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.

This document is the revised version of Formel Q New Parts Integral, containing the Volkswagen Group quality requirements placed on you as a supplier of products. Formel Q New Parts Integral is part of the Request and Quotation procedure.

For successful cooperation, it is mandatory throughout the supply chain to comply with the requirements 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, May 2024

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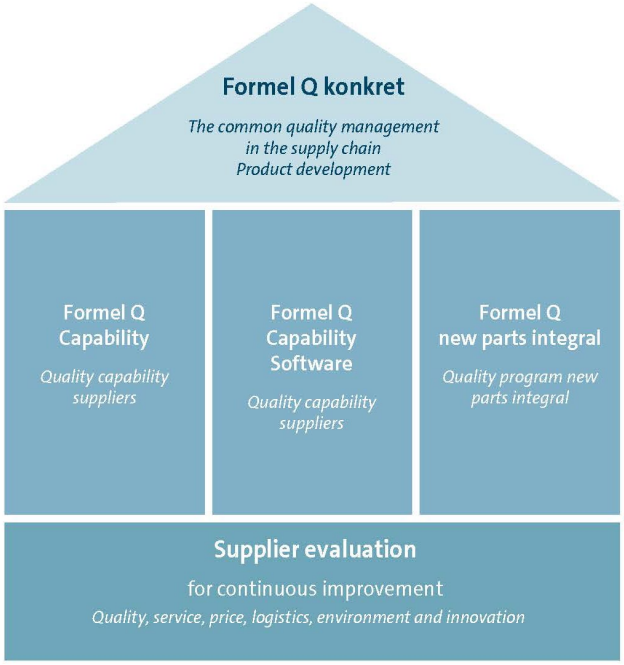
Content

0 General regulations

For the sake of simplification, the receiving assembly 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 including the attachment “brand specific supplements”. 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 is 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\Divisions\Quality Assurance\Formel Q".

In addition, all documents 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. Customer-specific requirements are valid in addition to the above-mentioned documents.

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

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 scopes or categories of outputs, e.g. hardware, services, software and processed materials) shall be fully completed, 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. Fundamentally, 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)
- Production Capability Analysis (PCA; in German SFN)
- Production Process and Product Acceptance (PPA process, in German PPF).

2 Quality Technical Requirement

QTR is a risk mitigation method that is applied to selected awards prior to the nomination of suppliers.

In the course of the award process, affected suppliers are asked to plausibly demonstrate their suitability as contractual partners for the specific scope of the Request, usually in the form of a presentation.

The presentation must cover all topics of the QTR questionnaire with suitable evidence. The focus is on the suitability of the planned production sites for components ("production sites"); any required development services for parts and software components are also considered. The QTR method and the requirements for the QTR presentation are described in detail and transparently for all suppliers in the QTR Guide. The QTR guide is available at ONE. KBP and is stored in the directory "Information\Business Units\Procurement\Quality Technical Requirements (QTR)".

Representatives of several of the customer's business units jointly ("cross-functionally") check the plausibility of the offers, identify possible risks (if necessary in discussion with the supplier) and, if necessary, can impose conditions for awarding contracts.

The QTR result is included in the award decision as part of the Q rating.

2.1 Determination of QTR-relevant scopes

The QTR relevance is determined by the customer, based on their priorities. The customer can change the prioritization at any time.

2.2 Providing a QTR Presentation

Prior to the award decision, Procurement requires affected suppliers to submit a Request-specific QTR presentation, which must be made available at short notice within a few working days.

Postponements of the deadline for the submission of the QTR documentation that have not been agreed with the customer may lead to exclusion from the subsequent award process.

2.3 Checking the offer for plausibility

The plausibility of the offer is checked by representatives of the Procurement, Quality Assurance, Development and Logistics divisions, on the basis of the documents provided by the supplier.

As part of the assessment, the supplier may be invited to an interdisciplinary QTR meeting at the customer's premises in order to clarify open questions and, if necessary, to review internal supplier documents. The supplier ensures the presence of the experts intended for the specific project (e.g. designated project managers, responsible for development, quality, industrialization, etc.) in the QTR meeting.

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

Agreed conditions/measures for the nomination are tracked in the subsequent maturity level assurance and must be implemented 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 aligned with corresponding milestones in the product emergence process (PEP).

The use of maturity assurance delivers 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, an Offer plausibility check (QTR; see chapter 2) is implemented. Maturity level assurance with the suppliers starts following nomination. The maturity level evaluation discussion takes place via "round tables" at the customer, or 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. A standardized set of "measurement criteria" based on the VDA volume "Maturity level assurance for new parts" is available for the purpose of evaluating this.

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 in line with the defined PEP milestone:

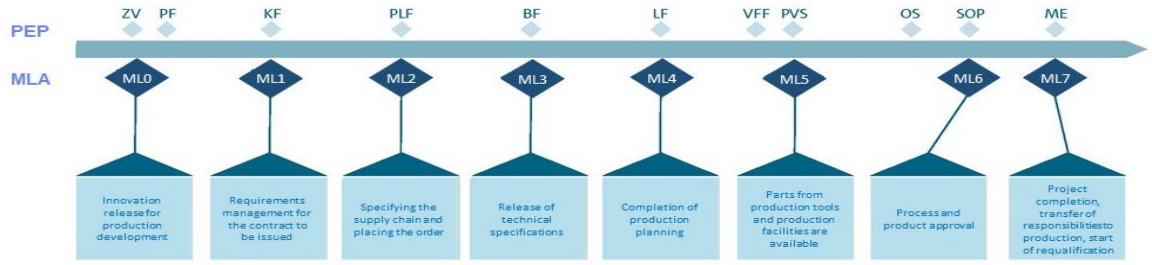


Figure1 Overview of maturity levels and PEP milestones (schematic using the example of focus parts of a new vehicle project with the Group PEP)

Execution at the customer:

- Maturity level 0 Innovation approval for the series development for the PEP milestone PF[1]: Start of cross-divisional maturity level assurance in the project. Integration of the customer's manufacturing site. Identification of critical part families for risk classification.
- Maturity level 1 Requirements management for the scope of the Request by the PEP milestone KE: Cooperation in the definition of component-specific targets. Detailed planning of the required scope of supply with the customer's manufacturing 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 Nomination of the scope of supply by the PEP milestone PLF: start of maturity level assurance by the nominated suppliers, clarification of the supply chain with sub-suppliers , as well as identification of the critical path (classification of the supply chain), presentation of the project organization, planning and management by the supplier.
- Maturity level 3 Release of the technical specification for the PEP milestone BF: Presentation of production planning as well as the tooling and production concept by the supplier, on the basis of the technical specifications, and including the test requirements and methods. If necessary, the functional dimension catalogs (German: Funktionsmesskatalog FMK) must be taken into account.
- Maturity level 4 Production planning completed by the PEP milestone LF: Tools in production, confirmation of dates and contents of the Production process and Product Approval (PPA). Ensuring the supplier's adherence to deadlines in the course of the project.
- Maturity level 5 Parts from series tooling and series production locations are available: Start of component and process optimizations, preparation of production and process approval.
- Maturity level 6 Production process and Product Approval: PPA procedure and securing parts supply. Execution of Process Acceptances and confirmation of the agreed capacities as part of the Production Capability Analysis.
- 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. Securing of project outcomes through lessons learned.

The timing and organization of the maturity level milestones is scheduled on a project-specific basis, 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-containing scopes.

3.2 Project facility

The customer commences maturity level assurance during the concept phase of the project. The customer evaluates the scopes of supply according to their risk, and in the case of risk classification A or B, informs the supplier after nomination.

The processing of the maturity level assurance is carried out in the system QPNI via so-called "part families".

3.3 Risk classification

The classification into maturity level risk A, B or C is the basis for the receiving customer to decide to what extent the processing of the maturity levels will be verified by cross-checks and on-site visits.

For cooperation with the customer, the following applies to the definition of the scope of supply:

A-classification: High Maturity Level Risk (= "critical scope").
The processing of products with this classification is carried out jointly by the supplier and the customer in the maturity level assurance system.

B-classification: Medium Maturity Level Risk.
The supplier provides the status of maturity level assurance to the customer in the system. The result is discussed in coordination between the supplier and the customer.

C-classification: Low Maturity Level Risk.
The supplier carries out the process of maturity level assurance independently and responsibly in their own organization and at sub-suppliers, without system support by the Volkswagen Group.

The customer may request the supplier prepare additional interim statuses as part of the of maturity level reporting, regardless of the ABC classification according to VDA.

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

In the case of significant changes (e.g. the product, manufacturing process or 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 independently processes and documents all maturity level milestones using the associated sub-processes in their organization. These include, e.g. the risk-oriented tracking of maturity levels at its sub-suppliers, the PPA report (the Production process and Product Approval) of its sub-suppliers' scopes of supply, and ensuring the delivery capability in the process chain.

If difficulties arise during the processing of the maturity level assurance which cannot be solved independently by the supplier, the supplier must contact the customer immediately. This applies regardless of the classification of the scope as risk classification A, B or C.

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

In the event of deviations from the 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 at an individual level. The procedure, contents and duration of the round tables must be agreed. If no consensus level can be reached in the round table, the customer's determination shall apply.

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

For products with the risk classification "C", the evaluation of the individual maturity levels is carried out by the supplier. The results must be submitted if requested by the customer. In the case of a "Red" evaluation result by the supplier, the customer must be notified, and corrective actions documented.

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 target cannot be achieved and • Corrective action involves an adjustment of the target.	• No solution available for the scope of supply, agreed framework schedules cannot be adhered to, proposal of corrective actions, escalation and decision by the management.
 Yellow	• The measurement criterion is answered with "no" and • a corrective action is necessary and has been agreed upon and • all project targets will be achieved with the specified actions.	• Corrective action is defined for the scope of supply, effectiveness is to be confirmed, timing late against target. 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 phased launch of a project, the customer can require a new maturity level assurance. In the case of partial modification of the scope of supply in the launch phase, any existing partial results can be transferred after agreement with the customer.

4 Production Capability Analysis

4.1 Purpose of the proof of serial capability

In order to avoid quality and capacity problems during vehicle production start-up, product changes, or relocations, a Production Capability Analysis (PCA; in German: SFN (Serienfähigkeitsnachweis)) for all products is carried out independently by the supplier, and the result is documented and submitted at the customer's request. The customer reserves the right to be present at the PCA on site after consultation.

An assessment of the Production Capability Analysis can be carried out as part of the PPA procedure.

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

The **process-oriented** requirements for the assessment 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 assessment 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 increases, as in JIT sizes and sequence productions (e.g. variant expansion),
- change of supplier.

4.2 Explanations of terms

The evaluations and the approvals are subdivided as shown in the next table. The detailed content continues from chapter 4.3.1 onwards.

Evaluations of Production Capability Analysis	
Term	**Description**
Maturity status to VFF / VFA	Assessment of maturity level 5[2]
Pre-Check (PCA1)	Ensuring the capability to deliver from series tools (manufacturing capacities)
Process Acceptance (PCA2)	Evaluation of series process quality and ACTUAL capacity, taking into account the launch curve and the contractual requirements, including agreed flexibility
Performance Test (PCA3)	Validation of the process and volume for the series process based on the contract, including agreed flexibility

Table: Overview of the terms of Production Capability Analysis

4.3 Demand-oriented Production Capability Analysis

Depending on the launch curve, the demand-oriented requirements of the project must be taken into account when planning and executing a Production Capability Analysis.

From Pre-check (Production Capability Analysis 1) the existing Assessment protocol of the 2-Day Production (Production Capability Analysis) within the customer IT system must be used.

4.3.1 Maturity status to VFF / VFA

As part of the status evaluation of the maturity level for the VFF/VFA, the supplier will update the criteria, which may have a limitation of the delivery relevance. The products 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.

The products for use in the VFF or VFA can still be manufactured from individual elements of the series process, without a correction loop. Starting with PVS, a manufacturing process under series conditions in the series site is required.

[2] For part families with maturity level risk A.

4.3.2 Pre-check

The Pre-Check (PCA1) must be carried out at the beginning of industrialization at the supplier's series production site (Target: SIP for PVS). The aim is the process- and quality-assurance of the manufactured products as well as the first capacity assessment against the contractual requirements, which is extrapolated from the cycle time. The evaluation result is based only on proven production capacity. In the case of a negative evaluation (result RED), the Pre-Check must be repeated.

4.3.3 Process Acceptance

The aim is to sign off the production and secure the process and volume by SIP 0-Series. To secure the volume, the actual contracted capacity including agreed flexibility is checked. It is permitted to extrapolate the quantities up until the Performance Test. A consistent and interlinked series process is required for Process Acceptance. Additional information can be found in VDA volume 2.

The volume and duration of the assessment is defined in Chapter 4.4.3. Assessment is based only on the demonstrated production process and resulting production capacity.

If the assessment result is negative due to a lack of capacity (traffic light status RED), the Process Acceptance (PCA2) must be repeated as soon as possible after the implementation of corrective actions.

Evaluation of Process Acceptance (PCA2) together with the Performance Test (PCA3) is possible under suitable conditions and after appropriate agreement (e.g. fully installed capacity at the supplier, series packaging available). For additional requirements, see Chapter 4.4.3. The timing of the Process Acceptance will determine the date. The result of the last assessment is always valid.

4.3.4 Performance Test

The Performance Test (PCA3) is the final confirmation of the installed capacity for series. The fully commissioned capacity of the entire process must be evaluated and approved in relation to the contracted volume, including flexibility. All supplementary facilities, materials and equipment required for series production are taken into account (e.g. packaging, warehousing, JIT and/or sequenced delivery).

A fully commissioned production capacity is a prerequisite for the assessment of the Performance Test and a successful PPA procedure.

With the customer’s agreement, a repetition of the Process Acceptance (PCA2) can be combined with the performance test (PCA3).

In the event of a negative result (traffic light status RED), after the corrective actions have been implemented, the Performance Test must be repeated as soon as possible.

A successful Performance Test concludes the Production Capability Analysis.

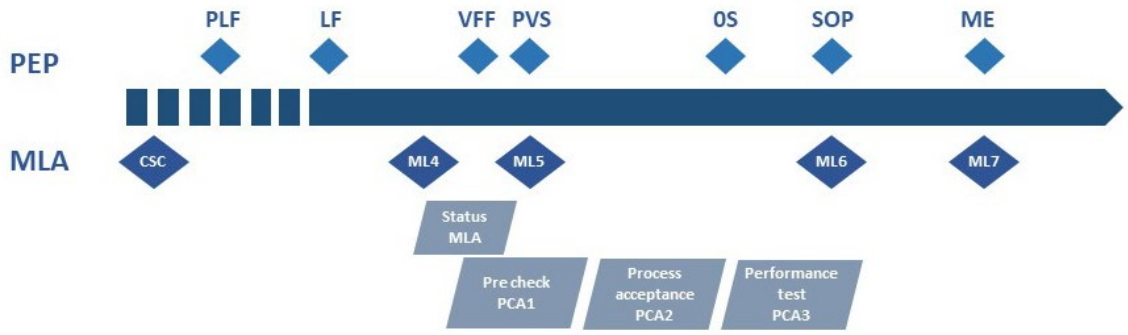


Figure: Production Capability Analysis (diagram)

	Description	Objective
Maturity level status to VFF / VFA	• Process evaluation based on the Maturity Level Assessment (during maturity level 5)	• Ensuring tool and plant availability. • Completion of ML 5[3]
Pre-Check (PCA1)	• Industrialization at the supplier's series site by SiP PVS • Capacity evaluation by extrapolation based on the cycle time, in accordance with the contract	• Securing process and volume for PVS, with facilities which are not yet interlinked
Process Acceptance (PCA2)	• Target: by SiP 0-series Capacity evaluation against the contract requirements, including agreed flexibility, by extrapolation, in advance of the Performance Test	• Securing process and volume for SOP and series launch, taking into consideration the launch curve up to the Performance Test, including agreed flexibility

[3] For part families with risk level A

Performance Test (PCA3)	• Target: by SiP SOP • Capacity evaluation against the contract requirements, including agreed flexibility, taking into account the supply chain and the vehicle launch curve • On a case-by-case basis, as a repetition of the Process acceptance	• Securing process and volume in line with the contract requirements, including agreed flexibility under full series conditions (including duplicate manufacturing facilities, where required)

Table: Summary and objective of multi-stage approvals

4.4 Process-oriented Production Capability Analysis

4.4.1 Prioritization and planning of the Production Capability Analysis

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

For maturity level risk "B" , the supplier carries out the PCA evaluations independently and presents them to the customer – the customer reserves the right to carry out the evaluations together with the supplier. The result is taken into account in the evaluation of the PPA procedure (see Chapter 5).

For products with risk classification “C”, the supplier is responsible for carrying out the assessment independently. On request, the documented result is presented to the customer.

4.4.2 Prerequisites for acceptance of the Production Capability Analysis

It is a basic prerequisite for a successful assessment at any stage of the Production Capability Analysis that the manufacturing process is under series production conditions throughout the entire supply chain. In addition, all necessary development and planning work must be completed in time for the Pre-check (PCA1). Deviations must be documented.

Basic requirements for assessments:

- The call-off forecast from Logistics is available to the supplier.
- The supplier has completed a Self-Assessment prior to each PCA phase.
- Capacity contractually agreed or confirmed by the supplier (nomination agreement plus accepted contractual additions) at the time of assessment.
- A coordinated planning meeting has been held.

4.4.3 Preparation of assessment

To successfully carry out each assessment, the supplier must ensure the following preparation is complete:

- The status of the supply chain (sub-supplier management) including the critical paths must be presented.
- Present a production control plan in accordance with IATF 16949.
- Plan the annual Group capacity for the customer.
- Plan the annual Group capacity for the vehicle or platform project to be accepted.
- Produce serial tools.
- Clear and consistent 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.
- Identification of the production process which determines capacity, taking into account scrap and rework.
- Consideration of the product variants (e.g. color, equipment).
- Implementation of any open/agreed points/measures from previous assessments and other customer visits/improvement programs.
- Ensuring availability of approved serial packaging/load carriers in sufficient quantities.

An indication of the key variables (assessment quantities and duration), depending on the manufacturing process for the product (process-oriented conditions for assessments), is given in the document "Formel Q New parts – additional document PCA" on the ONE.KBP under "Information\Divisions\Quality Assurance\Formel Q\Formel Q New parts integral".

At the beginning of assessment (from maturity level 5 or milestone VFF/VFA) a joint approach is to be agreed between all of the customers departments involved. This determines which scopes and product variants are to be accepted and at which stage. Assessment periods and quantities are to be agreed.

An increase of the assessment volume is possible in principle and must be agreed with all parties involved at an early stage in the planning process. When planning the assessment quantity, additional context such as upcoming technical changes (ÄKO process) and early component call-offs must be taken into account.

4.4.4 Results assessment and documentation

The PCA Checklist as well as the protocol of the Production Capability Analysis are to be used as the basis for the acceptances. The scope of the documentation must be agreed with the customer.

If a system cannot be used, the templates of the 2-Day Production (Production Capability Analysis) are on the ONE.KBP in the directory "Information\Divisions\Quality Assurance\Formel Q\Formel Q New parts integral". For the use of the templates, it is necessary to install the QPNI-2TP editor, which can be found in the specified directory.

The criteria for each traffic light result vary depending on the assessment stage. Criteria can be found in the following Table: Criteria for traffic light evaluation.

In the event of a negative result for an assessment stage (traffic light: RED), appropriate corrective actions with responsibilities and deadlines must be presented to the customer. The assessment must be repeated until an OK result is achieved.

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

	Basis for the Assessment	Evaluation	
Maturity status for VFF/ VFA	• Measurement criteria from the Maturity level method	Results evaluated in accordance with the Maturity Level method	
Pre-Check (PCA1)	• Capacity valuation based on cycle time with extrapolation to the contractual requirements • Evaluation of product and process Quality assurance, preferably on the basis of the PCA checklist	Assessed with no deviations, or with minor deviations	 yellow
		Assessed with serious deviations	 red
Process Acceptance (PCA2)	• Capacity valuation with extrapolation up to assess contractual requirements including 15% flexibility, up until the Performance Test • Evaluation of product and process Quality assurance preferably on the basis of the PCA checklist	Assessed with no deviations. The component supply for the planned volume of the lead project is secured*. A final performance test for the total volume must be carried out.	 green
		Assessed with no deviations, or with minor deviations**. The result must be taken into account in the risk assessment of the PPA procedure.	 yellow
		Assessed with serious deviations. The result must be taken into account in the risk assessment of the PPA procedure.	 red
Performance Test (PCA3)	• Capacity assessment based on the strongest year's volume according to the contract plus 15% flexibility, taking into account the logistics timeframes and the vehicle launch curve • Evaluation of product and process Quality assurance, preferably on the basis of PCA checklist in the event of open corrective actions, or a repetition of Process Acceptance	Assessed with no deviations.	 green
		Assessed with 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 of the comb line of the first vehicle or vehicle engine project.

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

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

4.4.5 Corrective Actions and Repetitions

In principle, only one release can made per assessment stage. The final approval of a manufacturing process takes place with the successful Performance Test (PCA3) according to the criteria of Maturity Level 6 or the PCA checklist, if required.

In the event of any deviations in quality and/or capacity, corrective actions shall be initiated as below and documented in the corrective action 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 corrective actions,
- perform root cause analysis,
- set down corrective action with responsibilities and deadlines, as well as
- assess the effectiveness and sustainability of the corrective actions taken
  (if necessary: repetition of the assessment stages Pre-Check, Process Acceptance or Performance Test).

If result of an assessment stage is negative (traffic light: RED) then the defined corrective actions must be monitored and the assessment repeated until an OK result is achieved.

If required repetitions mean that assessment stages are close together or overlapping, they can be combined.

4.4.6 Escalation

Reasons for the escalation may include:

- The supplier has caused a measurable deviation from the contractually agreed capacity
- Timing deviations from the agreed project milestones
- Deviations from the MLA requirements for VFF/VFA,
- Deviations from the general quality requirements in accordance with the agreed standards (Formel Q),
- High process risks identified (without mitigating actions).

If assessments have to be repeated and the supplier is responsible for the negative result, escalation may take place in accordance with the “Critical Suppliers” Program (see Formel Q konkret).

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5 PPA – Procedure

5.1 Basics

The release for series supply 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 prior to implementation of any activities relevant to approval, obtain the customer's consent and coordinate the scope of the Product process and Product approval. In particular, this includes:

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

This requirement also applies to activities within the supply chain.

The PPA procedure is documented in the "Bemusterung (Sampling) Online" (BeOn) system by the first-user customer location. Fit/function documentation is carried out at all other installation locations. Deviations from the approval and documentation process are agreed between customers and suppliers.

Relevant information, such as notifications of the customer and/or receiving plant, or the milestone dates to be adhered to are part of the contract, and can also be requested from the responsible Procurement department of the customer.

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

It is the duty of the supplier to clarify all information and activities necessary for release for series supply, as part of coordinating the PPA procedure with the customer (PPA agreement meeting).

The PPA process must be carried out by the supplier's production location. This also applies when:

- Sub-suppliers or service providers involved in the value-add process carry out the final step of manufacturing (e.g. surface finishing), or have a significant share in the value-add process,
- for logistical or other reasons, the deliveries to the customer are made from a sub-supplier or service provider.

As part of the PPA procedure, the 1st Tier supplier is responsible for the coordination, agreement 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 to ongoing compliance with the quality requirements during series delivery and up to EOS. The overall approval of the assembly is carried out by the customer.

In the case of PPA procedures for assemblies (ZSB) with directed parts (Setzteilen), which are released with the support of the customer, the complete proof of the series supply of the directed parts is to be attached to the assembly (ZSB) release documentation provided to the customer.

5.2 Elements of the PPA procedure

The basis for the Production Process and Product Approval (PPA) is the currently released design level (drawing status and, if necessary, 3D model) with the relevant valid generation level. If applicable, the hardware or software status or tool number are also to be taken into account. Any product, process or drawing change in accordance with the trigger matrix of the VDA Volume 2 appendix must be presented to the customer as part of a Production Process and Product Approval (PPA).

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 is an important prerequisite for the positive evaluation of the Production Process and Product Approval by the customer. This must be done throughout the actual supply chain, regardless of the contractual situation, and in time for the conclusion of the PPA procedure. In preseries, the entry must be made no later than 14 months before SOP.

Rules for checking and acceptance material data sheets are described in the standard VW 01155. Breach will lead to "rejection" of the release for series supply by the customer locations.

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

Tool graining may only be implemented after the customer has given a written graining release recommendation. Brand-specific regulations for the graining 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 following must be uploaded to the customer's relevant IT system:

- For consumables and process materials: Safety data sheet for substances and preparations according to REACH Regulation or local requirements. In addition, at the customer's request, the legal jurisdictions 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 provided in the system HAMON.
- When carrying out the PPA procedure for assemblies (ZSB), sub-suppliers must be identified, including the DUNS numbers of the production locations. For this purpose, the Assy Decomposition section must be completed in BeOn, and the VDA coversheets are to be attached.
- If the PPA procedure is a repetition, the preceding PPA shall be identified. In principle, all agreed documents must be provided in each PPA report, if necessary, by transferring them from the previous submission.
- All legally or officially required certificates and reports for production sites, products, and labelling approvals (e.g. REACH, Factory Inspection Report) are part of the documentation.
- For the Aftersales PPA procedure, a suitable representation (e.g. a photo) of the markings on the product, and a representation of the position of the markings on the product must be attached.
- 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 Production process and Product Approval is submitted.
- Deviations from the technical requirements must be identified by the supplier in the PPA report in accordance with customer requirements. The effects of the identified deviations and the resulting risk must be determined by the supplier as part of a risk assessment.
- A fully completed measurement report with drawing or schematic with identification of the measuring points.
- The material sampling must be carried out in accordance with the VW 52000. As soon as it becomes available, the use of a digital platform specified by Volkswagen AG is mandatory.
- Agreed evidence of Production Acceptance (see Chapter 4).
- For software, in consultation with the customer, complete function and release documentation in accordance with VDA Volume 2 must be supplied.

5.4 Delivery of PPA samples

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

The labelling of packages 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 filled out PPA coversheet.

5.5 Result of the PPA procedure

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

Designation	Description
M	for the dimensional evaluation
L	for laboratory and surface evaluation
F (German: **E**)	for the evaluation of the function, and for the installation under series conditions in the next level of assembly, or in the vehicle
T (German: **G**)	reflects the overall result of the submission , including the worst result of the individual evaluations of the PPA procedure. Irrespective of the individual results, the overall rating is "not suitable for series production", if: - the BMG is missing*, - IMDS/CDX- requirements are not met, - the product marking in accordance with VW 10500 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 "Suitable for series production-limited period" can be granted.

In addition to the above reasons, there may be other brand-, 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 sample submission dates has absolute priority over the points mentioned above. The supplier must make the agreed delivery of the PPA samples, 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 deviations, or due to planned changes by the customer.

The possible results are:

Customer Decision	Activity Status	Information
Suitable for series production	**PPA procedure closed**	The agreed customer requirements are completely fulfilled, or deviations are accepted permanently by the customer following a joint risk assessment by the supplier and customer.
	Temporary – Updated PPA documentation required	The agreed customer requirements are not completely fulfilled. Deviations are accepted by the customer for a limited time following a joint risk assessment by the supplier and customer. (abbr. German: 'STB', Serientauglich - Befristet)
Not suitable for series production	**New PPA procedure required**	Series delivery approval is not granted, because legal requirements and/or agreed customer requirements are not fulfilled.
	PPA procedure closed	Series delivery approval is not granted, because legal requirements and/or agreed customer requirements are not fulfilled. A new PPA is not required.

Table: Overview Evaluation of PPA procedures

Other control characters are:

Control characters	remark
0	Rating "0" is not included in the overall rating. The overall rating "Suitable for series production / Not suitable for series production" or "–" is given on the basis of the available individual results.
-	The termination of the individual examinations requires a termination of the overall examination with a justification. Rating rejected / no series release. Part is omitted or revaluation is required.

Table: Overview Control Signs PPA Procedures

The supplier is responsible for carrying out a tool data submission after the customer's approval of the PPA report, 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 identification of the supplied products, a unique product identified is required for each pre-series delivery, in consultation with the customer. The customer's standards 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 must 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, during pre-series, safety-relevant products are not functional or not certified for the safety-relevant technical function, they shall be clearly marked as "non-functional" or "not type approved", e.g. airbag module, control panel, column cladding, seats, steering wheels, seatbelt tensioners. 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 PPA samples. Alternatively, it can be marked on the printed label or as laser marking. Other types of marking may be used if agreed with the customer.

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 BMG of the technical development therefore does not increase the generation count).

If changes are introduced compared to the previous generation, which are not visually identifiable, or are only very slightly visually identifiable (material, varnish, etc.), this must be listed in the field "Other details" of the “Quality record for the pre-series phase” (see next chapter).

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

- "H" - products made using auxiliary tools or handmade samples (not able to be released via PPA),
- "K" - products from small series tools and/or from small series process/products from non-interlinked processes (can be released via PPA),
- "S" – Products from series process and series tools, from the series production 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 yellow sticker must be omitted if the overall rating "Suitable for series production" is available.

5.6.2 Product Documentation

In order to ensure an optimal flow of information in the pre-series between the customer and the suppliers, the forms "Quality record 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 PPA 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 details" in the Quality record. Coordination of rework and deviations must also be documented in the "Other details" field, stating the contact person.

The parts history must contain the implementation date of any change to the product or process chain together with to the delivery note number of the first inbound delivery to ensure traceability. The part history, including 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\Divisions\Quality Assurance\Production Process and Product Approval - Procedure".

5.7 Agreement and optimization process

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

- Master fixture (Meisterbock)/Cubing,
- Electric Master rig (Meisterbock),
- Vehicle audit,
- Release drives,

- Series tests.

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

For master fixtures and cubing, current sample parts from series tooling, unless otherwise agreed, are to be provided in duplicate (color and specification in coordination with the customer) for each maturation 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-approval (for house parts) up to 3 months according to SOP, will be made in the K(osten)V(erfolgungs; cost tracking)-ÄKO- or ÄKO-process by the project organization (Fachgruppe/SET) with regard to their Effects in terms of technology, costs, expenses, deadlines, quality, weights, CO2 and dependencies evaluated and brought to decision.
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.
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.
FMK	Functional dimension catalogue (German: **F**unktions**m**ess**k**atalog)
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 Production process and Product 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**rad**a**bsicherung). 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.
SIP	**S**tock-**I**n-**P**lant (German: **T**eile**B**ereitstellungs**T**ermin). Date on which the necessary parts must be available at the customer's production site.
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 PPA 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.
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.