VOLKSWAGEN
AKTIENGESELLSCHAFT

Formel Q

New Parts integral

Overall Quality Management in the Supply Chain Product creation.

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The German-language edition of Formel Q Neuteile Integral is binding. The companies affiliated with Volkswagen AG pursuant to §§ 15 et seq. of the German Stock Corporation Act (AktG) may define a different language version as binding for their contracts with the respective suppliers.

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Foreword

Ladies and gentlemen,

Increasing demands, global competition and cost pressure require mature products for series start-up and robust production processes. We must face up to this task together in order to be successful on the market with our products.

With this document you hold in your hands the revised version of Formel Q new parts integral, which contains the quality requirements of the companies of the Volkswagen Group, which we place on you as a supplier of products. The Formel Q new parts integral is part of the inquiry and quotation procedure.

For successful cooperation, it is imperative to comply with the requirements within the supply chain prescribed in these relevant documents by means of transparent communication as well as cost and deadline discipline.

You can retrieve the currently valid Formel Q new parts integral on the Internet: ONE. Group Business Platform (ONE. KBP) under www.vwgroupsupply.com.

Wolfsburg, November 2021

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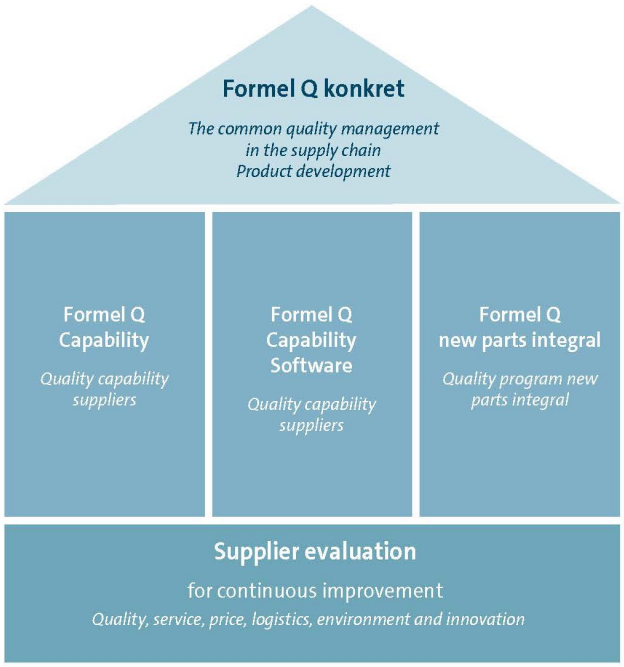
Content

0 General regulations

For the sake of simplification, the declining, construction plant or the responsible specialist department of the companies of the Volkswagen Group is subsequently referred to as a "customer".



The Formel Q publication series is a valid document on the contracts that the suppliers conclude with the Volkswagen Group and its companies.

It consists of Formel Q konkret as a cross-sectional agreement as well as the supplementary volumes Formel Q Capability, Formel Q Capability Software and the Formel Q New Parts Integral inclusive the attachment “brand specific supplements” available here. The supplementary documents in each case serve to evaluate and support the delivery requirements in order to achieve and maintain a high-quality and sustainable delivery capability.

The basis of the present version of Formel Q new parts integral is the edition of the quality management agreement between the companies of the Volkswagen Group and its suppliers "Formel Q konkret", in particular with regard to maturity assurance (RGA) sections 3.1 and 3.2, which are valid at the time of the request. All of the following statements in this document deepen the relevant areas of this Agreement.

These documents are available at ONE. KBP is stored in the directory "Information\Business Areas\Quality Assurance\Formel Q".

In addition, all documentations and regulations specifically listed in Formula Q are considered to be part of the contract.

In addition, the customer's technical delivery regulations and standards applicable to the respective product shall apply. Any agreed customer-specific requirements are valid in addition to the above-mentioned documents.

Information may be passed on to other Volkswagen Group companies that arise in the course of business relationships.

The disclosure of confidential information to external third parties may only take place with the written consent of the customer. The external third parties are obliged to maintain secrecy.

1 Introduction

The supplier is obliged to carry out the qualification of all delivery volumes as described in the VDA volume "Maturity level assurance for new parts" and in the VDA volume "Securing the quality of supplies - production process and product approval ". The qualification of products (includes all commissioned sizes or categories of results (e.g. hardware, services, software and processed materials) shall be fully carry out, including the supply chain, with particular reference to the "Critical Path". Depending on the risk classification, the customer determines whether the maturity level assurance is to be carried out in the given system (e.g. LION-QPNI) or in a different format. In principle, all necessary evidence must be provided for inspection at the customer's request.

1.1 Scope/scope of application

The present Formel Q new parts integral describes the following procedures:

- Quality Technical Requirement (QTR),
- Maturity level assurance (MLA; in German RGA),
- Serial capability certificate (SFN), formerly: multi-stage 2-day production,
- Production process and product release (PPF process).

2 Quality Technical Requirement

The aim of the Quality Technical Requirement (QTR) is to ensure that suppliers can meet the qualitative and quantitative requirements for the volumes of deliveries during product development and the product life cycle. During the request process, it is necessary to ensure that the supplier's offer takes into account the customer's requirements and all supply-relevant documents.

2.1 Determination of QTR-relevant sizes

The QTR relevance is determined by the customer on the basis of his prioritization. A change of prioritization by the customer can be made at any time.

2.2 Checking the plausibility of the offer

In the context of the quotation request, the procurement informs the supplier whether the QTR process is relevant and transmits the QTR questionnaire in addition to the request documents. By submitting an offer, the supplier must submit the QTR documents in full. Postponements of deadlines that have not been agreed with the customer may lead to exclusion from the further award process.

The subject of the check is the plausibility of the offer, which the supplier has prepared on the basis of the documents provided. The QTR questionnaire serves as a basis for this. Upon receipt of the complete offer documents by the supplier, an internal check is carried out by the customer. During the examination, the supplier can be invited to a cross-disciplinary QTR meeting with the customer in order to clarify open questions and to review supplier-internal documents if required.

The evaluation result of the audit is "eligible for award without or with conditions/measures" or "not eligible for award".

The QTR evaluation result, including the agreed conditions, is ultimately part of the award or the contract (nomination agreement).

Agreed conditions/measures for nomination are followed in the further degree of maturity assurance and must be processed by the supplier.

3 Maturity level assurance

In their projects, the Volkswagen Group companies apply the VDA volume "Maturity level assurance for new parts" in the currently valid version.

The eight maturity levels are based on corresponding milestones in the product emergence process (PEP).

The use of maturity assurance creates the following added value:

- optimizes internal and external coordination processes and generates synergies,
- supports the cooperation and communication between the customer and its suppliers,
- harmonizes the content and processes in the development phase between the customer and its suppliers,
- engages suppliers at an early stage in coordination and qualification processes,
- minimizes risks on the part of the customer and its suppliers,
- ensures robust production processes.

At the customer, the first two maturity levels 0 and 1 are carried out internally. If necessary, a supply plausibility (QTR; see chapter 2) is implemented. With the nomination the maturity level protection starts with the suppliers. The result is discussed by the respective maturity levels via "round tables" at the customer, if necessary depending on the project at the supplier.

Each maturity level describes a status in terms of the product, process, and project maturity. The aim is to identify potential risks at an early stage and to counteract them in a timely manner. For this purpose, a standardized range of "measurement criteria" based on the VDA volume "Maturity level assurance for new parts" is available for evaluation.

3.1 Overview of the maturity levels within the PEP

The execution of the maturity level assurance is divided into the maturity levels 0 to 7, which must be processed for the assigned PEP milestone:

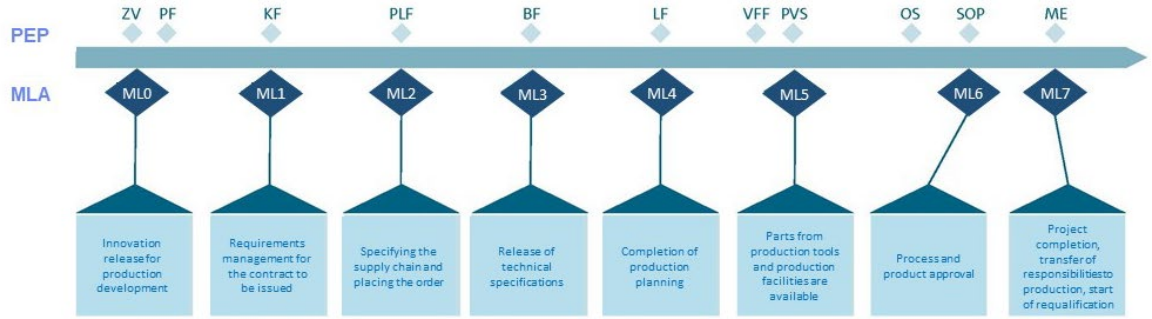


Figure1 Overview of maturity levels and PEP milestones (schematic using the example of focus parts of a new vehicle project, Group PEP)

Execution at the customer:

- Maturity level 0 Innovation approval for the series development for the PEP milestone PF[1]: Start of cross-divisional maturity assurance in the project. Integration of the customer's digestive production site. Identification of critical part scopes for risk classification.
- Maturity level 1 Requirements management for the scope of the award for the PEP milestone KE: Cooperation in the definition of component-specific targets. Detailed planning of the delivery volumes to be serviced with the customer's digestive production site. If necessary, perform the QTR (Quality Technical Requirement).

Implementation in cooperation between customer and series supplier:

- Maturity level 2 Determination of the supply chain and allocation of the scopes for the PEP milestone PLF: start of maturity assurance by the nominated suppliers, clarification of the supply chain with sub-suppliers with definition of the critical path (classification of the supply chain), presentation of the project organization, planning and control by the supplier.
- Maturity level 3 Approval of the technical specification for the PEP milestone BF: Presentation of production planning as well as the tool and production concept by the supplier on the basis of the technical specifications as well as the test requirements and means. If necessary, the function measurement catalogs must be taken into account.
- Maturity level 4 Production planning completed for the PEP milestone LF: Tools in production, reconciliation of dates and contents of product process and product approval. Ensuring the supplier's adherence to deadlines in the course of the project.
- Maturity level 5 Serial tool-falling parts and series plants are available: Start of component and process optimizations, preparation of product and process acceptances.
- Maturity level 6 Product process and product approval: PPA procedure and ensuring parts supply. Execution of process acceptances and confirmation of the agreed capacities within the scope of the Production Capability Analysis (formerly the multi-stage 2-Day Production).
- Maturity level 7 Project completion, transfer of responsibility to series, start requalification: Completion of supplier qualification as part of the

[1] For explanations of the PEP milestones, see the glossary at the end of this document.

Production Capability Analysis. Lessons Learned to secure project results.

The timing and organization with the scheduling of the maturity milestones is project-specific depending on the current project framework schedule, forward sourcing planning, project specifications and the corresponding use cases. Separate agreements may have to be made for software-determining scopes.

3.2 **Project facility**

In the concept phase of the project, the customer starts with maturity assurance. The customer evaluates the delivery volumes according to their risk and informs the supplier after the nomination in case of risk classification A or B.

The processing of the maturity level protection and the system usage is carried out via so-called "part families".

3.3 **Risk classification**

The classification in the maturity level risk A, B or C is the basis for the decision of the decreasing customers to what extent the processing of the maturity levels can be verified by cross-examination and on-site visits.

For cooperation with the customer, the following applies to the definition of the delivery quantities:

A-classification: High degree of maturity (= "critical scope").
The processing in the maturity level assurance of these such classified products is carried out system-supported together between the supplier and the customer.

B-classification: Medium maturity risk.
The supplier provides his status of maturity assurance to the customer. The result is discussed in coordination between the supplier and the customer.

C-classification: Low degree of maturity.
The supplier carries out independently and on its own responsibility, without system support by the Volkswagen Group, the processing of the maturity levels with the associated sub-processes in his organization and at its sub-suppliers.

The customer may request the creation of additional intermediates within the scope of maturity reporting by the supplier, regardless of the classification in the ABC classification according to VDA.

The maturity level assessments for the A and B prioritized sizes must be carried out with the central IT system QPNI/LION. Deviations must be agreed with the customer in writing.

In the case of significant changes, e.g. the product, manufacturing process or in the supply chain a new risk classification can be made during the course of the project. In this case, the supplier concerned will be informed.

3.4 **Execution of maturity assurance**

The supplier processes and documents all maturity milestones with the associated sub-processes in his organization independently. These include, e.g. the risk-oriented tracking of maturity levels at its sub-suppliers, the PPF report (the production process and product approval) of its sub-supplier volumes and ensuring the ability to deliver in its process chain.

If difficulties arise during the processing of the maturity assurance that are not to be solved independently by the supplier, the supplier must contact the customer immediately. This applies regardless of the classification of the sizes in a risk classification A, B or C.

If defects occur during the course of the project, which can lead to a risk to the start-up (e.g. insufficient maturity processing, process or product problems), a new risk assessment is possible. The maturity risk can then increase, e.g. from a maturity level C to a maturity level risk B.

In the event of deviations from agreed project objectives or lack of project performance, the customer reserves the right to initiate the escalation into the "critical suppliers" program (see Formel Q konkret).

The assessment of the individual maturity levels for products with the risk classification "A" is carried out at the so-called "round tables". The customer and the supplier agree on an appropriate procedure for carrying out the project, e.g. web meetings, as well as the necessary participants. In addition, the responsibilities must be recorded in person. The procedure, contents and duration of the round tables must be agreed. If no consensual level of maturity can be achieved in the context of a round table, the customer's determination shall apply.

The evaluation of the individual maturity levels for products with the risk classification "B" is carried out by the supplier. The results must be presented to the customer and the evaluation must be coordinated with the customer.

The evaluation of the individual maturity levels for products with the risk classification "C" is carried out by the supplier. The reviews must be submitted upon request by the customer. In the case of an evaluation with the result "Red" by the supplier, this must be notified to the customer and documented with measures.

3.5 **Evaluation of measurement criteria**

The measurement criteria are evaluated with the traffic light system according to the VDA volume "Maturity level assurance for new parts":

assessment	definition	hint
 Red	• The measurement criterion is answered with "no" and • at least one project objective is not achievable and • Action means a target adjustment.	• No solution for the considered scope of delivery available, agreed framework schedules cannot be adhered to, proposal of measures, escalation and decision by the management.
 Yellow	• The measurement criterion is answered with "no" and • a measure is necessary and agreed and • all project objectives will be achieved with the defined measures.	• Measure for the scope of supply under consideration is defined, effectiveness is to be confirmed, time overruns of the target is given. Overall project objectives are not at risk.
 Green	• The measurement criterion is answered with "yes" and • no additional activities are necessary.	• No relevant deviation. Overall project objectives are not at risk.

Table: Traffic light system for measurement criteria evaluation

3.6 **Procedure for start-up stages**

In the case of products that are used e.g. in a modified form as part of a start-up phase of a project, the customer can demand a new degree of maturity assurance. In the case of modifications of partial scopes of a delivery scope at start-up stages, any existing partial results can be transferred after consultation with the customer.

4 Production Capability Analysis (multi-stage 2-Day Production)

4.1 Purpose of the proof of serial capability

In order to avoid quality and capacity problems during vehicle start-ups, product changes or relocations, a Production Capability Analysis (PCA; in German: SFN (Serienfähigkeitsnachweis)) for all products, formerly: a 2-Day Production (2DP), carried out by the supplier independently, documented and the result submitted to the customer's publishers. The customer reserves the right to be present at the PCA/2DP on site after consultation.
The implementation of individual acceptance stages within the framework of the PPF procedure is possible under certain conditions. The result of the last evaluation is always valid.

In order to secure the start-up volume quantitatively and qualitatively at an early stage of the project and to identify risks at an early stage, evaluations are carried out taking into account the start-up curve. This means that the **needs-oriented** requirements are taken into account in the project.

The **process-oriented requirements for the acceptance volume are also taken into account** depending on the complexity of the product of planned changes and the different manufacturing processes (see Chapter 4.4).

In the case of on-site evaluations, the requirements for the acceptance volume must be determined specifically together with the customer in advance and in a consultation on the planned PCA acceptance stage.

The evaluations are also required for:

- subsequent technical changes with manufacturing relevance,
- duplication and expansion of manufacturing facilities,
- planned volume jumps, as in JIT sizes and sequence productions (e.g. variant expansion),
- supplier changes.

4.2 Explanations of terms

The evaluations and the approvals are subdivided as shown in the next Table. The detailed content follows from chapter 4.3.1.

Evaluations of Production Capability Analysis (multiple stage 2-Day Production)	
concept	**abstract**
Maturity status to VFF / VFA	Assessment of maturity level 5[2]
PCA1 (Pre-Check)	Ensuring delivery capability from series tools (manufacturing capacities)
PCA2 (Process acceptance)	Evaluation of series process quality and IST capacity taking into account the start-up curve and the contract incl. agreed flexibility
PCA3 (Performance test)	Process and volume hedging in series processes based on the contract incl. agreed flexibility

Table: Overview of the terms of Production Capability Analysis

4.3 Demand-oriented Production Capability Analysis (multi-stage 2-Day Production)

Depending on the start-up curve, the demand-oriented requirements in the project in the planning and execution of a Production Capability Analysis (formerly "Multi-stage 2-Day Production") must be observed.

From PCA1 (Production Capability Analysis 1; Pre-check) the existing acceptance protocol of the 2-Day Production (Production Capability Analysis) in consultation with the customer in the LION/QPNI system applies for the respective evaluations.

4.3.1 Maturity status to VFF / VFA

As part of the status determination of the maturity level for the VFF/VFA, the supplier will update the criteria, which may have a limitation of the delivery relevance. The quantities produced for the VFF/VFA or PVS must be documented by the supplier in the form "Proof of Quality in the Pre-Series Phase" with the average cycle times per product.

[2] With maturity risk A.

The products can still be manufactured for use in the VFF or VFA from individual components of the series process without a correction loop. Starting with PVS, a manufacturing process under series conditions in the series site (not chained) is required.

4.3.2 Production Capability Analysis 1 (Pre-check)

The Production Capability Analysis 1 (PCA1; Pre-Check) must be carried out at the supplier's series production site at the beginning of industrialization. The aim is the process and quality assurance of the manufactured products as well as the first capacity assessment as an extrapolation on the basis of the cycle times for the fulfilment of the contract. Evaluations applies only to proven production capacity. In the case of negative rating (result RED), the PCA1/Pre-check must be repeated.

4.3.3 Production Capability Analysis 2 (Process Acceptance)

The aim is to secure the production process within process and volume until TBT SOP. For volume protection, the actual capacity of the contract inclusive agreed flexibility is checked. Extrapolation of the quantities up to the time of evaluation of the performance test is permitted. A consistently chained series process is required for process acceptance. Additional information can be found in VDA volume 2.

The volume to be evaluate and the periods are regulated in Chapter 4.4.3. Acceptance applies only to the proven production process and the resulting production capacity.

In the event of a negative result of the evaluation due to a lack of capacity (traffic light status RED), the repetition of the Production Capability Analysis 2 (PCA2; Process Acceptance) must be carried out as soon as possible after implementation of the measures.

Joint implementation of Process Acceptance (PCA2) with the Performance Test (PCA3) is possible under certain conditions and after equivalent agreement (e.g. fully set up capacity at the supplier, serial packaging available). For more conditions, see Chapter 4.4.3. The time period of process acceptance is decisive for the date. The result of the last acceptance is always valid.

4.3.4 Production Capability Analysis 3 (Performance Test)

The Production Capability Analysis 3 (PCA3; Performance Test) is the final confirmation of the capacities set up for the series. The overall process is to be subject to conditions of fully established capacity at the supplier compared to the contract inclusive the agreed flexibility. The entire peripherals required for series production are taken into account (e.g. packaging, warehousing, JIT and/or sequence delivery).

A prerequisite for the acceptance of the performance test is a fully set up production capacity and a successful PPA procedure.

In consultation with the customer, a repetition of the process acceptance (PCA2) can be summarized with the performance test (PCA3).

In the event of a negative result (traffic light status RED), the repetition of the Performance Test must be carried out as soon as possible after the measures have been implemented.

A successful Performance Test is the completion of the Production Capability Analysis.

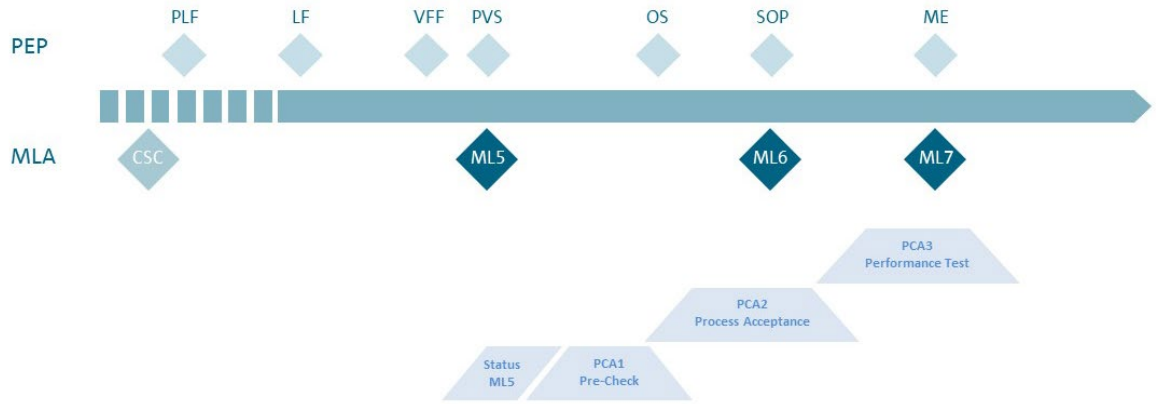


Figure: Production Capability A (schematic figure)

	Abstract	Goal
Maturity level status to VFF / VFA	• Process evaluation based on the maturity assessment methodology (during maturity level 5).	• Ensuring tool and plant availability. • Completion of ML 5[3].
PCA1 (Pre-Check)	• Start of industrialization at the supplier's series site up to 2 weeks before TBT 0 series. • Capacity valuation as extrapolation based on cycle time of the contract.	• Process protection and Volume hedging 0-series with not yet chained systems.
PCA2 (Process Acceptance)	• Target to TBT SOP. • Capacity assessment of the contract incl. agreed flexibility with extrapolation up to the performance test.	• Process and volume protection of the SOP and series start-up under visibility of the start-up curve up to the Performance test incl. agreed flexibility.

[3] With risk level A

PCA3 (Performance Test)	• Capacity assessment of the contract incl. agreed flexibility taking into account of the logistics period and the vehicle start-up curve. • On a case-by-case basis, as a repetition of the Process acceptance.	• Process and volume hedging to the contract incl. agreed flexibility under full series conditions (for several identical manufacturing facilities).

Table: Summary and objective of multi-stage approvals

4.4 Process-oriented Production Capability Analysis (multi-stage 2-Day Production)

4.4.1 Prioritization and planning of the Production Capability Analysis

For products with a maturity level risk "A", the individual stages of acceptances may be together with the supplier on site. The result is taken into account in the evaluation of the PPA procedure (see Chapter 5).

In the event of a "B" degree of maturity, the supplier carries out the acceptances independently and presents them to the customer – the customer reserves the right to carry out the acceptances together. The result is taken into account in the evaluation of the PPA procedure (see Chapter 5).

The supplier also carries out the acceptance of products of the risk classification "C" automatically. On request, the documented result is presented to the customer.

4.4.2 Prerequisites for acceptance of the Production Capability Analysis

A basic prerequisite for a successful acceptance at the respective stages of the Production Capability Analysis (multi-stage 2-Day Production) is a manufacturing process under series production conditions throughout the entire supply chain. In addition, all necessary development and planning work must be completed from the PCA1 (Pre-check). Deviations must be documented.

Basic requirements for acceptances:

- The call-up preview of the logistics is available from the supplier.
- Self-assessment of the supplier before each PCA phase.
- Contractually agreed capacities (nomination agreement with accepted contract additions) at the time of acceptance.
- A coordinated planning interview is available.

4.4.3 Preparation of acceptance

In order to successfully carry out the respective acceptances, the following preparatory steps must be carried out by the supplier:

- The supply chain (sub-supplier management) including the critical path must be demonstrated.
- Create production control plan according to IATF 16949 standard .

- Planning of group capacity per year for the customer.
- Planning of the group capacity per year for the vehicle or aggregate project to be taken away.
- Provide serial tools.
- Consistent and comprehensible capacity planning is available.
- Consideration of all factors affecting capacity, such as group capacity per year, setup and maintenance times, other downtimes, scrap rate, rework, number of shifts, break times.
- Determination of the capacity-determining sequence of work, taking into account scrap and rework.
- Consideration of the product variants (e.g. color, equipment).
- Processing of any open/agreed points/measures from previous acceptances and other visits/improvement programs of the customer.
- Ensuring approved serial packaging/load carriers.

An orientation on the basic initial variables (decrease quantities and times) depending on the manufacturing process for the product (process-oriented conditions of acceptances) gives the document "FQN supplementary document PCA evaluation" on the ONE.KBP under "Information\Business Units\Quality Assurance\Formel Q".

At the beginning of acceptance (from maturity level 5 or milestone VFF/ VFA) all the participating areas of the customer must be agreed in a planning discussion. It determines when which sizes and product variants are to be accepted and in which stage. Acceptance periods and quantities are to be agreed.

An extension of the acceptance volume is in principle possible and agreed with all parties involved at an early stage in the planning process. Further general conditions such as upcoming technical changes (ÄKO process) and early component call-offs must be taken into account when planning the respective acceptance volume.

4.4.4 Results assessment and documentation

The "Checklist 2-Day Production" as well as the acceptance protocol of the 2-Day Production (Production Capability Analysis) are to be used as the basis for the acceptances. The documentation must be agreed with the customer.

If a system cannot be used, the templates of the 2-Day Production (Production Capability Analysis) to be used are on the ONE.KBP in the directory "Information\Business Units\Quality Assurance\Formel Q".

The result criteria of the respective traffic light circuit are different depending on the respective acceptance stage. Criteria can be found in Table: Criteria for traffic light evaluation.

In the event of a negative result of an acceptance stage (traffic light RED), appropriate measures with responsibilities and deadlines must be presented to the customer. The respective acceptances must be repeated up to an o.k. result.

However, if the implementation period overlaps with the planned date of the subsequent acceptance stage, a repetition is not necessary. The result of the last acceptance carried out is always valid.

	Basis for the decrease	Earnings assessment	
Maturity status for VFF/ VFA	• Measuring criteria of maturity methodology	Results evaluation within the framework of the maturity degree method	
PCA1 (Pre-Check)	• Capacity valuation based on cycle time with extrapolation to the contract • Evaluation of Q product and process protection preferably on the basis of checklist 2DP	Acceptance without or with small deviations	yellow
		Decrease with serious deviations	red
PCA2 (Process Acceptance)	• Capacity valuation with extrapolation up to acceptance performance test against contract/ plus 15% flexibility • Evaluation of Q product and process protection preferably on the basis of checklist 2DP	Acceptance without deviation The component supply for the number of comb-line pieces of the first start project is secured* . A final performance test for the total volume must be carried out.	green
		Decrease without or with minor deviations**. The result shall be taken into account in the risk assessment of the PPA procedure.	yellow
		Decrease with serious deviations. The result shall be taken into account in the risk assessment of the PPA procedure.	red
PCA3 (Performance Test)	• Capacity assessment based on the strongest year in volume according to the contract plus 15% flexibility taking into account the logistics period and the vehicle start-up curve • Evaluation of Q product and process protection preferably on the basis of checklist 2DP in case of open measures or repetition of process acceptance	Acceptance without deviations.	green
		Acceptance with small deviations.	yellow
		Acceptance with heavy deviations	red

Table: Criteria for traffic light evaluation

* For COP components e.g. with cross-project or cross-brand use. Approval is only made for the start-up curve up to the comb line of the first vehicle or vehicle engine project.

** In case of acceptance of the fully set up capacity at the supplier for the highest volume year according to the contract/nomination agreement.

The results of the acceptance stages PCA1/Pre-Check, PCA2/Process Acceptance and PCA3/Performance Test must be documented in the acceptance protocol of the 2-Day Production (Production Capability Analysis) with indication of the respective acceptance stage.

4.4.5 Measures and repetitions

In principle, only one release can be made at a time up to the next acceptance stage. The final approval of a manufacturing process takes place up to the successful Performance Test (PCA3) according to the criteria of maturity level 6 or the checklist 2-Day Production, if any.

In the event of any deviations in quality and/or volume hedging, measures shall be initiated below and documented in the measure sheet for the 2-Day Production (Production Capability Analysis). The following steps must be carried out in the event of deviations:

- define and initiate immediate measures,
- perform root cause analysis,
- set down corrective action with responsibilities and deadlines, as well as
- Assess the effectiveness and sustainability of the measures taken
  (if necessary repetition of the acceptance stages PCA1/Pre-Check, PCA2/Process Acceptance or PCA3/Performance Test).

In the event of a negative result of an acceptance stage (red light), the defined measures must be followed and the respective decreases repeated up to an o.k. result.

If acceptance steps due to required repetitions are closely related in time or overlap, these can also be summarized.

4.4.6 Escalation

Reasons for the escalation may be:

- Is the deviation caused by the supplier to the agreed quantity requirements of the start-up curve,
- time-related IST deviations from agreed Volkswagen project milestones,
- deviations from the requirements of the maturity level status to the VFF / VFA as well as
- deviations from the general quality requirements in accordance with the agreed Volkswagen standards (Formel Q),
- identified high process risks (without hedging measures).

If acceptances have to be repeated and the supplier is responsible for the negative result, the escalation may take place according to the program "critical suppliers" (see Formel Q konkret).

5 PPA - Procedure

5.1 Basics

The serial delivery release as part of the production process and product approval (PPA) is based on VDA Volume 2. This chapter explains the additional customer requirements.

The supplier is obliged to notify the customer of any events relevant to approval prior to implementation, to obtain the customer's consent and to coordinate the scope of the product and process approval. These are in particular:

- new parts,
- all events of the trigger matrix according to VDA Band 2 appendix,
- use of replacement tools,
- change of sub-supplier,
- and renaming (also along the entire supply).

The PPA procedure is documented at the customer's initial location by the "Sampling Online" (BeOn) system. Installation/function documentation is carried out at all other installation sites. Deviations from the approval and documentation process are agreed between customers and suppliers.

Relevant information, such as notes on customer and/or acceptance plant or the milestone dates to be adhered to are part of the contract and can be requested additionally from the responsible procurement of the customer.

The number of PPA samples to be delivered must be agreed between the supplier and the customer.

It is in principle the duty of the supplier to clarify all information and activities necessary for serial delivery release in the context of a coordination of the PPF procedure with the customer.

The PPA process must be carried out through the supplier's manufacturing location. This also applies if:

- perform the final step of the manufacturing process (e.g. surface finishing) or have a high share in the value creation process,
- for logistical or other reasons, the subsequent deliveries to the customer are made from the sub-supplier or service provider.

As part of the PPA procedure, the 1st Tier supplier is responsible for the coordination, approval and evaluation of all quality requirements for the assembly (e.g. gaps, flushness, color, gloss level, functional dimensions, functional safety, electronic evaluation). The 1st Tier supplier shall use appropriate testing and measuring equipment as part of its responsibility to verify and ensure

the quality requirements. This also applies in the further course to compliance with the quality requirements during series delivery and up to EOS. The complete release of the assembly is carried out by the customer.

In the case of PPAF procedures by assembly (ZSB) with directed parts, which are released with the support of the customer, the complete proof of the delivery approvals of the sets is to be attached to the assembly (ZSB) release documents to the customer.

5.2 Items of the PPA procedure

The basis for the production process and product approval is the currently commissioned level of development (drawing status if necessary 3D model) with the respective valid generation level. If applicable, the hardware or software status or tool number attributes are also to be taken into account. Any product, process or drawing change must be presented to the customer as part of a production process and product approval.

An important prerequisite for the positive evaluation of the production process and product approval by the customer is the recording of the material data in the IMDS system (link: www.public.mdsystem.com) and/or CDX (Compliance Data Exchange, link: www.cdxsystem.com) according to the VW standard 91101. This must be done along the real supply chain, regardless of the contractual situation and in time for the conclusion of the PPF procedure. In the pre-series, the entry must be made no later than 14 months before SOP.

Rules for checking and acceptance of material data sheets are described in the standard VW 01155. Violations of results lead to "rejection" of the serial delivery release by the customer locations.

In the PPA procedure, the "part weight per piece" in grams must be determined and documented in the part data of the PPA report in BeOn. The weight information for the same product in the IMDS and BeOn applications must be plausible.

A graining may only be introduced into the tool after the written pre-grain release recommendation by the customer. Brand-specific regulations for the pre-grain release process must be taken into account.

5.3 Contents of the Documentation on the PPA

In addition to the evidence required in VDA Volume 2, the customer's IT system must be set up (e.g. LiOn, BeOn, HAMON):

- For consumables and process materials: Safety data sheet according to REACH Regulation for substances and preparations, concerning local requirements. In addition, at the customer's request, the legal areas approved for the respective product must be identified, unless these have already been contractually regulated.
- For products with electrical/electronic components, a hardware documentation must be carried out in the system HAMON.

- When carrying out the PPA procedure for assembly (ZSB), it is necessary to indicate the sub-suppliers with the DUNS no. of its production site. For this purpose, the ZSB decomposition must be used in BeOn and the VDA cover pages are to be attached as an attachment.
- If the PPA procedure is repeated, the preceding PPA shall be indicated. In principle, all agreed documents must be provided in each PPA report, possibly by transfer from the previous operation.
- All certification certificates and proofs of production site, products and labelling approvals (e.g. REACH, Factory Inspection Report) required by law or by the regulatory authorities are part of the documentation if required.
- For the PPA procedure in the after sales, a suitable representation (e.g. a photo) of the markings executed on the product and a representation of the location of the markings on the product must be attached in BeOn.
- Component markings, in particular country of origin marking, country specific identification (e.g. CCC marking) and markings for limited shelf life of the products (minimum shelf life date) shall be taken into account and implemented by the supplier in accordance with the specification.
- Component certificates (e.g. CCC, radio) and Factory Inspection Reports must be valid for at least 2 months at the time the product and process approval is discontinued.
- The deviations from the technical documentation must be marked by the supplier in the PPA report according to customer specifications. The effects of the detected deviations and the resulting risk assessments shall be determined by the supplier as part of a risk assessment.
- A fully completed measurement report with drawing or principle sketch with marking of the measuring points.
- The material sampling must be carried out in accordance with the specifications of the VW standard 52000.
- Agreed Production Capability Analysis 2 (see Chapter 4).
- For software provision, a complete function and release document in accordance with VDA Volume 2 must be supplied in consultation with the customer.

5.4 Delivery of samples to the PPA

The packaging units of the samples for the PPA and the associated delivery documents must be clearly marked with "Samples for PPA".

The packaging units and their labelling for laboratory, dimension and functional build samples, etc., must be coordinated with the customer.

The delivery note number in BeOn must be up-to-date and identical to the shipping documentation of the PPA samples. A "dummy" delivery note number is not allowed.

The PPA report should be attached as print-out from BeOn with the completely fulfilled cover sheet of the PPA.

5.5 Result of the PPA procedure

The customer's evaluation is carried out in the BeOn system. The results of the individual evidences are combined into an overall assessment. The following priority topics will be taken into account in the overall evaluation:

Designation	Description
M	for the measured evaluation.
L	for laboratory-side evaluation and surface area.
E/F	for the evaluation of the function and the installation under series conditions in the next higher assembly stage or in the vehicle.
G	reflects the overall score for the clearance test and results from the worst individual assessment of the PPA procedure. Irrespective of the individual grades awarded, the overall rating is "not suitable for series production", if: - the BMG is missing*, - IMDS/CDX- requirements are not met, - the marking for VW 10500 products is missing, - necessary certificates are not available.

Table: Overview of individual assessments of PPA procedures

* In the presence of a valid AWE (deviation permit), a "ready for series production-limited period" can be granted.

In addition to the above reasons, there may be other brand- resp. process- or product-specific reasons for the overall assessment "Not suitable for series production". In the event of such an assessment, the customer site will inform the supplier of the reasons.

Note: Compliance with the agreed model dates is an absolute priority compared to the above points. The agreed dispatch of the PPA samples by the supplier must be made even if it is already foreseeable that the overall assessment "Not suitable for series production" for the PPA procedure will be pronounced due to the above-mentioned deviations or planned changes by the customer.

The possible ratings are:

rating	hint
Ready for series	All agreed requirements.

production	If the customer requirements are not fully met, a " ready for series production-limited period " may be granted on the basis of the risk assessment. PPA samples come from serial tools.
Not suitable for series production	Specifications and/or legal regulations are not met. Samples of the PPA where there are serious deviations from the technical documentation and other requirements. New PPA procedure required.

Table: Overview Evaluation of PPA procedures

Other control characters are:

Control characters	remark
0	The evaluation of characteristics is not possible (e.g.: Assessment of dimensional accuracy in oils or other consumables). Applies only to the individual notes.
-	Indicates the termination of the initiated PPA procedure. The supplier is informed of the reason.

Table: Overview Control Signs PPA Procedures

The supplier undertakes to carry out a tool data return after the approval of the PPA report by the customer and in consultation with the customer, which serves to ensure the quality of the parts in the case of duplication of tools and to make it available to the customer.

5.6 Labelling of products

In order to ensure the unique allocation of the products delivered, a unique product label is required for each delivery, during the pre-series in consultation with the customer. The customer's standards valid for product labelling must be strictly observed.

If, during the pre-series phase, the type of marking required in the drawing is not yet possible, a sticker shall be used instead. This must include the name of the supplier, the part number and designation, the production date, and the subscription or agreement status.

If safety-relevant scopes such e.g. airbag module, control panel, column cladding, seats, steering wheels, belt tensioners are not given the safety function (e.g. for sample deliveries) during the pre-series, this shall be marked as "non-function" or "non-type release" clearly. This also applies to "non-function" of a single component or a sub-assembly (ZSB). The marking must be agreed with the customer beforehand.

5.6.1 Labelling stickers

In the pre-series phase, a yellow, circular sticker must be affixed to each product in a place not visible during assembly (see the following figure). This also applies to the PPF patterns.

Figure: Sample labeling for product labelling

The sticker shall be labelled with numbers and a letter. In the case of electronic products, the hardware or software status (HW/SW status) must always be indicated.

The two digits indicate the generation level of the products. The first generation of products receives the generation level 01.

If the product is physically modified (e.g. other material combination, other paint, trimming changes), the generation level increases (old generation level plus 1, without taking into account the number of changes introduced). If no changes are introduced from one delivery to the next, the generation level remains unchanged (the granting of the type approval of the technical development therefore does not increase the generation count).

If changes are introduced in comparison to the previous generation, which are not or only very slightly visually recognizable (material, varnish, etc.), this must be listed in the field "Other information" of the “Q certificate” (see next chapter).

The identification letter after the two digits indicates the type of tool used:

- "H" - products made of auxiliary tools or hand samples (not PPF-releasable,
- "K" - products from small series tools or / and from small series process/products from non-chained processes (PPF-releasable),
- "S" - Products from series process and series tool from the serial site.

If the tool type or part number used (e.g. from H to K) is changed, the generation count starts at 01.

The product label with a sticker must be omitted if the overall rating "Serial suitable" is available.

5.6.2 Product Documentation

In order to ensure an optimal flow of information in the pre-series between the customer and his suppliers, the forms "Quality certificate for the pre-series phase" and "part history" must be fully documented for all product deliveries in the pre-series phase. Alternative detection options (TGS-Online) must be agreed with the customer. As an accompanying document, the delivery documents must be attached as an attachment, as long as products are delivered to the special warehouse or pre-series warehouse and the PPF procedure is not completed with the overall assessment of "suitable for series production ".

For parts with software, the hardware/software (HW/SW) status must always be listed in the field "Other information" in the Q-proof. Coordination of rework and deviations must also be documented in the "Other information" field, stating the contact person.

The parts life cycle must contain the date of use of any change to the product or process chain related to the delivery note number of the first inbound delivery to ensure traceability. The parts life cycle with place of production and associated DUNS number must always be maintained by the supplier up to EOP of the product.

The forms are on the ONE.KBP together with a corresponding filling aid available in the directory "Information\Business Units\Quality Assurance\Formel Q".

5.7 Agreement and optimization process

Within the pre-series, possibly also in the series process, there are continuous rounds of agreement and optimization between suppliers and the receiving plants of the customer. For analysis and evaluation purposes, the following methods are used on the part of the customer:

- Master jig /Cubing,
- electric master jig,
- Vehicle audit,
- Acceptance journeys,
- Series-accompanying tests.

The supplier is responsible for the self-responsible optimization and agreement of its scope of delivery.

For master jig and cubing, current series tool-falling sample parts, unless otherwise agreed, are to be provided in double version (color and execution in coordination with the customer) per coordination loop without additional charge.

6 Appendix

6.1 Glossary, terms and abbreviations

Abbreviation / Term	Explanation, definition
0-S /0-Series (Zero Series)	Precursor of series production - milestone in PEP. The 0-series is intended to ensure the fit and dimensional accuracy of the individual parts as well as the assembly before the application date of a new product. The function of the tools, test equipment and devices under production conditions is also checked. The 0-series covers the entire production process as a precursor to series production. It consists entirely of tool-trapping parts.
2-DP	**2-D**ay-**P**roduction; Milestone used to demonstrate manufacturing quality and capacity over a defined manufacturing period. Now: Production Capability Analysis (PCA).
ÄKO	Change control - All changes to assemblies/parts from CSC completion (for purchased parts) or P-release (for house parts) up to 3 months according to SOP, in the K(eastern)V(success) EKO or ACO process, the project organisation (Specialist Group/SET) is Impact scant and made to decision in terms of technology, costs, expenses, deadlines, quality, weight, CO2 and dependencies.
Type-approval (BMG)	Model approval: is issued by the customer's responsible development department. See standard VW 99000.
BF	Purchasing release (Beschaffungs Freigabe); milestone in the PEP.
Checklist 2-Day Production	Can be used as a tool for preparing a Production Capability Analysis (formerly 2-Day Production).
CDX	Compliance Data Exchange: Similar to material data acquisition in the IMDS system, the CDX system is available for non-vehicle-specific products. The information from CDX is transferred to the MISS system via download and checked.
Cubing	Incarnation of the body with all fastening elements in order to simulate the completion of the body with connected components under assembly-like conditions.
eNA	**e**lectronic **N**omination **A**greement; Procurement system for processing, documentation and archiving of the Nomination Agreement/Contract with the Supplier.
EOP	**E**nd **o**f **P**roduction. End of production of a vehicle type.
EOS	**E**nd **o**f Service; End of supply of spare parts.
Forward Sourcing	Procurement process for newly developed and manufactured products.
IMDS	**I**nternationales **M**aterial**D**aten**S**ystem. In order to gain knowledge about the ingredients of all components installed on the vehicle, the "International Material Data System" (IMDS) was developed by the car manufacturers.

JIS	**J**ust **I**n **S**equence: Delivery of customer-specific parts in sequence, e.g. Delivery of door interior panels exactly in the order in which they are installed. Variant formation takes place after retrieval by an assembly line.
JIT	**J**ust **I**n **T**ime: Finish the product in the right quality and quantity in the right place at exactly the time it is needed.
KF	Concept freeze; milestone in the PEP.
LF	**Launch release (L**aunch-**F**reigabe); milestone in the PEP.
ME	**MarketAvailabilty (M**arkt**E**inführung); milestone in the PEP.
Part	See Product.
Part Families	A part family consists of a group of part variants within a project that belong to the same part number sequence and come from comparable manufacturing processes.
PCA	**P**roduction **C**apability **A**nalysis, replaces the previous 2DP levels Pre-Check, Process Acceptance, Performance Test. In German: SFN.
PEP	**P**roduct **E**mergence **P**rocess. In German: Produkt-Entstehungs-Prozess.
PLF	Planning release; milestone in the PEP.
PPA	**P**roduction Process and **P**roduct **A**pproval. Procedure for performing a product and process approval in the supply chain, described in VDA volume 2.
Product	Replaces the term "part" to capture the broader purpose of components and services for vehicles/aggregates created on behalf of the customer. Product includes all product categories such as .B hardware, software, services and processing materials with the associated development and production process. See also ISO 9001:2015.
PVS	Production pre-series **(P**roduktions-**V**ersuchs-Serie); milestone in the PEP.
QPNI	**Q**ualification**P**rogram **N**ewparts **I**ntegral.
QTR	**Q**uality **T**echnical **R**equirement - Quality requirements.
RGA	Maturity Level Assurance **(R**eife**g**rada**b**sicherung). Standard of the Association of the German Automotive Industry (VDA). It describes the methodology for evaluating the project maturity of new parts on the basis of quantifiable parameters (maturity measurement criteria).
Scope of delivery	A **scope of delivery/supply is** contractually agreed between the customer and the supplier. It includes all products and services necessary for the contractually agreed delivery.
SET	**S**imultaneous **E**ngineering **T**eam.
Small/serial tool	There is no distinction between series and small series tools. Only products from series tools and series processes/ processes close to series production can be presented as samples in the PPF process. This means that the quality, drawing instructions, material, surface and production plan correspond to the planned series production.
SOP	**S**tart **O**f **P**roduction - milestone in PEP. Start of series production.
TGS-Online	**T**eile**G**eneration**S**tand-Online: System for recording the quality certificate and the part CV for pre-series parts.

TBT	**T**eile**B**ereitstellungs**T**ermin. Date on which the necessary parts must be available.
VFA	**V**orserien-**F**reigabe-**A**ggregate**;** milestone in the aggregate PEP (see also VFF).
VFF	**V**orserien-**F**reigabe-**F**ahrzeuge; milestone in the PEP.
ZV	Target agreement (Ziel Vereinbarung); PEP milestone.