviews and approves / disapproves the project at the Tollgate Review at the end of each phase. The decision is dependent on the status of required activities and deliverables for the preceding phase, including safety and security -related deliverables. The TRB also may decide the way the project will proceed in the next phase.

TRB for Local Projects:
This review board has a chairman and representatives from the functional management team (see VS100 Appendix D).

GTRB for Global Projects
For Global Projects (see separate definition) the GTRB is the approving body. The global tollgate members are described in VS100 appendix D.

Global Projects Definition

All VS108 projects are classified as Global and are governed according to VS108 standard. A VS100 project is defined as **Global** when one of the following criteria is met:

- a project introducing a new product or technology
- a project introducing a new major global customer
- a project introducing a product launching in more than two plants within a short period of time (typically within six months)

Furthermore, the local TRB may decide to nominate a project to be presented at the GTRB for any reason it deems necessary.

Cross-Functional Project Team, CFT

The Veoneer organization identifies the cross-functional Project Team, CFT, with representatives from at least: Engineering, Manufacturing, Purchasing, Quality and Sales. The team is led by a PM (Project Manager). The representatives take the responsibility for all the required project activities according to this procedure and all local procedures ensuring that all end-of-phase tollgate requirements are met prior to Tollgate Review.

Language

The Veoneer group language is English. Based on the project tasks the following minimum requirements concerning using English must be followed:

1. Data and information about the task in eVPDS must always be in English (or in English **and** a local language).
2. Documents supporting the VS100 VPDS tasks. The documents giving the output and confirmation of this task must as a minimum be in English.
3. Documents related to locally required VPDS tasks. Local procedure applicable for these documents. If documents are in local language and requested by other Veoneer organizations (involved in same or similar project) then the company generating the information is responsible for the translation into English.

Project Setup

The Project are set up in eVPDS prior to VPM3 approval. The Account Manager or PM provides the necessary information in the Project Setup Sheet. When Account Manager and PM are in agreement on the project structure the projects are created in eVPDS.

5 Procedure

5.1 The VPDS Workflow

The VPDS Workflow consists of five phases and five TGs.

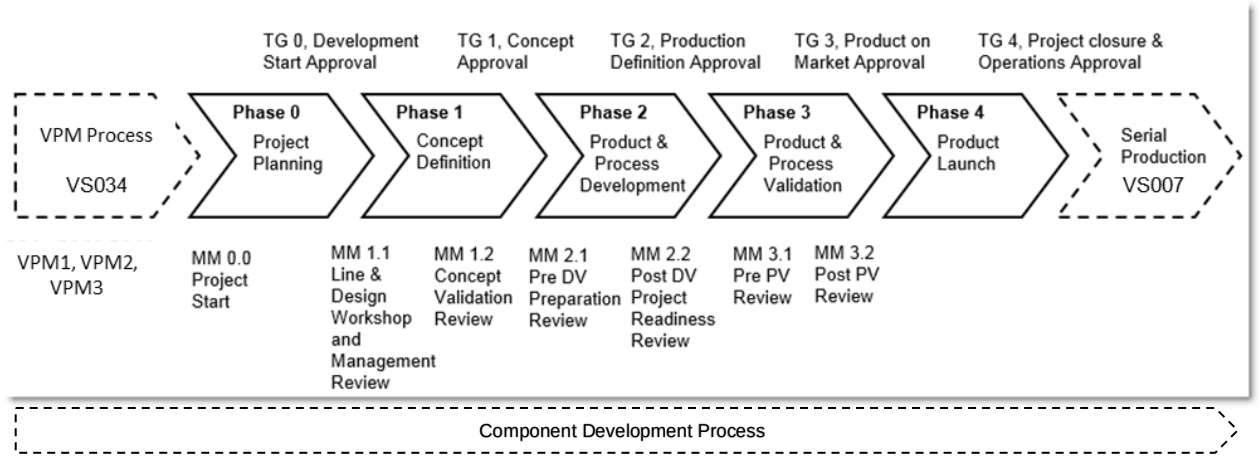

Figure 1: The VPDS Workflow

The VPDS workflow to be used in VPDS projects must all be based on the corporate VS100 VPDS workflow (ref. VPDS pages in the Veoneer Business and Development Processes site & eVPDS). This is considered as the "complete VPDS" to be viewed as the default workflow providing a minimum of risks. Please note that functional safety and cyber security related activities are relevant for all the phases in the VPDS workflow. Changes are possible for individual projects when approved by TRB. These changes must be justified and may fall into any of these categories:

- Elimination of Tasks when completed previously in other projects with enough similarity.
- Elimination of Tasks when not needed due to the nature of the project (e.g. no prototype tooling when prototypes are not required)
- Alternative ways to perform the tasks still within the scope. (e.g. different risk assessment methods for different product types)
- Added Tasks and milestones as required by customers.

Alternatively, special workflow templates could be developed in eVPDS. These must be based on VS100 VPDS with permanent changes according to the requirements above. These templates need to be approved by Project Management Office.

For projects where products are transferred from other OEMs, competitors, customers or suppliers, VS100 phases 3 & 4 must be completed and more if the TRB determines that it is necessary.

Complete list of tasks, their description and list of required deliverables can be found in the VPDS pages on the Veoneer Business and Development Processes site.

5.1.1 TG and MM meaning

The TG and MM described in this standard has a well-defined meaning and purpose. Approval of these MM and TG means that their purpose is fulfilled or that the management has given approval to proceed.

TG / MM	Approved by	External Driver	TG / MM Meaning
MM 0.0	Project Management	Approved VPM3 to start VPDS project	Approval to prepare detailed project plan based on VPM3 output
TG 0	TRB	Proposed project + plan	Development start with verified customer or management commitment
MM 1.1	Project Management	Line & Design workshop	Line & Design workshop and proof of concept. Prototype delivery planning.
MM 1.2	Project Management	Plan for DV testing	DV plan approved
TG 1	TRB	Prototype and DV testing plan	Prototype tooling with HW/SW definitions (as applicable) kick-off and approval of validated concept and start of design validation.
MM 2.1	Project Management	Date for DV testing	DV test plan, equipment and parts OK
MM 2.2	Project Management	Date for DV completion	Product design OK. CAPEX OK to submit
TG 2	TRB	Production tooling dates	Product and process definition approval and production tooling kick-off
MM 3.1	Project Management	Date for PV parts	PV plan approval
MM 3.2	Project Management	Date for PPAP completion	Product and process design OK
TG 3	TRB	Date for first sellable vehicle	Parts approved for market use (sellable vehicle)
TG 4	TRB	SOP + 90 days	Final VPDS project closure, handover to and acceptance by operations

Figure 2: TG and MM meaning

5.1.2 Phase 0, Project Planning

Phase 0 starts with MM0.0 which starts with handover from VPM team to the project team.

At VPM 3, a decision is made by the VPM team on whether to start a VPDS project. The decision to start a VPDS project is a management commitment, with or without a customer commitment at this point.

5.1.2.1 Main deliverables in VPDS phase 0, Global projects

The same applies in global projects as in local projects. In addition, the assignment of the Global PM together with global leaders for each project function must take place latest immediately after customer order or commitment. This is to enable enough time before TG0 to complete the global planning and reach commitment between the regions involved. This planning must include:

- Customer contact points
- Complete set of minimum global project targets (including functional safety and cyber security targets)
- Resource Plan
- Global team communication, escalation and meeting structure
- Prototype plan (A-, B- and C-samples), for details please see VS117
- Complete Cost Pool proposal (see References)
- Project Setup. This includes Application, Application Derivative and Electronic components projects

5.1.3 Phase 1, Concept Definition

Phase 1 is the actual start of the development activities. The activities are led by a PM. The PM leads a CFT.

In phase 1 the concepts (including the functional safety concept and cyber security concept) are verified according to Concept Verification Plan (CVP) based on virtual or prototype level parts (mock-up, surrogate, carry over etc.).
Line & Design workshops are performed to verify the design of both the product and the manufacturing process. This activity is also performed with the selected supplier development partners. RFQ is submitted to potential key suppliers. VS150 Review outputs are updated. This is also an input to the Design Review.

Simulations and risk evaluation are performed for the system, product, business case and manufacturing process. Prototype A-Samples are produced in order to test and evaluate the concept. Later prototype samples are produced for the simulation and evaluation of the process. The DV plan is decided and customer/supplier Advanced Product Quality Planning (APQP) processes is initiated.

In support of the Demand Planning process, Car Model Connections shall be created in this phase. In PLM, prototypes (A-, B- and C-samples) and other finished good parts are to be connected with VMIS Car Model information in order to create data for use in downstream planning systems.

5.1.4 Phase 2, Product & Process Development

Phase 2 continues with start of the prototype tooling (as required). HW and SW definitions for the prototype samples (A-, B- and C-samples) are defined. The manufacturing process is in detail engineered and all the remaining potential suppliers are selected. The product's functional design and technical safety concept are verified in the DV testing, as well as the cyber security mechanisms (e.g. Key Management). These mechanisms are described in the cyber security concept, which shall be finalized during this phase. The production drawings and BOM are released. Update of the risk analysis with FMEAs and CC&SC lists.

5.1.5 Phase 3, Product & Process Validation

In phase 3 the internal and external tools and equipment are ordered, built and installed. The supplier and customer PPAPs are submitted and approved. APQP processes are performed and risk analysis is confirmed. All confirmation measures related to functional safety have been performed. A final testing of the product has been done. The functional safety and cyber security cases have been assembled and reviewed. All cyber security mechanisms have been implemented on the manufacturing line.

5.1.5.1 Inter-company Customer PPAP

Customer PPAP shall be submitted to receiving Veoneer Company when this company is a different legal entity from the sending Veoneer Company.

5.1.6 Phase 4, Product Launch

Passing TG3 means that products are approved and has received PPAP or similar to be on the market (that is saleable vehicles for consumers to be used on public roads) even if the Veoneer SOP (Start of Production) has not yet occurred. In phase 4 the SOP occurs, and the process capacity, and quality parameters are being monitored closely. The final lessons learned from the project are captured as well as potential further VEVA's to complete as part of the project but after SOP. This phase completes approx. 90 days after SOP, following approval from the manufacturing operations. These 90 days may be extended due to completion of VEVA's. Change Management, VS007, is applied after TG3 on Parts after initial PPAP.

Management of functional safety and cyber security continues throughout product life cycle.

5.2 VPDS Project Synchronization

A global project can be managed via several supporting projects. A Lead Application Project may be used to govern the Application Derivative project in the regions. When managed as separate projects they are required to deliver results and to be synchronized with each other as they progress. This synchronization will in detail be decided between the PM's involved. It is always the Lead Application Project that is responsible for the total

timing towards the Veoneer customer, considering the requirements from all involved projects.

If the VS100 project is dependent on deliverables from a VS108 platform project, the synchronization between the projects shall be decided between both project managers (PMs) involved and described in each project's development plan. A best practice is to establish an interface agreement between the projects.

5.2.1 Connected Projects

VPDS projects may be connected to other projects. These projects may be driven either under governance of the VS160, VS108 or VS100 standards. Key component development could also be a supporting project. Key component development is governed by the Component Development Process. It is important that there is a synchronization between these projects and that the VPDS project plan considers the key milestones of the connected projects.

5.3 Project Status Follow-up

5.3.1 Project Reviews

eVPDS will support information about the project status concerning timing and task completion etc. The project issues must be managed by the project team and the PM in eVPDS to support project reviews. The purpose for this is project risk mitigation in a systematic way. A complete project review, involving the complete project team, must be performed at least prior to every TG.

5.3.2 Project Audit

Project audits must be performed as required in VS003. The purpose of the audit is to give feedback to management about systemic project management issues and to be used as a follow-up tool. These audits must be performed according to a plan fulfilling the requirements in VS003.

5.3.3 Functional Safety Assessment

Functional safety assessments must be performed for products having at least one safety goal or requirement of ASIL B or higher as required in VS132. Functional safety assessments check the compliance of the project to requirements contained in VS132 and ISO 26262.

5.3.4 Cyber Security Assessment

Cyber Security assessments must be performed for products having at least one cyber security goal as required. Cyber Security assessments check the compliance of the project to requirements contained in ISO/SAE 21434.

5.3.5 Tollgate Review and Phase Approval

The TRB conducts the Phase Approval meetings in the planned end of each project phase. This board has the authority to decide continuation with or without additional follow-up requirements.

The purpose is to obtain a management approval for a release of the project into the next phase. The review is based on any risks and the actions to alleviate those risks coming from the prior project reviews. Upon satisfactory completion the TRB makes a formal sign-off. In the case that all requirements are not completed satisfactorily, the TRB may decide on a countermeasure plan that allows the project to proceed. In such a case the TRB must approve the results of this plan separately as a follow-up to the TG. If project targets are not able to be met as approved at TG0, the project shall be forwarded back to TRB for review and decision.

The phase approval must also consider the status from any related project (ref. 5.2) concerning their reached project phase and TG level.

For the formal TG approval and meeting minutes with directions to the project team, the eVPDS system must be used.

6 References

VS002	Veoneer Standard	Process Audits
VS003	Veoneer Standard	Project Audits & Project Quality Strategy
VS005	Veoneer Standard	Substance Use Restrictions
VS007	Veoneer Standard	Change Management
VS034	Veoneer Standard	Veoneer Pursuit Management (VPM) Process
VS052	Veoneer Standard	Special Characteristics Classification
VS054	Veoneer Standard	Project Launch indicators
VS063	Veoneer Standard	Problem Management & Lessons Learned
VS103	Veoneer Standard	Patent
VS104	Veoneer Standard	FMEA
VS107	Veoneer Standard	DVP&R
VS108	Veoneer Standard	New Product Development (Pre-VPDS)
VS109	Veoneer Standard	CAD Drawing and Model Standard
VS117	Veoneer Standard	Prototype Process
VS130	Veoneer Standard	Design Review
VS132	Veoneer Standard	Functional Safety Management
VS150	Veoneer Standard	Electronic Module Design for Manufacturing
VS160	Veoneer Standard	Veoneer System Development System (VSDS)
VS403	Veoneer Standard	Manufacturing Release Process
VS405	Veoneer Standard	Manufacturing Process Specification
VS406	Veoneer Standard	Product and Process Transfer
MPS112	Manufacturing Process Specification	Interim Inspection Plan (IIP)
VSM	Veoneer Supplier Manual	
VSPP	Veoneer Sourcing and Purchasing Process	
VES	Veoneer Excellence System	
VPDS	VPDS Application	
CDP	Component Development Process for Purchased Components	

Corporate PLM Information
Corporate Cost Share Contract
Financial Manual
Veoneer Business and Development Processes site

7 Modification Index

Version #	Date/ Author	Modification
1	1.4.18 / Frederic Dacheux, Bill Ortner, Satoru Yamaguchi	First Release
1.1	25-MAR-2020/ Lena Aleberg, Frederic Dacheux, Jacob Gustafsson	Clarification of prototype need in text. General updates to adapt to new Veoneer terminology.

1.2	14-OCT-2020 Peter Porreca, Lisa Clark, Jonas Villasmil	Key Component Development text updated in standard. Supporting projects paragraph updated and heading changes to Connected projects. Cyber Security and Functional Safety references added into the standard.