SCHAEFFLER

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Production process and product approval for suppliers

Basic principles

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1. Scope

This document describes the production process and product release procedure for externally supplied products and services to Schaeffler and is therefore addressed to all suppliers of the final product relevant products and services.

2. Purpose

The Schaeffler Group’s Production Process and Product Release Procedure is to be used by the supplier as a means of proving that all product requirements agreed with Schaeffler are being met.

This method applies to the processes involved in the manufacture of products (raw material, semi-finished products, components and chemical operating materials) and to services such as coating or heat treatment for example. The release comprises an assessment of the production process or service based on the relevant documents, records and samples, to ensure that the requirements associated with the batch production of products which conform to specification are met.

3. Assessment of the production process

The supplier is personally responsible for assessing the effectiveness of his volume production process for initial production sampling and therefore prior to the batch production release. A trial production run takes place to establish whether the existing batch production process is capable for manufacturing the products to the customer's required quality with the agreed production capacity, for a stipulated period, or of providing the relevant services.

In order to furnish proof of the planned output, the following must apply

- all volume production equipment (e.g. installations, machinery, tools, inspection equipment) must be in operation
- at the designated location
- using volume production material
- working to full capacity
- using standard personnel
- and all supporting systems

A batch size which is representative of the process (usually daily requirement from annual requirement) should be used to assess the batch production process.

In the case of higher risk level at Schaeffler (risk level RL 1, respectively RL 2 according to brochure "Advanced Quality Planning for suppliers") the volume production process is usually assessed in the presence of the Schaeffler representative and also, where necessary, with end customer. The date and scope of the process assessment are agreed between Schaeffler and supplier within the framework of the advanced quality planning.

4. Sample Types

A distinction is made between various sample types:

4.1 Prototypes

Prototypes can originate from provisional production processes. Unless requested otherwise by the customer in his order, the following constitute the minimum requirements for prototype sampling:

- Inspection record with nominal/actual comparison of at least one part, e.g. by means of an entry in the drawing
- For prototype tools with several cavities: nominal/actual comparison of one part per cavity
- Marking of checked prototype parts for allocation to inspection record
- Indication of material composition

The prototypes are divided according to the proximity to series production:

4.1.1 Functional prototype (M1)

Product according to specification, produced with any production process.

4.1.2 Prototype (M2)

Product with an approved drawing, using any manufacturing technologies/processes, tools, or devices. The general requirements of batch production do not apply.

Example: Machining of castings or molded parts.

4.1.3 Near-series prototype (M3)

Product with an approved drawing partly on series production equipment and processes, where the general requirements of batch production partially apply.

Example: Production of parts with series tooling on machines deviating from series or on series machines without complete interlinking of the production steps.

4.2 Samples

Samples are products or services which have been manufactured or provided in full using standard operating materials and under standard conditions. They must be taken from a batch size which is representative of the batch production process.

The scope of sampling and the submission level are to be determined by the receiving location.

The samples are divided according to the type of application or reasons for sampling:

4.2.1 Initial samples (M4)

Initial samples must always be submitted by the supplier in the event of the following:

- New parts or products (i.e. a specific part, subassembly or material which has not been supplied to Schaeffler before)
- Changes to the product involving the drawing, specification or material
- Changes to the drawing or specification which do not affect the product or function
- Elimination of a defect in a product that has already been sampled previously, i.e. the release was subject to conditions or initial samples were rejected (re-sampling / new sampling)
- Production interrupted for extended period (no production for more than 12 months) on the precondition that the product was previously delivered at least four times a year
- Receipt of delivery at another or additional Schaeffler site.

4.2.2 Change samples (M5)

- Changes to the production process
- Change of subcontractor for raw materials or purchased parts, or for services, e.g. heat treatment or coating
- Volume production which uses tooling, machinery or installations which are to be transferred to a different production plant of the supplier
- Use of new tooling (except for wear tooling, such as indexable cutting inserts, drills)
- Use of additional or replacement tooling, e.g. multiple cavity tooling / cavities
- Volume production which uses existing tooling, machinery or installations that have been overhauled or modified
- Significant changes to inspection or test methods released through preliminary sampling

4.2.3 Repeat samples (M6)

The supplier must submit repeat samples at Schaeffler's request, e.g.:

- As part of the periodic requalification inspection of products
- Following serious quality problems

5. Scope of sampling

The sampling must be conducted in full and documented by the supplier according to the requirements defined by Schaeffler. Schaeffler stipulates the type and scope of the sampling process to the supplier in written form in the order.

The defined requirements must be implemented throughout the supply chain, and confirmation of their implementation is part of the sampling documentation.

Unless defined otherwise by Schaeffler in the order, the supplier shall generally follow PPAP, submission level 3.

5.1 PPAP

The PPAP (Production Part Approval Process) is one of the structured sampling processes for series parts. It is clearly standardized according to the AIAG (Automotive Industry Action Group) reference manual.

The requested submission level is defined by Schaeffler in the order.

Submission level	Requirements
1	Only the Part Submission Warrant (template Appendix 1) is submitted and, if additionally requested by Schaeffler, a “Report on the approval of appearance-dependent parts”.
2	Part Submission Warrant with sample parts and restricted supporting data / documentation are submitted.
3	Part Submission Warrant with sample parts and comprehensive supporting data / documentation are submitted.
4	Part Submission Warrant and other requirements defined by Schaeffler within the framework of Advanced Product Quality Planning.
5	Part Submission Warrant with sample parts and complete supporting data / documentation are available for evaluation by Schaeffler at the supplier’s production site.

The requirements associated with the relevant submission level can be found in the following table.

No.	Element / requirement	Explanation / comments	Submission level 1	2	3	4	5
1	Design documents	Customer drawing, specification, product delivery guideline, technical delivery conditions (marking of characteristics)	R	S	S	*	R
		For components which the supplier was responsible for developing (“Black-Box”)	R	R	R	*	R
		For all other components	R	S	S	*	R
2	Modification documents	Documents on changes approved by the customer, which are not yet documented in the drawing, if available	R	S	S	*	R
3	Design release from the customer	Design approval from the customer, if requested in the customer drawing	R	R	S	*	R
4	Design FMEA	Only applicable to suppliers with design responsibility. Cover sheet to Design FMEA, including current modification level, date and group of participants, as a minimum	R	R	S	*	R
5	Process flow chart(s)	Process flow chart for the product or the product family	R	R	S	*	R
6	Process FMEA	Cover sheet to Process FMEA, including current modification level, date and group of participants as a minimum	R	R	S	*	R
7	Control Plan	Control plan as a minimum for all special characteristics (see Schaeffler Standard S 102012-1) for the product or the product family	R	R	S	*	R
8	Inspection equipment capability study	Inspection equipment capability study of inspection equipment for all special characteristics	R	R	S	*	R
9	Dimensional measurement results	Inspection report on all dimension characteristics in the customer drawing and applicable specifications (form, Appendix2), including OK / not OK rating	R	S	S	*	R
10	Material test results and function test results	Material inspection report on all material data in the drawing and all applicable specifications (form, Appendix 3), including OK / not OK rating. Enclose results from raw material supplier as 3.1 inspection certificate to DIN EN 10204	R	S	S	*	R
		Ingredients must be entered into the International Material Data System (IMDS). In exceptional cases, the form in appendix of S 132030-1 may be used					
		Evidence on the use of prohibited substances and substances requiring declaration in accordance with Schaeffler Standard S 132030-1					
		Inspection report on all function features in the customer drawing and applicable specifications (form, Appendix 2) including OK / not OK rating					
11	Process capability study	Process capability evidence for all special characteristics in the customer drawing, and other features specified by the customer, and applicable specifications (see Schaeffler Standard S 102012-1); alternatively as Cm/Cmk, Pp/Ppk, or Cp/Cpk values	R	R	S	*	R
12	Documentation from the test laboratory	If an external laboratory has been appointed, the laboratory’s test results and the ISO/IEC 17025 certificate must be submitted, with specification of the scope	R	S	S	*	R
13	Report for appearance-critical parts	If requested by the customer and specifically agreed within the framework of Advanced Product Quality Planning	S	S	S	*	R
14	Sample parts	Check five sample parts, unless specified otherwise. Deliver parts in volume production packaging in accordance with packaging data sheet.	R	S	S	*	R
15	Reference sample part	At least one reference sample part per cavity should be stored by the supplier for the life of the product, plus one additional year. The allocation to the initial sample inspection report should be ensured by means of clear marking.	R	R	R	*	R
16	Inspection equipment / Inspection aids	Not required (only if specifically requested)	R	R	R	*	R
17	Compliance with customer requirements	Not required (only if specifically requested)	R	R	S	*	R
18	Part Submission Warrant	Part Submission Warrant (template, Appendix 1)	S	S	S	S	R
19	APQP Status Report	For Risk Level RL 1 or RL 2, in accordance with brochure “Advanced Quality Planning for suppliers”	R	S	S	*	R
20	PPAP-Status of supply chain	Approval status of individual sub-elements	R	R	S	*	R

No.	Element / requirement	Explanation / comments	Submission level 1	2	3	4	5
21	Capacity confirmation	Confirmation of the required capacity (in the whole project lifetime)	R	S	S	*	R
22	Part history	Chronological summary of all changes to the product or to the related production process (template, Appendix 4)	R	R	S	*	R
23	Software test report	If software is part of the sampled product, all test results must be proven	R	S	S	*	R

S Submit to Schaeffler

R Retain and keep available for immediate access at request from Schaeffler

* The decision on whether to submit (S) or retain (R) the individual elements is agreed specifically between Schaeffler and supplier during the course of APQP

☐ In addition to AIAG standard – “PPAP 4th Edition”

5.2 PPA according to VDA

The production process and product approval (PPA) procedure is also one of the structured sampling procedures for series parts. It is clearly standardized according to Volume 2 of the VDA (German Association of the Automotive Industry).

If sampling is required according to the PPA procedure, the elements for submission to Schaeffler will be aligned with the supplier in advance.

The PPA elements are listed in the table below, the details can then be found in VDA volume 2.

VDA-Number	Proofs, if relevant for the product	Supplier	Submission
0.1	PPA cover sheet/evaluation	D	S
0.2	Self-assessment for product, process, SW (if appl.)	D	S
1	**Deliverables of product development**		
1.1	Technical specifications	D	A
1.2	Approved design changes	D	A
1.3	Design, development approvals	D	A
1.4	Material data via IMDS	D	S
1.5	Design FMEA	D	A
2	**Deliverables of production process development**		
2.1	Process flowchart	D	A
2.2	Process FMEA	D	A
2.3	Control plan (CP)	D	A
3	**Deliverables of the validation of the product**		
3.1	Geometry, dimensions	D	A
3.2	Material (strength, physical properties, etc.)	D	A
3.3	Function	D	A
3.4	Haptics	D	A
3.5	Acoustics	D	A
3.6	Odor	D	A
3.7	Appearance	D	A
3.8	Surface requirement	D	A
3.9	Technical cleanliness	D	A
3.10	Reliability	D	A
3.11	Resistance to electrostatic discharge (ESD)	D	A
3.12	Electrical safety / high-voltage safety	D	A
3.13	Electromagnetic compatibility (EMC)	D	A
4	**Deliverables of the validation of the production process**		
4.1	Assurance of special characteristics according to technical specifications and agreed characteristics (e.g. poka-yoke, 100% inspection, process capabilities, etc.)	D	A
4.2	Laboratory qualification	D	A
4.3	Sample including production documentation	D	A
4.4	Master sample	D	A
4.5	Production capacity	D	A
4.6	Tools	D	A
5	**General deliverables**		
5.1	Evidence of compliance with statutory requirements	D	S
5.2	PPA status of supply chain	D	A
5.3	Test equipment list for product and production process	D	A
5.4	Measurement equipment analysis studies product and production process	D	A
5.5	Part history	D	S

VDA-Number	Proofs, if relevant for the product	Supplier	Submission
5.6	Measurement equipment analysis studies product and production process	D	A
5.7	Documentation of agreements regarding the diagnosis and analysis process • Complaints handling (e.g. 8D) • Field failure analysis	D	A
5.8	Documentation of the requalification agreement	D	A
5.9	Other	D	A
6	**Deliverables for software**		
6.1	Software release	D	S
6.2	Definition of scope of the software product	D	S
6.3	Reference to contractually stipulated quality requirements	D	S
6.4	Documentation of technical SW specifications	D	A
6.5	Implementation of the requirements from 6.3 and 6.4, especially the Special Characteristics	D	A
6.6	Documentation of FOSS (free and open-source software)	D	S
6.7	List of known errors	D	S
6.8	Documentation of development tools	D	A
6.9	Documentation of testing tools	D	A
6.10	Documentation of version management	D	A
6.11	Documentation of a process evaluation (e.g. VDA Automotive Spice)	D	A

S Submission to Schaeffler (minimum scope)

D If applicable: Execution, documentation und archiving by the supplier, inspection by Schaeffler upon request

A All submission items that go beyond the minimum scope must be agreed between Schaeffler and supplier prior to the order

5.3 Specific definition of sampling score

For projects in special areas, the scope of sampling can be defined individually by Schaeffler. In such cases, the scope of sampling is specified in writing by Schaeffler after prior alignment with the supplier.

6. Documentation

The supplier must prove that all features correspond with the Schaeffler specifications, e.g. drawings incl. corresponding technical delivery conditions and specifications, by specifying the inspection results in the inspection report for initial batch production samples. Deviations must be clearly shown in the inspection report.

Unless agreed otherwise in writing, the storage period for documentation relating to samples, as well as for reference sample parts (one per cavity in cases where multiple cavity tooling is used) is the agreed life of the product plus one year.

Where possible, the documentation should be sent electronically to the relevant sampling department at the Schaeffler recipient plant in advance. Where this is not possible, it should be included with the initial batch production samples or delivery papers.

Unless specified or agreed otherwise in the order or in one of the Schaeffler “technical delivery conditions”, the following requirements apply as standard.

6.1 Dimension, material and function report

A clear reference to the inspection report (see Appendix 2) must be established through the consecutive numbering of the features in the drawings, including the corresponding “technical delivery conditions” and specifications.

Following prior agreement with Schaeffler, features which cannot be checked by the manufacturer are either confirmed using certification by means of specific test results (e.g. material certificate) or proven by means of inspection certificates from accredited inspection institutes (see table in Section 5.1, requirement no. 12).

6.1.1 Components

Unless requested otherwise by Schaeffler, five parts taken at random from the process are inspected. The actual values must be assigned to the relevant numbered sample part in the corresponding forms of the initial sample inspection report. In the case of multiple cavity tooling, 5 parts must be clearly marked and delivered for each mould cavity. In each case, at least one part must be measured in full and documented by means of an inspection report.

6.1.2 Raw materials and semi-finished products

Unless stated explicitly in a corresponding “technical delivery conditions” or specification, the test and sample scope for raw materials and semi-finished products (e.g. granulated material, strip, wire, tube, rod profiles) must be agreed with the relevant sampling department at the receiving Schaeffler plant.

6.1.3 Chemical operating materials

Unless stated explicitly in a corresponding “technical delivery conditions” or specification, the test and sample scope for chemical operating materials (oils and greases) must be agreed with the relevant sampling department of the receiving Schaeffler plant.

6.2 Evidence of process capability

The preliminary process capability of the characteristics identified specifically in the Schaeffler drawing or by means of applicable specifications (to Schaeffler Standard S 102012-1) is determined from a minimum of 125 parts (25 samples of 5 parts). A capable process exists if the preliminary process capability generates a capability index Ppk › 1,67.

A minimum of 10 parts must be checked for destructive testing and a minimum of 300 parts for attributive testing.

6.3 Appearance report

Where parts are required to have a defined appearance in accordance with a drawing regulation or specification, this feature must be rated accordingly in the inspection report.

6.4 Duty to supply information on ingredients

The initial sample inspection report must include confirmation that the materials used, and their ingredients comply with the Schaeffler requirements where the environment, recycling and safety are concerned.

The ingredients of the following products must be specified in the International Material Data System IMDS (www.mdsystem.com):

- Components (e.g. seals, springs, rotating parts)
- Subassemblies
- Oils / greases for products
- Coatings (e.g. phosphate coating, chrome plating)

The corresponding IMDS ID no. (ident. number) must be entered in the Part Submission Warrant. Following prior agreement with the sampling department at the receiving Schaeffler plant, the form in Appendix of Schaeffler Standard S 132030-1 – sheet “Declaration_of_Conformity” can also be used as an alternative to an entry in the IMDS database.

The requirements governing information on the use of prohibited substances and substances requiring declaration are described in Schaeffler Standard S 132030-1, see www.Schaeffler.de / Company / Purchasing & Supplier management / Sustainability.

6.5 Marking and packaging

Transport containers and delivery paperwork from consignments of initial samples must be clearly marked “Initial samples” or “Erstmuster”.

If the initial samples cannot be delivered in the designated volume production packaging, the supplier must ensure by means of suitable packaging that the quality of the samples is not impaired by, for example, damage or corrosion.

7. Customer decision

Following submission of the samples and documentation, Schaeffler carries out further inspections at his own discretion, which can also take place at the supplier's premises in the case of submission level 5 or as part of a trial production run.

One of the following decisions is made based on the initial sample inspection report and where required on the inspections carried out by the customer:

- Approved / Ready for series production (PPA procedure to be concluded)
- Conditional approval (resampling required) / Ready for series production (PPA procedure to be updated)
- Rejected (new sampling required) / Not ready for series production (new PPA procedure to be conducted)

The initial samples must be released by Schaeffler before the batch production products can be delivered.