APQP Elements

Note:

The most significant changes compared with the previous version of 2013 are displayed in green text below.

The aims, expectations and requirements associated with documenting the individual elements of the *APQP Status Report* (see internet marketplace *SupplyOn* *Project Management* at *www.SupplyOn.com* or *QAA / S 296001-1 - Advanced Product Quality Planning, Appendix 3*) are described below:

# Customer order

Aim:

Formal placing of an order by the customer so that investments can be effected on schedule by the supplier.

Expectations:

* The customer selects a supplier and informs the supplier of the decision.

Documentation with supplier:

* Nomination Letter
* Individual order indicating Risk Level (RL) for *Advanced Product Quality Planning (APQP)* and the submission level for the sampling operation
* Delivery schedule

Submission to customer:

* Status in *APQP Status Report*

# Customer specifications

Customer specifications include, for example, the design briefs, drawings or specifications which are required at the start of a project.

**Technical and project-related data**

Aim:

To avoid misunderstandings by using clear specifications.

Expectations:

The supplier must be familiar with the requirements of the product / project, e.g.

* requirements/regulations of the (end) customer which are relevant to the supplier
* installation situation
* ambient conditions
* functional performance requirements
* dimensions
* weight
* material
* reliability (life)
* guarantee objectives
* quality objectives for incoming parts (ppm rating, defect levels and rejection quotas)
* capacity data or volumes
* milestones
* checking the program status
* final definition of the design (Design Freeze)
* prototype parts
* pre-production
* initial volume production samples

Documentation with supplier:

* Design briefs, drawings or specifications
* List showing issue level of the individual documents

**Contract review**

Aim:

To carry out a commercial and technical assessment of the documents provided by the customer to check that they are complete, up-to-date and feasible.

Expectations:

Before entering into a delivery agreement with the customer a contract review is carried out to ensure that:

* The product requirements have been suitably defined and documented (e.g. drawing, specification, design requirements)
* Deviating requirements are clarified prior to submitting the quotation or closing the contract
(e.g. drawing deviations, drawing modifications made by the customer, delivery dates, price)
* The defined requirements can be met. The quotation is prepared following a cross-functional manufacturing feasibility analysis.

Documentation with supplier:

* *Manufacturing feasibility assessment, e.g.*  to *QAA* / *S 296001-1, Appendix 4*
* *Confirmation of capacity* to *QAA* / *S 296001-1, Appendix 5*

Submission to customer:

* Status in *APQP Status Report*
* List showing revision level of the individual technical documents
* *Manufacturing feasibility assessment,* e.g. to *QAA* / *S 296001-1, Appendix 4*
* *Confirmation of capacity* to *QAA* / *S 296001-1, Appendix 5*

# Craftsmanship (appearance)

Aim:

To define characteristics relating to appearance, texture, handling ability and acoustics.

Expectations:

* The supplier should be familiar with and meet the requirements that relate to the above-mentioned characteristics.
* In order that the characteristics can be checked, characteristics catalogues and reference samples etc. should be made available and agreed with the customer.

Documentation:

* Characteristics catalogues and reference samples

Submission to customer:

* Status in *APQP Status Report*

# Design FMEA

Only applicable to suppliers with personal responsibility for product development.

A Design FMEA is a systematic procedure used to ensure that potential development and design defects and their respective causes have been taken into account and have been countered by preventive measures within a technical cross-functional team.

The Design FMEA must cover all functions of the product and must take into account experiences and concerns.

Aim:

To prevent defects during product development.

Expectations:

* The severity levels from the customer’s FMEA are taken into account
* Problems relating to product layout are solved in good time so that all sampling and volume production dates can be observed.
* Checks can be made on progress in respect of the *Design Verification Plan.*
* Unforeseen potential defect modes which occur at the design review stage must be incor­porated into the Design FMEA and the layout criteria modified in agreement with the customer.
* Checks must be made on potential for improvement as regards product reliability and manufacturing costs.
* Checks must be made on progress in terms of achieving goals relating to reliability, quality, costs and planning.
* Influencing defect modes are described and assessed and, where necessary, corrective measures are introduced and monitored by the persons responsible.

Documentation with supplier:

* Design FMEA

Submission to customer:

* Status in *APQP Status Report*
* Cover sheet to Design FMEA including participants and issue level

# Design Review

Aim:

To prevent misunderstandings and problems.

To monitor the progress of measures and to ensure that objectives are met.

Expectations:

* Problems relating to product layout are solved in good time so that all sampling and volume production dates can be observed.
* Checks can be made on progress in respect of the *Design Verification Plan.*
* Unforeseen potential defect modes which occur at the design review stage must be incorporated into the Design FMEA and the layout criteria modified in agreement with the customer.
* Checks on potential for improvement as regards product reliability and manufacturing costs
* Checks must be made on progress in terms of achieving goals relating to reliability, quality, costs and planning.

Documentation with supplier:

* Meeting reports prepared by the supplier or the customer

Submission to customer:

* Status in *APQP Status Report*

# Design Verification Plan – DVP

Only applicable to suppliers with personal responsibility for product development.

Aim:

Systematic planning of all tests or calculations to check whether the product or design is suitable for the application.

Expectations:

* The suitability of the product must be proven by means of planned tests or calculations.
* Responsibility for technical tests on volume products must be defined (see *APQP Element 22*).

Documentation with the supplier:

* *Design Verification Plan*
* Test reports, layout calculations and tolerance studies

Submission to customer:

* Status in *APQP Status Report*
* Status for design verification (current status of *DVP*)

# Subcontractor quality planning

The suppliers must forward the APQP requirements to their subcontractors, check implementation and give the results in summarized form in the *APQP Status Report*.

Aim:

To provide a clear illustration of the progress that a subcontractor is making on a project for process/products associated with increased risks, or at the customer's specific request.

Expectations:

* The supplier must carry out a risk assessment and specify the extent of his subcontractors' participation in the advance quality planning process.
* The suppliers must check the progress of the project on a regular basis with their subcontractors, particularly if they deliver these products with "special characteristics“ (see Schaeffler standard *S 102012-1 Classification of characteristics* / *Special required documentation*).

Documentation with supplier:

* Subcontractor’s status report on the progress of the project

Submission to customer:

* Status in *APQP Status Report*
* Detailed schedules at the customer’s request

# Equipment, tools and inspection equipment

**Equipment and tools**

Aim:

Capable / released operating materials

Expectations:

* Planning (monitoring of dates) and provision of all necessary operating materials
* Deadlines for the procurement or manufacture of equipment and tooling must be monitored.
* The equipment and tooling should be tested prior to the production trial run.

Documentation with supplier:

* Schedules, capacity plans, proof of capability established within the framework of the initial sampling process

**Inspection equipment and inspection methods**

Aim:

To obtain inspection methods which have been coordinated with the customer and inspection equipment which is suitable for the inspection tasks.

Expectations:

* The inspection methods should be coordinated between the supplier and the customer.
* Deadlines for the procurement or manufacture of inspection equipment must be monitored.
* Proof of inspection equipment capability and, where necessary, inspection process suitability must be provided.

Documentation with supplier:

* Stipulation in Control Plan, proof of capability established within the framework of the initial sampling process

Submission to customer:

* Status in *APQP Status Report*
* Detailed schedules according to the customer’s request

# Prototype Control Plan

Aim:

To secure the prototype quality.

Expectations:

* The type and scope of the inspections and the corresponding inspection equipment for prototypes are defined and agreed with the customer.
* All "special characteristics“ are included.

Documentation with supplier:

* Prototype Control Plan

Submission to customer:

* Status in *APQP Status Report*
* Prototype Control Plan

# Production and inspection of prototype parts

Aim:

To dispatch, on schedule, prototypes which meet cost and quality requirements.

Expectations:

* Dates and quantities for the manufacture of prototypes must be planned, monitored and met.
* Inspection reports must be supplied with the prototypes (see *QAA* / *S 296001-2 – Production Process and Product Release Procedure*).
* Approval must be obtained from the customer for non-conforming prototypes prior to delivery.

Documentation with supplier:

* Prototypes, inspection report

Submission to customer:

* Status in *APQP Status Report*
* Prototypes and inspection report

# Drawings and specifications

The term "drawings and specifications“ includes all technical drawings, CAD data, material specifications and technical specifications from the customer / supplier.

Aim:

To provide, on schedule (Design Freeze), all drawings and specifications that are needed to observe the initial volume production sample date/start of production (SOP).

Expectations:

* The customer must be notified by the supplier of the latest possible date for making changes to volume production drawings and specifications to ensure that the planned initial volume production date is met.
* If responsibility for development work lies with the supplier, all drawings and specifications must be agreed with the customer at this point.
* Any "special characteristics“ that have been specified must be given appropriate consideration within the framework of the product and process planning process.

Documentation with supplier:

* Drawings
* Specifications

Submission to customer:

* Status in *APQP Status Report*

# Manufacturing feasibility assessment

A cross-functional team must assess the manufacturing feasibility of the intended product within the framework of the contract review. Even if the customer is responsible for the design, the supplier must assess the manufacturing feasibility of the products, both at the quotation/prototype phase and at the planning stage of the volume production process.

Aim:

To assess manufacturing feasibility (volume production) relative to the intended design.

Expectations:

* The team must be convinced that the product is suitable for the intended application and can be produced, checked, packed and delivered to the customer in sufficient quantities, at a competitive price and to the required quality.
* If subcontractors are involved and their activities have an influence on "special characteristics", the supplier must decide whether to request a manufacturing feasibility assessment.

Documentation with supplier:

* *Manufacturing feasibility assessment*, e.g. to *QAA / S 296001-1, Appendix 4*

Submission to customer:

* Status in *APQP Status Report*
* *Manufacturing feasibility assessment*, e.g. to *QAA* / *S 296001-1, Appendix 4*

# Process flow chart and volume production layout

The volume production process flow chart is a graphical representation of the planned sequence of operations.

Aim:

To provide a foundation for investment planning, Process FMEA, production plan, control plan and visual aids.

Expectations:

* To ensure the sequence of all volume production stages and inspection stages from goods inwards through to goods issue.

Documentation with supplier:

* Process flow chart
* Machine setting plan (layout)

Submission to customer:

* Status in *APQP Status Report*
* Process flow chart

# Process FMEA

A Process FMEA is a systematic procedure used to ensure that potential production defects and their respective causes have been taken into account and have been countered by preventive measures within a technical cross-functional team.

The Process FMEA, e.g. to *VDA volume 4* or similar, must cover all production and inspection stages and must take into account experiences and previous concerns.

Aim:

To prevent defects during process development.

Expectations:

* All production and inspection stages are listed and analysed.
* Potential defect modes are described and evaluated and, where necessary, corrective measures are introduced and monitored by the persons responsible.
* Significant numbers are coordinated with the customer.

Documentation with supplier:

* Process FMEA
* Action plan for high risk priority number (RPN)

Submission to customer:

* Status in *APQP Status Report*
* Cover sheet to Process FMEA including participants and issue level
* Pareto analysis of risk priority numbers (top 20 of RPN)

# Inspection equipment capability

Aim:

To evaluate the suitability of the intended inspection equipment and inspection methods by means of a capability study, e.g. to *VDA Volume 5 or MSA procedure of the AIAG*.

Expectations:

* Capability studies must be carried out in order to check the suitability of the inspection equipment.
* The customer should be given the opportunity to check the results.
* Where appropriate, inspection/measurement methods must be agreed in good time with the customer (see *APQP Element 8*).
* If modifications are made to the inspection/measuring equipment, the capability studies must be repeated.

Documentation with supplier:

* Proof of capability with individual values, e.g. printouts from the statistical program used

Submission to customer:

* Status in *APQP Status Report*
* Proof of capability with individual values within the framework of the *Production Process* and *Product Release Procedure*

# Pre-Launch Control Plan

Aim:

To ensure that process and product requirements are met during pre-launch,
e.g. through increased inspection frequency, additional inspection characteristics.

Expectations:

* The type and scope of the inspections and the corresponding inspection equipment for pre-launch are defined and agreed with the customer.
* Reaction plans are defined for handling discrepancies.
* All "special characteristics“ are included.

Documentation with supplier:

* Pre-Launch Control Plan

Submission to customer:

* Status in *APQP Status Report*
* Pre-Launch Control Plan

# Process instructions

All instructions for production personnel, e.g. production plans, work instructions and inspection instructions, maintenance plans, defect catalogues, process parameters.

Aim:

To ensure quality and quantity.

Expectations:

* Easily understood (available in the national language of the respective production site) and accessible instructions, at the workplace, to ensure that procedures are followed and requirements regarding the process or the product are implemented.
* Descriptions are given of the procedures involved in controlling defective products.
* All employees must have been trained or instructed in the tasks they are to perform. Proof of training must be kept and expertise regulated.

Documentation with supplier:

* Process instructions
* Proof of training

Submission to customer:

* Status in *APQP Status Report*

# Packaging and Logistics Concept

**Packaging**

Aim:

To maintain product quality through the use of suitable packaging materials.

Expectations:

* Suitable packaging materials have been defined for
* transport from or to the subcontractor
* internal transport/storage
* dispatch to customer
* Packaging specifications and corrosion protection for shipments to the customer have been agreed with the customer.
* Related customer packaging specifications must be observed.
* It must be ensured that the quality of the product is not impaired when it is packed, dispatched, put into storage and removed from storage.

Documentation with supplier:

* Defined packaging specifications and corrosion protection

Submission to customer:

* Status in *APQP Status Report*
* Packaging specification and corrosion protection agreed with the customer

**Logistics concept**

Aim:

To ensure delivery capability in agreement with the relevant customer contact.

Expectations:

* Call-off system, e.g. Web-EDI
* Definition of transport routes
* Customs arrangements (where applicable)
* Inventory, e.g. consignment warehouse, safety stock
* Compliance with Schaeffler Logistics Guideline
(see www. schaeffler.com/supplier/logistics/sets of rules)

Documentation with supplier:

* Logistics agreement with the customer, minimum inventory planning

Submission to customer:

* Status in *APQP Status Report*

# Production Trial Run

Aim:

To check the effectiveness of the volume production process.

Expectations:

* Use of volume production installations, machinery, tooling, inspection equipment and conditions (including regular operating personnel), also at the subcontractor's premises
* Use of volume production materials
* Verification of the required product quality and the planned nominal quantities (capacity)
* Verification of the volume production process
* The production quantity must consist of at least one production batch size which is representative of the process (usually daily requirement from annual requirement).
* Taking of initial volume production samples from this batch
* Customer participation, if stipulated beforehand

Documentation with supplier:

* Records and/or proof of capability

Submission to customer:

* Status in *APQP Status Report*

# Volume Production Control Plan

Aim:

To ensure that process and product requirements are met during volume production.

Expectations:

* The type and scope of the inspections and the corresponding inspection equipment for volume production are defined and agreed with the customer.
* Inspections for requalification of the product are included.
* Reaction plans are defined for handling discrepancies.
* All "special characteristics“ are included.

Documentation with supplier:

* Volume Production Control Plan

Submission to customer:

* Status in *APQP Status Report*
* Volume Production Control Plan

# Preliminary process capability study

Process capability studies use statistical methods to prove that the product can be manufactured in line with the specification. Proof of the capabilities of “specific characteristics” and, where applicable, other characteristics defined with the customer within the framework of *APQP* must be provided.

Aim:

To provide statistical proof of capable processes.

Expectations:

* Preliminary process capability under volume production conditions, e.g. to *VDA Vol. 4*, at Pp/Ppk values of > 1.67 (at least 25 x 5 parts) and machine capability (50 parts) at Cm/Cmk values of > 1.67.
* In the event of incapable processes, suitable corrective measures must be introduced in order to achieve process capability. A 100 % inspection must be carried out until process capability is achieved.

Documentation with supplier:

* Proof of capability with individual values

Submission to customer:

* Status in *APQP Status Report*
* Proof of capability with individual values within the framework of the *Production Process* and *Product Release Procedure*
* Action plan to achieve required process capabilities, where required

# Technical tests on volume production parts

Aim:

To provide proof that the volume product meets customer requirements with the aid of a structured *Process Verification Plan (PVP)*.

Expectations:

* Technical tests with products from the production trial run, if defined in the *Design Verification Plan* or in the specification

Documentation with supplier:

* Records and/or examination reports

Submission to customer:

* Status in *APQP Status Report*
* Proof within the framework of the *Production Process and Product Release Procedure*

# Initial volume production sampling

Documented proof that the product manufactured under volume production conditions meets the customer's requirements. The *Production Process and Product Release Procedure* is described in detail in *QAA* / *S 296001-2*.

Aim:

To provide proof of product and process release.

Expectations:

* To produce, on schedule, the initial volume production samples; to prepare documentation for all elements requested by the customer in accordance with the P*roduction Process and Product Release Procedure.*
* To provide documentation on schedule; scope in accordance with defined submission level.

Documentation with supplier:

* Initial sample inspection report, initial volume production samples
* Documentation for all requested elements in accordance with the *Production Process and Product Release Procedure*

Submission to customer:

* Status in *APQP Status Report*
* Scope in accordance with defined submission level