PRETTL

Agreement on Quality, Occupational Safety, Environmental Protection and Social Responsibility Quality Assurance Agreement

Between

Prettl GmbH XXXX
Sandwiesenstrasse 2,
72793 Pfullingen

also in the name of and on behalf of the respective companies in which PRETTL or one of its associates has a direct or indirect majority involvement

- hereinafter referred to as "PRETTL" -
und /and

xxxx
xxxx
Street
Zip code,City
Country

- hereinafter referred to as "SUPPLIER –

Inhalt

Preambel

This agreement is part of the supply contract with PRETTL and is binding for business relationships between the SUPPLIER and companies in the PRETTL group (and therefore all companies in which PRETTL or one of its associates has a direct or indirect majority involvement).

This agreement has priority over any former arranged quality assurance agreements between PRETTL and the SUPPLIER. Any individual regulations (e.g. product- or feature-specific contents) made between PRETTL and the SUPPLIER as part of previously arranged quality assurance agreements continue to remain valid and have priority over the general regulations of this quality assurance agreement in case of any doubt. The same applies with respect to additional agreements on existing quality assurance agreements.

All submitted documents must be written in English, unless otherwise agreed.

Additional feature- or parts-related appendices can be agreed in writing with the respective PRETTL business division in addition to this quality assurance agreement.

All products or services supplied by the SUPPLIER are part of the agreement.

The regulations of the IATF, ISO, AIAG and the VDA are to be used unless otherwise described in the QAA or required by PRETTL!

For cited standards and regulations, the current versions are always valid!

Language of business

Business language is English.

Abbreviation

8D	**Eight disciplines problem solving**
AIAG	**Automotive Industry Action Group**
APQP	**Advanced Product Quality Planning**
ASPICE	**Software Process Improvement and Capability Determination**
AV	**Appraiser Variation**
BI	**systematic measurement error**
BOM	**Bill of Material**
CAD	**computer-aided design**
C/C	**Critical Characteristic**
Cg	**potential capability of gauge**
Cgk	**actual capability of gauge**
Cm	**machine capability**
Cmk	**capability machine index**
Cp	**capability process**
Cpk	**capability process index**
CQI	**Continuous Quality Improvement**
CSL	**Controlled Shipping Level**
DIN	**Deutsche Indusrie Norm**

EQC	**Extended Quality Cooperation)**
EV	**Equipment Variation**
e.g	**for example**
FIFO	**First in First out**
FMEA	**Failure Mode and Effects Analysis**
GRR	**Gauge Repeatability and Reproducibility**
IATF	**International Automotive Task Force**
ICL	**Important characteristics list**
ISO	**International Standard Organization**
K	**Kappa**
MSA	**Measurement System Analysis**
N	**Amount of parts**
Ndc	**number of distinct categories**
PCN	**Product Change Notification**
PCP	**production control plan**
Ppk	**Process Capability Index**
Pp	**Process Capability**
PPA/PPAP	**Production Part Approval Process**
PTC - P / C -	**Pass through characteristic**
PV	**Parts Variation**
PSCR	**Product Safety & Conformity Representative**
QAA	**Quality Assurance Agreement**
R&R	**Run and Rate**
RE	**display resolution**
S / C	**Significant Characteristic**
SICR	**Supplier Initiated Change Request**
SPC	**Statistical process control**
SQC	**Standard Quality Cooperation**
SW	**Software**
UCAL	**calibration uncertainty**
VDA	**Verband der Automobilindustrie**

1 Preface

PRETTL expects quality from their suppliers for each aspect of cooperation. To support the implementation of a shared quality strategy in a spirit of partnership, quality requirements have been defined based on the standards of the automotive industry. This manual explains those quality requirements, applicable for supplies to PRETTL or in PRETTL automotive products. It is intended to help achieve the zero defect target. The requirements apply to all deliveries of products, materials, services and digital goods to PRETTL (software, data and IT-Services, in further text collectively referred to as: “product”). The information contained in this document is provided for informational purposes only. The points explained herein shall not impose any restrictions on any referenced law or regulation, existing or future legal requirements, applicable contracts or on any other requirements or obligations agreed upon between Supplier and PRETTL. For easier readability, this manual uses the short terms “Supplier” and “PRETTL”.

2 Requirements for Management Systems

2.1 Quality Management System

Following IATF 16949 requirements, Suppliers manufacturing locations have to

- maintain a certified management system in accordance with IATF 16949 or are
- obliged to develop such a system.

Supplier has to provide PRETTL with copies of the relevant valid certificate on its own accord. Furthermore, Supplier has to ensure that all applicable state-of-the-art, industry specific and / or material field specific requirements (e.g. AIAG, VDA, DIN) are fulfilled. If a renewed certificate is issued with delay, Supplier has to notify PRETTL before expiration of the current certificate, and provide information about the expected date of recertification. After re-certification, supplier has to immediately present the confirmation of a successful re-certification by the certification body. Supplier has to inform PRETTL immediately in the event that any of the above certificates are withdrawn.

2.2 Environmental Management System

Supplier has to introduce and develop an environmental management system (EMS) analogous to ISO 14001 or an environmental management system that is appropriate to the specific industry.

2.3 Sub-Suppliers Management System

Supplier has to make sure that its sub-suppliers adhere to the same quality and environmental management system standards.

Supplier has as well to ensure that its sub-suppliers fulfill all applicable state-of-the-art, industry specific and / or material field specific requirements.

Supplier shall take appropriate steps to confirm the effectiveness of the sub-suppliers' management systems.

3 Assessments and Audits

To ensure that PRETTL requirements regarding management systems or processes are met by Suppliers or sub-suppliers, PRETTL may conduct audits or assessments
- ***MS 04_00003_Lieferantenselbstauskunft*** -.

Before any audits or assessments, PRETTL informs Supplier and assures agreement. In some urgent cases short term planning may be required, e.g. in case of quality issues.

For the audits and assessments Supplier allows PRETTL, and if necessary PRETTL costumers, access to all involved locations e.g. production locations, commercial areas, test centers, warehouses and adjoining areas as well as to all quality-related documents. Supplier may take all necessary and reasonable measures to safeguard proprietary material.

With appropriate technical equipment and agreed handling conditions, it is also possible to do a remote visit via livestream to reduce efforts for PRETTL and Supplier.

PRETTL informs Supplier about the result of these audits or assessments. If non-conformities or opportunities for improvements are identified, Supplier

- as to prepare a corrective action plan within the applicable time limit,
- shall implement the corrective actions, and
- shall inform PRETTL on its progress as appropriate.

4 Supplier evaluation

The SUPPLIER evaluation at PRETTL is ongoing and will be communicated to the SUPPLIER until further notice if required, but at least once a year if the SUPPLIER is nominated as serial supplier. The calculation is based only on complaints that the SUPPLIER is responsible for. Counted are faulty units / quantities, regardless of their complexity. After successful error analysis, the amount of complaint will be corrected in

5 Cooperation for new products

For new products, cooperation between PRETTL and Supplier is aligned to PRETTL's product development process. One main goal is to assure product quality within the supply chain. Activities to reach this goal are for example:

- Technical discussions
- Confirmation of feasibility
- Preventive Quality
- Risk Management
- Initial sampling
- Safe launch activities

5.1 Contract Review & Feasibility Confirmation

As part of contract review, Supplier shall examine upon receipt all technical documents to ensure their implementation. Technical documents are e.g. parts lists (Bill of Material), specifications, drawings, CAD data, packaging specification and standards. Supplier shall immediately inform PRETTL of any deficiencies and risks identified during the review as well as of any improvement possibilities.

PRETTL expects the Supplier to provide a written confirmation of feasibility before final awarding of the contract.

Supplier's confirmation of feasibility ***- MS 05_00010_Herstellbarkeitsanalyse_feasibility study -*** shall not replace the internal feasibility analysis, which must be available to PRETTL for review purposes. Any documentation used for analysis purposes shall remain with the Supplier.

5.2 Product Development

If the order to Supplier includes development tasks, the requirements shall be defined by the contracting partners, e.g. in the form of a specification sheet.

5.3 Project Management

The Supplier provides project management in the planning phase for processes, products, procedures and other cross-departmental tasks. This is documented by quality management and project management plans and provided to PRETTL as evidence**.**

In the course of the contract review, the SUPPLIER will check all technical documents such as specifications, drawings, parts lists, CAD data, packaging specifications and standards for feasibility upon receipt. The SUPPLIER shall notify PRETTL immediately of any defects and risks identified in the process, as well as opportunities for improvement.

On the basis of the dates specified by PRETTL, the SUPPLIER creates a project-related schedule and makes this available to PRETTL. The SUPPLIER regularly monitors the respective project progress. Any delay in the deadline must be communicated to PRETTL in good time. The production of prototypes and pre-series parts must be carried out under series production conditions. The exact conditions as well as the required documentation must be agreed with PRETTL.

5.3.1 APQP status reports

From the time PRETTL places orders up to the phase 5 gate review, the suppliers are obliged to update the APQP status at regular intervals (at least monthly or as otherwise agreed).

5.3.2 APQP Review Meetings

Once a supplier has been awarded a deal, the appropriate PRETTL representative can work with the supplier to create a plan to visit their manufacturing facilities that will allow PRETTL, and sometimes its customer, to review and evaluate the supplier's APQP process and readiness to go .

5.3.3 Responsibility of the supplier

In the course of the contract review, the SUPPLIER will check all technical documents such as specifications, drawings, parts lists, CAD data, packaging specifications and standards for feasibility upon receipt. The SUPPLIER shall notify PRETTL immediately of any defects and risks identified in the process, as well as opportunities for improvement.

On the basis of the dates specified by PRETTL, the SUPPLIER creates a project-related schedule and makes this available to PRETTL. The SUPPLIER regularly monitors the respective project progress. Any delay in the deadline must be communicated to PRETTL immediately. The production of prototypes and pre-series parts must be carried out under series production conditions. The exact conditions as well as the required documentation must be agreed with PRETTL.

5.3.4 Assessment of manufacturability

In addition to the IATF 16949 requirements, this analysis also includes the examination of the

• Feasibility of the planned development project (development suppliers only)

• Economic and process-capable manufacturability (procedures, materials, tolerances, S / C and C / C parts).

5.3.5 Statutory Regulations / Requirements

The SUPPLIER must prove to PRETTL that all processes, products and services comply with the applicable legal, official and other requirements of the import and export country as well as the destination countries specified by the customer PRETTL.

The feasibility study and the confirmation of the legal, official and other requirements must be submitted to the purchasing department when the offer is submitted and are essential for the award of the contract.

5.3.6 Prototypes and Pilot Series

For prototypes and pilot series, the Supplier coordinates the prototypes and pilot series with PRETTL and documents respective activities. The pilot series are produced under near-series conditions.

PRETTL may request sample parts for prototypes and pilot series. Specific definitions are made on a case-by-case basis.

Prototypes and pilot series parts must be packed separately from the serial deliveries. The packaging units must be clearly marked (e.g. Attention: prototypes / pilot series parts).

5.3.7 Preventive Quality

As part of project management activities, Supplier initiates and conducts preventive quality activities, such as e.g. feasibility analysis, management of characteristics, reliability checks, risk analysis, FMEA, inspection planning. Furthermore, Supplier maintains and documents a continuous improvement process, e.g. as part of a "lessons learned" process.

This includes a systematic evaluation of experiences e.g. from ramp-up validation and complaints. The information gained from this must be incorporated in the Supplier's QM system standards (e.g. production control plan, FMEA).

PRETTL may request and conduct additional preventive quality activities.

5.4 Management of Characteristics

To assure series quality, supplier performs process planning (work plans, inspection plans, resources, tools, machines, etc.) for all characteristics.

Additionally, PRETTL identifies important characteristics (incl. special characteristics) and defines requirements for their inspection and documentation.

PRETTL calls this procedure “Management of Characteristics”.

The procedure includes

- classification of those characteristics @ PRETTL
- communication of those characteristics to the Supplier (via “Important Characteristics List”)
- explanation of the form sheets used
- requirements of PRETTL for those characteristics with regard to
- Management in the Supply Chain
- Inspection planning in the Supply Chain
- Measurement System Analysis
- Process Capability Studies
- Process Monitoring
- Data Recording
- Documentation within Control Plan(s)
- Labeling in documents.

5.4.1 Classification of Characteristics

PRETTL classifies characteristics (including potential and confirmed Special Characteristics) with the intent to:

- establish safeguards (quality control loops) for this characteristics in the entire value stream
- install an efficient and effective production control in the entire value stream
- improve product quality in terms of:
- safety
- compliance with regulatory as well as legal requirements
- functional fulfilment
- create a common understanding of characteristic management in the affected areas (e.g.
- product view vs. process view)
- minimize manufacturing defects
- ensure that appropriate safeguards are defined for confirmed special characteristics.

PRETTL has defined four classes of characteristics:

CLASSIFICATION EXPLANATION	CLASSIFICATION EXPLANATION
A	□ Confirmed special characteristics C/C; S/C; P/C
B	□ Potential special characteristics □ Process relevant characteristics □ “not functionally robust” and “manufacturing method robust” characteristics □ “functionally robust” and “not manufacturing method robust” characteristics
C	□ “functionally robust” and “manufacturing method robust” and “not process relevant” characteristics □ “not functionally relevant” and “not process relevant” characteristics
PRETTL classification + customer requirements	□ Customer requirements and PRETTL classification (A or B or C) have to be considered [- / C]

For those classes, specific inspection strategies are predefined and have to be implemented for the communicated characteristics.

5.4.2 Rules for classes of characteristics

5.4.2.1 Rules for characteristics with classification A

Class A applies to confirmed Special Characteristics.

For class A characteristics no defective parts are allowed.

Therefore, the predefined inspection strategy is failure sorting by:

- Direct 100% inspection
- In-direct 100% inspection
- Poka Yoke (detection or prevention).

Additionally, for class A characteristics an appropriate Measurement System Analysis (MSA) is required.

MSA requirements are defined in chapter 5.5.2.

Special Characteristics according to IATF 16949:2016, are product characteristics or production process parameters that may have an impact on

- safety or compliance with official (legal) regulations, (S, G)
- fit, function, performance or further processing of the product (F).

Special Characteristics must be identified by an organization. They have to be measurable or testable and

need to be considered during inspection planning as inspection characteristics; they must be secured

controlled and monitored) in the relevant manufacturing processes.

They are included in the Control Plan.

PRETTL used term “Confirmed Special Characteristics” defines functionally relevant characteristics, which are “not functionally robust” and “not manufacturing method robust” und cannot be manufactured with the required process quality.

In VDA vol. 1, the term "critical characteristics" is used for special characteristics with regard to safety and legal relevance.

The term "production process parameter" used in IATF 16949:2016 refers to process characteristics.

The extension `/C` identifies a special characteristic specified by a customer from PRETTL.

The abbreviation PTC “Pass Through Characteristics” identifies potential and confirmed Special

Characteristics on purchased parts that are solely ensured with a Supplier inspection.

Rules for Characteristics with Classification B Class B applies to

- Potential Special Characteristics
- Process relevant characteristics
- “not functionally robust” and “manufacturing method robust” characteristics
- “functionally robust” and “not manufacturing method robust”

For class B characteristics, a defined process quality is required.

Therefore, at least one of the following predefined inspection strategies has to be implemented:

- Process monitoring
- Failure prevention
- In-process control
- Poka Yoke
- Statistical Process Control (SPC) incl. regular Cpk-verification
- Failure detection
- Process parameter monitoring
- Regular Cpk-verification
- Acceptance chart incl. regular Cpk-verification

- Sampling inspection
- Failure sorting
- Direct 100% inspection
- In-direct 100% inspection
- Poka Yoke (prevention or detection).

It is often necessary to define multiple inspection strategies for one characteristic.

Additionally, for class B characteristics an appropriate Measurement System Analysis (MSA) is required.

5.4.2.1.1 "C / C" - Critical Characteristic

Any deviations in these characteristics could seriously affect a product's performance in terms of driving safety or regulatory compliance.

5.4.2.1.2 "S / C" - Significant Characteristic

Any deviations in these features can seriously affect customer satisfaction due to disruptions in assembly, design, function, durability, performance or primary functions.

5.4.2.1.3 "P / C" - Pass through characteristic

Any feature / property that a supplier specifies on a component that is not tested or used in a PRETTL and can lead to dissatisfaction among PRETTL customers.

In the case of S / C or C / C features on the material, a works certificate 3.1 in accordance with the standard DIN EN 10204 [11] is required

and must for C / C for every delivery / production batch and

for S / C can be presented on request at no additional cost.

INSPECTION STRATEGY	INSPECTION STRATEGY – DETAIL	MASHINE CAPABILITY	PROCESS CAPABILITY	PROCESS MONITORING	REMARKS
		cmk	C pk ST	C pk	
Process monitoring	Regular Cpk verification	X		x	For initial sampling, either Cmk or Cpk is possible.
	SPC incl. regular Cpk verification	X		x	
	Acceptance chart incl. regular Cpk verification			x	
	sampling based inspection	x	-	-	

Remarks:

- A characteristic is "not functionally robust" if the characteristic leads to a failure immediately after the tolerance limit is exceeded, or if the characteristic at the tolerance limit is a large contributor to a failure (expert decision).

5.4.2.2 Rules for Characteristics with Classification C

Class C applies to

- “functionally robust” and “manufacturing method robust” and “not process relevant” characteristics “not functionally relevant” and “not process relevant” characteristics

Class C characteristics are not listed on the ICL. Class C characteristics are part of the measurement of all characteristics during initial sampling (PPA/PPAP).

Class C characteristics have to be included in the respective layout inspection and functional testing (requalification).

5.4.3 Communication & Implementation of Management of Characteristics – ICL

5.4.3.1 Communication & Implementation: PRETTL to Supplier

PRETTL summarizes Important Characteristics in a document calls “Important Characteristics List” (ICL). PRETTL communicates the ICL to Supplier during the product development phases, several drafts and versions may be necessary. For all characteristics contained in the ICL, an inspection strategy for the series production must be defined. This definition must be documented in the control plans, identified with specific markings corresponding to the ICL.

Remarks:

PRETTL uses two different forms for the communication of the important characteristics. Differences

between them are as follows:

1. For new projects / in case of major changes PRETTL uses a form that contains the characteristics and their classification as explained before. The related rules apply. Results for MSA, capabilities etc. will be requested during initial sampling (PPA/PPAP). Evidence for those requests are part of the initial sampling documentation.

Form for Sampling planning / Report for planning and agreeing the sampling

Date of Issue:

Supplier			
Name of Supplier:		Receiving plant:	
Address:		Name Initiator:	
Supplier number:		Telephone number:	
Part number:		Part number:	
Part description:		Part description:	
Drawing number:		Drawing number:	
Drawing issue / Date:		Drawing issue / Date:	

Reason for Sampling:		Sample kind:	
Type of part:		Sampling procedure:	
Type of Sampling:		Submission level:	
Cavities / tool:		Special characteristics:	

Date for Sampling:

Contact persons:

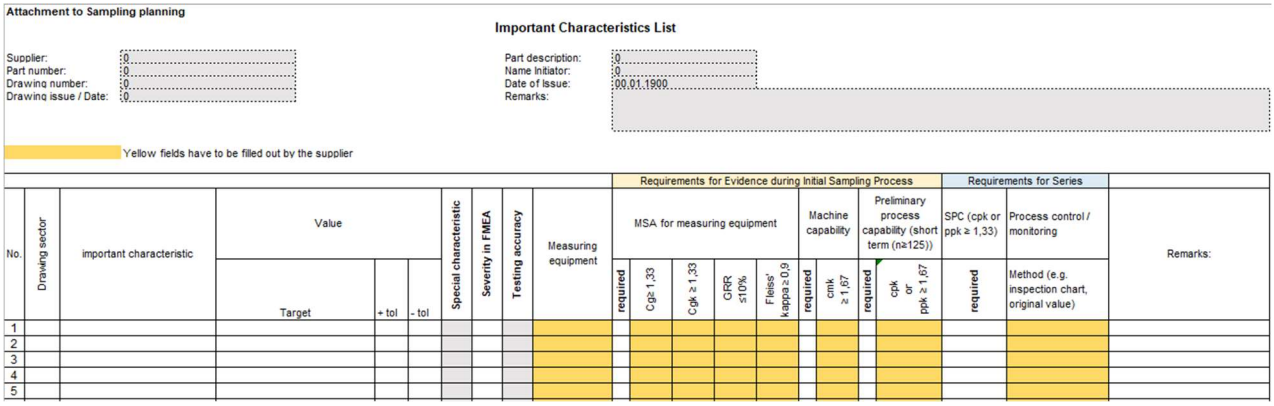
Name	Department:	Contact data (E-Mail / Telephone number)	Customer / Supplier

2. For existing projects PRETTL uses a form which contains explicit requirements for

- Measurement System Analysis
- Process Capability Studies
- Process Monitoring
- Data Recording

within the form.

Supplier needs to record results in the form and submit the filled form as documentation of evidence during initial sampling (PPA/PPAP).



Attachment to Sampling planning

Important Characteristics List

Supplier: 0
Part number: 0
Drawing number: 0
Drawing issue / Date: 0

Part description: 0
Name Initiator: 0
Date of issue: 00.01.1900
Remarks:

Yellow fields have to be filled out by the supplier

										Requirements for Evidence during Initial Sampling Process								Requirements for Series		
No.	Drawing sector	important characteristic	Value			Special characteristic	Severity in FMEA	Testing accuracy	Measuring equipment	MSA for measuring equipment					Machine capability		Preliminary process capability (short term (n≥125))		SPC (cpk or ppk ≥ 1,33)	Process control / monitoring	Remarks:
			Target	+ tol	- tol					required	Cg≥ 1,33	Cgk ≥ 1,33	GRR ≤10%	Fleiss' kappa ≥ 0,9	required	cmk ≥ 1,67	required	cpk or ppk ≥ 1,67	required	Method (e.g. inspection chart, original value)	
1																					
2																					
3																					
4																					
5																					

5.4.3.2 Communication & Implementation: Suppliers to Sub-Tier Suppliers

Each supplier has to communicate the requirements for sub-components to the respective sub-tier suppliers. Sub-tier suppliers have to include relevant characteristics from this subset of the ICL in their control plan and mark them accordingly. Supplier has to check the implementation at sub-tier suppliers at least during PPA/PPAP evaluation.

5.5 Capabilities - general information

Capability studies are carried out in order to statistically describe the behavior of measurement processes, machines and production processes. The results are used to derive a prediction of future behavior. If it is not possible to verify a product characteristics by means of process capability key figures (e.g. for welding, heat treatment casting, rolling, surface coating), the proof of process capability (process quality) is to be provided through secondary characteristics, or a correlated non-destructive 100% test is to be used.

In cases that exclude such an option, other suitable verification methods must be used to assure for process safety for the specific standard parts (e.g. random spot check frequency, boundary samples).

5.5.1 Actions in Case of Non-Capable Processes

It has to be ensured that each non-capable production process only delivers parts that conform to all specifications. This can be achieved either

- by an inspection (e.g. 100%-inspection) using a capable measurement process or
- other adequate measures (e.g. functional testing during successive process steps, risk analysis, decision / approval by management).

If process capability cannot be proven by means of the available inspection equipment, either the equipment has to be replaced with suitable equipment or a further tolerance study of the inspection characteristic has to be carried out. If practical, measurement uncertainty studies have to be carried out in order to optimize capabilities.

In the case of conditionally capable and definitively non-capable measurement processes the tolerance range of the inspection characteristic has to be reduced at the upper and / or lower specification limit by the expanded measurement uncertainty to the range of conformity. If the tolerance range cannot be reduced and PRETTL requirements cannot be met, suitable agreements have to be arranged with PRETTL.

5.5.2 Measurement process capability (Measurement System Analysis)

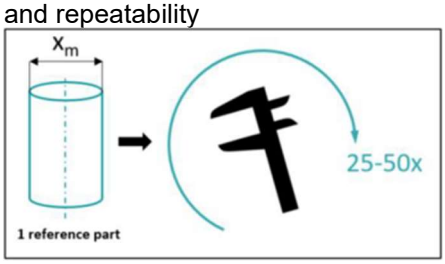
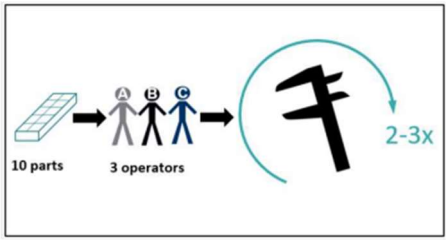
The verification of capability has to be provided by means of measurements and tests at the place of operation of the measuring or test systems and through statistical analysis of the results. Statistical analysis is only reasonable for measuring and test systems that conduct a sufficiently large number of similar recurring measurements and tests (e.g. in the production flow) and it is valid for the examined characteristic only. If measurements and tests of different characteristics are done with the same measuring or test system, individual verification of capability is required for each characteristic.

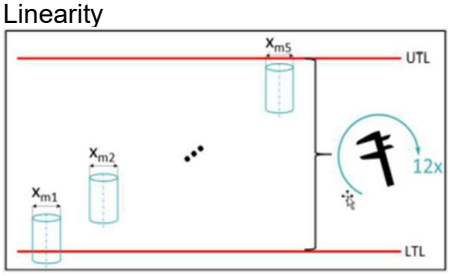
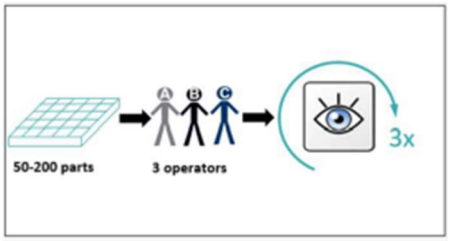
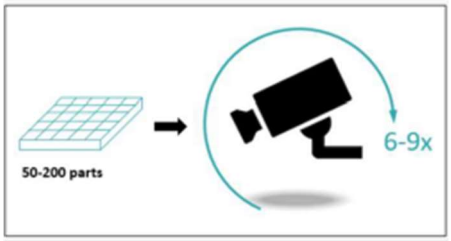
5.5.2.1 Verification of capability for measurement processes for continuous (variable) characteristics

Generally, it is a pre-requisite that the capability criteria according to procedure 1 (type-1 study) are met in order to perform one or more of the procedures 2 – 5.

The R&R analysis must reveal the following: (EV), (AV), (PV), (ndc)

Procedure 1:

PROCEDURE	EXPLANATION	CAPABILITY CRITERION
Procedure 1 (type-1 study) Systematic measurement error and repeatability  	Verification of the capability of a measurement process in terms of location and variation of measured values within the tolerance field of this characteristic (as a test process for a particular characteristic). Measurement of master part incl. handling and clamping min. 25x (cgk≥ 1,67) or standard 50x (cgk≥ 1,33).	Compliance with specified minimum values for Cg and Cgk. The following limits apply: 1. Cg ≥ 1.33 and 2. Cgk ≥ 1.33
PROCEDURE	**EXPLANATION**	**CAPABILITY CRITERION**
Procedure 2 (type-2 study) Repeatability and reproducibility (gage R&R) with operator influence  	Verification of the capability of a measurement process (as a test process for a particular characteristic) in terms of its variation behavior using measurements of serial parts. Measurement of 10 serial parts for 2-3 runs by a minimum of 3 operators, incl. handling and clamping (random measuring sequence).	Compliance with the specified limiting value for the variation %GRR of the measurement process. The following limits apply: 1. %GRR ≤ 10%: measurement process is capable 2. 10% ≤ %GRR ≤ 30%: measurement process is conditionally capable 3. %GRR ≥ 30%: measurement process is not capable RE ≤5% T (display resolution) UCAL ≤5% T (calibration uncertainty) BI ≤5% T (systematic measurement error) 99.73% MSA variation
PROCEDURE	**EXPLANATION**	**CAPABILITY CRITERION**

Procedure 4 Linearity 	Verification of a sufficiently linear relation between the values of a physical quantity to be measured and the corresponding measured values determined by the measuring system. This procedure determines whether the systematic measurement error of the measuring system is within the acceptable limits regarding the measuring range relevant for the measurement. Measurement of 3-5 master parts for 12 runs incl. handling and clamping (random measuring sequence)	Maximal systematic deviation from reference: 1. ≤ 5%T = capable 2. ≤10%T = conditionally capable
PROCEDURE	**EXPLANATION**	**CAPABILITY CRITERION**
Procedure 7 Test decisions for discrete and discretized continuous characteristics  	Verification of the capability of a test process regarding unambiguous test decisions when testing discrete or discretized continuous characteristics. Minimum 3 operators in 3 runs inspecting a randomized reference lot (inspection automat 6-9 runs, all cameras included). Documentation of ok / nok-results	The capability is classified by means of the parameter κ “kappa”): 1. κ ≥ 0.9 test process is capable 2. 0.9 > κ ≥ 0.7 test process is conditionally capable 3. κ < 0.7 test process is not capable The minimum of all determined κ - values is relevant for the final classification of the test process.

5.5.2.2 Repetition of capability studies

During use in production, the capability of the measurement process must be ensured at all times.

In doubt, the measurement process analysis has to be repeated and the capability must be verified again.

5.6 Measurement adjustment

Before performing a MSA study, the measurement devises from the SUPPLIER has to be aligned based on golden samples together with PRETTL. Therefore a measurement process must be fully described. This includes information about drawing data, measuring strategies and influences from the measuring and manufacturing process. The results of the proof of suitability always relate to the measurement process as a combination of measurement system, measurement object, feature, person, environment and other typical influences based on the **AA QM0030 Measurement adjustment.**

5.6.1 Process Capabilities

A successfully completed suitability study of the measuring equipment is a prerequisite for conducting process capability studies.

TYPE OF EVIDENCE	REQUIREMENT	COMMENTS
Machine capability index, short term study	Cm ≥ 2,00 Cmk ≥ 2,00	sample size n ≥ 50 (n ≥ 100 recommended) (sequential parts)
Preliminary process capability (= short term = ST) Stabile process	Cp-ST ≥ 1.67 Cpk-ST ≥1.67	Sample size n ≥ 125 (25 samples with 5 parts each) In contrast to the long-term study, the parts that are to be examined can be taken from the production process directly one after another, unless a sufficient amount of parts is available.
Preliminary process performance (= short term = ST), instable process (characteristics with varying mean values)	Pp-ST ≥ 2.00 Ppk-ST ≥ 2.00	Sample size n ≥ 125 (25 samples with 5 parts each) In contrast to the long-term study, the parts that are to be examined can be taken from the production process directly one after another, unless a sufficient amount of parts is available.
Process capability index	Cp ≥ 1,67 Cpk ≥ 1,67	Long term study, stable process
Process performance index	Pp ≥ 1,67 Ppk ≥ 1,67	Long term study, instable process

Cpk / Ppk ≥ 1.67 for S / C and P / C characteristics

Cpk / Ppk ≥ 2.0 for C / C characteristics

The supplier is obliged to adhere to the above values or higher values. The statistical process control must be carried out for all special characteristics.

The supplier has to carry out a capability study based on the PPAP procedure. The capability study must be carried out separately for each cavity.

If fewer than the required minimum number of parts are available, this is to be documented and the reduced number is to be taken into account by raising the standard values.

The standard values are to be increased by the following amounts:

NUMBER OF PARTS:	CM / CMK	CP-ST / CPK-ST / PP-ST / PPK-ST	CP / CPK / PP / PPK
124 TO 100	**-**	**-**	**0,33**
99 TO 50	**-**	**0,33**	**0,67**
49 TO 25	**0,33**	**0,67**	**1,00**

A copy of the detailed results of the capability test must be attached with the sampling documentation.

5.6.2 Repeating of the Evidence of capability

The following criteria are typical examples that may make a new verification of capability necessary:

- Specification changes of the manufactured characteristic;
- increased occurrence of unexpected process results and/or defective parts;
- Intervention in the manufacturing process (for example, after exceeding control limits) lead to process results, which differ significantly from the results prior to the intervention (for example, verifiable on the basis of a control chart);
- Commissioning of new, overhauled or reconditioned production equipment (for example, after maintenance, in which extensive dismantling, rebuilding and/or replacement of essential components were required);
- technical changes (for example design, software), changes of process parameters (for example, settings) and/or boundary conditions of the manufacturing process (for example, processes, environment);
- Relocation of production equipment.

When in doubt, the analysis must be repeated and the capability has to be proven again. Process changes may lead to non-comparable conditions before and after the change. It is possible that the previous random samples and validation intervals are also no longer adequate.

5.6.3 Special process requirements

PRETTL can require suppliers with special processes to provide evidence of documented information such as AIAG CQI, VDA 6.3 etc.

The aim is to develop a special process management system for continuous improvement, error avoidance and reduction of dispersion and waste in the supply chain.

Suppliers can be expected to conduct annual self-assessments. PRETTL reserves the right to carry out its own assessment on site.

Supplier has to forward with each delivery a capability report based on the special characteristics

5.6.4 Calculation of new SPC control limits

New control limits are only calculated after process changes have been proven effective, e.g.:

- Technical improvements
- Reduction or elimination of previously observed changes of averages
- Reduction of internal process variation

Otherwise, the control limits remain constant.

5.6.5 Acceptance chart incl. regular Cpk-verification

Requirements for Acceptance chart incl. regular Cpk-verification are successfully completed suitability study of the measuring equipment, machine capability analysis (resp. short-term capability analysis) and initial long-term process capability analysis and the inner variation small enough compared to the tolerance

A successfully completed suitability study of the measuring equipment is a prerequisite.

5.6.6 Sampling inspection

The inspection strategy "Sampling inspection" is only suitable for discrete features, if the process behavior is such that inspection of a single part can safely detect the failure (e.g., hole missing). A successfully completed suitability study of the measuring equipment is a prerequisite.

5.6.7 Poka Yoke (Prevention)

As opposed to the detection Poka Yoke the prevention Poka Yoke is no measurement equipment. Therefore, a successfully completed suitability study of the measuring equipment is not necessary. A suitable method for Error proofing has to be implemented.

5.6.8 In-process control / Process parameter monitoring

Successfully completed suitability study of the measuring equipment, analyzed and described cause-effect relationships between process parameters and product characteristics, taking into account disturbance and control variables.

5.7 Control Plan

The production control plan (PCP) is a documented description of the systems and processes for product control purposes. It contains all the process steps, from receipt of goods to delivery, including tests that accompany the process, outsourced processed and the substitute, rework and alternative processes.

Control plans have to be developed for each production location and all products supplied.

The production control plan provides evidence that

- the information from the FMEAs was taken into account during the planning and implementation of production
- a transparent / reproducible documentation of the product / process characteristics is assured
- monitoring and control of the inspection and production processes is assured.

Typical process steps that require process monitoring and control are:

- Goods receipt checks / incoming inspection (including identity / quantity checks)
- Production, assembly and test steps in the production flow
- On-going series production tests and product audits
- Logistics processes that impact the product / packaging quality (e.g. repackaging / picking)
- Set-up procedures, such as machine adjustment, tool changeover, provision of parts

Family control plans are acceptable for bulk materials and similar parts provided the product family parts are produced using a common production process.

The following items have to be included in the control plan:

- activities / measures used for monitoring and control of the manufacturing process, including verification of job set-ups (control method)
- first-off / last-off part validation, as applicable
- all items from the ICL – i.e. special characteristics and other important characteristics that have to be marked as follows:
- special characteristics:
- with letter(s) as noted on the ICL (e.g. F, G, S, /C or combinations)
- other important characteristics:
- with letters: ICL
- methods for monitoring the control of special characteristics, both for those identified by PRETTL and / or for those identified by the supplier
- defined reaction plan for occurrences when nonconforming products are detected or when the process becomes statistically unstable (not controlled) or not statistically capable

Further information that has to be included in the control plan:

- general header data
- Part / Process step no.
- Process name / Operation description
- Product characteristics / Process characteristics
- Specification / Tolerance
- Machines / jigs / fixtures / tools for manufacturing, incl. measurement equipment (including identifiers, as appropriate)
- Inspection method
- Sample size / frequency
- Error proofing
- corrective action(s)
- requalification (layout inspection and functional testing)

A copy of the control plan is part of the PPA/PPAP documentation.

5.8 FMEA

5.8.1 Basic Information

Failure Mode and Effects Analysis (FMEA) is a team-oriented, systematic, qualitative and analytical

method intended to:

- Evaluate the potential technical risks of failure of a product or a process
- Analyze the causes and effects of those failures
- Document preventive and detection actions
- Recommend actions to reduce risk

The FMEA is used for analyzing the technical risks to reduce failure and improve safety in the products and processes.

DESIGN-FMEA	PROCESS-FMEA
The Design FMEA (DFMEA) analyzes the failure possibilities that may be created during the design phase of the product. It shall assure that, to the extent possible, potential Failure Modes and their associated Causes or mechanisms of failure have been considered and addressed prior to releasing the part to production. The Design FMEA (DFMEA) analyzes the functions of a system, subsystem or component of interest as defined by the boundary shown on the block/boundary diagram, the relationship between its underlying elements, and to external elements outside the system boundary. This enables the identification of possible design weaknesses to minimize potential risks of failure.	The process FMEA analyzes the design of processes in terms of quality from the receipt of goods to the delivery to the customer. The process FMEA (PFMEA) analyzes the potential failures of manufacturing, assembly and logistical processes to produce products which conform to design intent. The overall purpose is to analyze processes and take action prior to production start, to avoid unwanted defects related to manufacturing and the consequences of those defects. Process-related failures are different than the failures analyzed in the design-FMEA. The process FMEA analyzes processes by considering the potential failure modes which may result from process variation, to establish priority of actions for prevention, and as needed, improve controls.

Application of FMEA is mandatory.

New projects should follow the current AIAG & VDA FMEA process and tools (Failure Mode and Effects Analysis – FMEA Handbook last Edition).

Foundation and family FMEAs are recommended to be created and used as a basis for new analyses.

Supplier ensures that the FMEA is checked for necessary updates following:

- Changes to the operating conditions
- Changes to requirements (law, norms, customer, state of the art)
- Changes to the product / process / production location
- after complaints and incidents (both external and internal)
- after negative findings due to product monitoring and lessons learned
- after negative findings from process observation
- after negative findings in development- and / or manufacturing network.

Special Characteristics have to be marked with abbreviations or symbols in the Process FMEA (Special Characteristics column).

5.8.2 Cooperation between PRETTL and Supplier

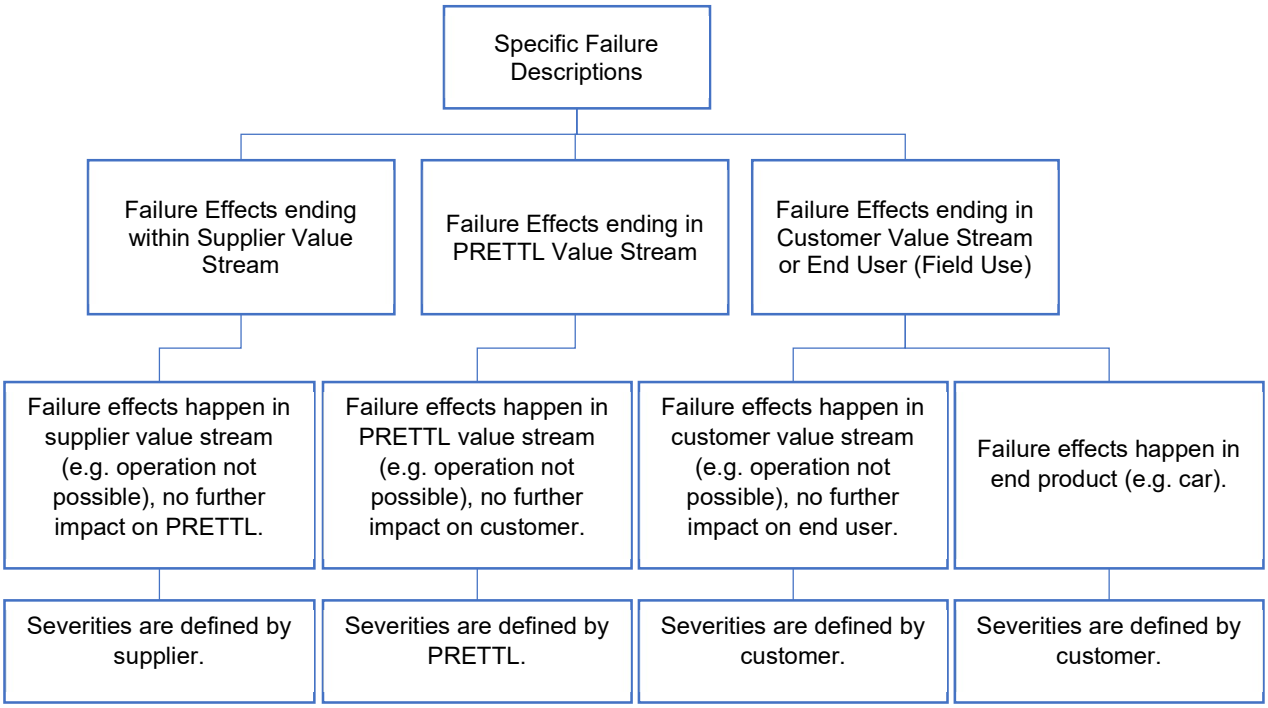
To ensure successful cooperation, a discussion and agreement between PRETTL and SUPPLIER about severity evaluations is useful for newly developed parts and / or new processes or changes. To support this, meetings between organizations to exchange relevant information about failure effects and severity evaluation may take place.

Additionally, PRETTL reserves the right to hold FMEA discussions in order to evaluate remaining risks in order to decide about further risk mitigation.

Specific failure descriptions are a prerequisite:

- Specific and precise failure descriptions related to manufacturing, assembly and logistics are required as basis.
- Failure descriptions might not be included or different to those in the D-FMEA.

The following chart shows the context of severity evaluation:



Severity evaluation of 9 or 10 does not automatically require „Special Characteristic“ for this failure. For the definition of Special Characteristics, various other criteria than severity (S) apply.

5.9 Component cleanliness requirements

5.9.1 Cleanliness Level

The supplier must guarantee the sequent level of cleanliness for the components in terms of the maxi-mum amount of particles permitted, size and total weight per pieces.

The quantity of tested parts shall be minimal: 3pcs

The cleanliness level shall be considered as follow

Concerning the technical cleanliness (particles) the contract partners have to agree upon cleanliness specification and a connected test instruction on the base of VDA 19 or ISO 16232.

Organic surface contamination (oil, grease)

Attention: level of cleanliness must also be considered in the feasibility study and supplier component review.

The minimum requirements are:

For parts with added cleaning process 36 mN/m surface tension test is required (e.g. with arcotec test ink).

For parts stamped with evaporating oil see chapter 7.1 Qualification. This is not valid for parts delivered in corrosion protection packages (in oil).

5.9.2 Extraction method

The reference standard to define the extraction method is:

- ISO16232-3.2 – "Road vehicles -- Cleanliness of components of fluid circuits – Part 3: Method of extraction of contaminants by pressure rinsing

5.9.3 Counting method

The standard for counting method is following:

- ISO16232-7.2 – "Road vehicles -- Cleanliness of components of fluid circuits – Part 7: Particle sizing and counting by microscopic analysis ".

By the optical microscope can be performed more detailed analysis since is it possible to evaluate the nature of the particles.

In case of PRETTL is owner of packaging, the supplier still takes full responsibility for potential damages during the manipulation in supplier or sub-supplier process, transport and potential related quality claims like corrosion or dirt.

5.10 Process release

PRETTL may participate in Supplier’s internal process releases. The goal is to ensure that quality requirements in relation to product and process can be met by the serial process at the Supplier site. The process release may be combined with the PPA/PPAP evaluation.

If PRETTL participates during the process release, a positive overall result is a prerequisite for a positive PPA/PPAP evaluation. If non-conformities or opportunities for improvements are detected, Supplier

- has to prepare a corrective action plan within the applicable time limit,
- shall implement the corrective actions, and
- shall inform PRETTL on its progress as appropriate.

5.11 Run@Rate

Supplier performs a Run@Rate (performance test) as part of the internal PPA/PPAP process.

Duration of Run@Rate covers the production of volume that corresponds to 2 days' production at PRETTL, but no less than 4 hours.

Deviations from this period may be possible in consultation with PRETTL.

PRETTL may either check the results or may participate in Supplier's performance test. Process performance (contractually agreed weekly capacity) and quality capacity of the complete production process is evaluated under series production conditions (e.g. tool, systems, clock time, personnel) as part of a Run@Rate (performance test) on the Supplier side.

5.12 Ramp-up validation (Launch Management)

PRETTL expects a secure ramp-up. Supplier ensures this with necessary measures even without being specifically requested to do so by PRETTL.

In addition, PRETTL can agree with the Supplier on measures for securing the ramp-up (Early Production Containment); these may include for example additional tests or increasing the test frequency for a particular period until previously defined criteria are reached (exit criteria).

5.13 Production Process and Part Release - Procedure / Sampling

Production Process and Part Release procedure (PPA/PPAP) must be performed in line with VDA Volume 2 (current edition) or AIAG PPAP manual (latest version) requirements. Supplier is obliged to conduct a complete PPA/PPAP and document the results as evidence for the fulfillment of the requirements.

PRETTL requests documents and samples - ***MS 06_00011_PPAP_PPF_Sampling_agreement_EN_DE*** - as evidence for the PPA/PPAP and adds specific sampling requirements, if needed.

Additionally, PRETTL may request samples and accompanying results / evidence to evaluate maturity and fulfilment of requirements during the development of products.

5.14 Evaluation of Initial samples / Result

PRETTL evaluates the initial samples and related documentation, as requested. The result is documented on the cover sheet (based on VDA Volume 2 and / or AIAG PPAP manual) and communicated to Supplier. Supplier has to follow-up any defined corrections / activities in a timely manner within the defined validity / timeframe.

The same applies to an evaluation after a change.

6 Marking of Products, Parts, Samples and Packaging

Supplier marks products, parts, samples and packaging according to the agreements reached with PRETTL.

Markings on the packaged products have to remain legible during transport and storage.

6.1 Tool Identification & Ownership

All tools and materials that PRETTL purchases directly or indirectly from suppliers or that PRETTL purchases from or reimburses to the supplier in whole or in part (collectively "property of PRETTL") remain the property of PRETTL and are held by the supplier on a deposit basis. Supplier will sign or authorize PRETTL to sign on its behalf any and all documents deemed reasonably necessary by PRETTL to be filed with federal, state or local officials to establish PRETTL's title and interest in PRETTL's property.

The supplier will not sell, lend, rent, encumber, pledge, lease, transfer or otherwise dispose of the property of PRETTL.

In addition, the supplier will not assert or permit any person who asserts an interest through the supplier in order to assert property claims or other interests in the property of PRETTL.

The supplier will clearly mark tools and / or dedicated measurements or mark devices and associated materials, if applicable, with "property of PRETTL". Layout and Information has to be clarified together with purchasing of PRETTL.

In certain cases the supplier is obliged to use the tools with the additional note "Property of (OEM)" as indicated.

The supplier will permanently mark the tools with the part number that corresponds to the tool.

In the event that direct marking of the tool is not practicable, an identification marking is created and a corresponding data record is kept that contains the corresponding part number for the brand. This data set is kept for the life of the program.

A descriptive breakdown of each of the various components that make up the tools and / or gauges, the size and type of equipment that is used, proof of expenditure, and photographic evidence of the Finished tool and / or measuring devices must be sent to the relevant purchasing representative in front of PPAP. Additional information may be required depending on specific customer needs.

The tools and / or measuring devices must be stored and handled in such a way that in order to avoid damage and deterioration.

6.2 Border samples / reference samples

6.2.1 Agreement and Definition

It is the responsibility of the supplier to define the limit samples together with the PRETTL project team, in which the agreements and requirements are specified.

6.2.2 Documentation of limit samples

Each party should have at least 3 borderline samples with the process and product-specific types of cosmetic defects. A record of the agreements must be drawn up with documentation of all reference samples, indicating the number and type of cosmetic defects. The reference samples must be clearly marked so that they can be identified in the protocol. All relevant parameters such as product identification, date of manufacture, product process must be defined in the protocol.

6.2.3 Storage of borderline samples

When storing or handling reference samples, care must be taken to ensure that they do not become dusty, dirty or damaged.

6.2.4 Catalog of errors

In addition to partial samples, an agreed failure catalog with pictures of OK and NOK parts can also be used for visual inspection. This document should point out and explain which specific areas must be considered by an inspection and where these possible deviations are on the part.

6.3 Visual inspection

6.3.1 Operator calibration

In cases where samples and / or defect catalogs are in use, operators must be trained in manual / visual inspection through operator calibration procedures.

6.3.2 Operator inspection station

The operator workstation must be checked during the R @ R to ensure its suitability.

6.4 Marking of Samples and after Release

The samples shall be packed in accordance with the packaging specification. If there is no packaging specification yet (e.g. for samples during product development), the sample packaging must be agreed in advance between Supplier and PRETTL.

Deliveries of samples for PPA/PPAP release (initial sample) must be clearly marked on the packaging and on the delivery paper.

The revision level must also be clearly visible on the delivery papers for all parts for which a revision level is listed on the bill of materials (BOM) (use orange label per package / smallest unit).

A copy of the cover sheet has to be added to the package.

At least the first three deliveries after the start of a series and after a change must be marked accordingly.

PRETTL prefers returnable and reusable packaging and pallets. No wooden pallets are allowed for production facilities.

7 Traceability / FIFO

Traceability is required for all parts produced for PRETTL. Based on their traceability the parts can be pinpointed, isolated, filtered out and reworked as necessary in the event of a defect in order to minimize the impact on the customer.

To assure this, Supplier follows the first in / first out (FIFO) principle and ensures the traceability of the products it supplies.

If a defect is found, it is necessary to ensure that the faulty parts / products / batches and related production data are identified within a working day. This also applies to traceability among sub-suppliers.

Supplier must outline the traceability system / concept to PRETTL during the contract negotiations within the offer or in technical discussions. If necessary, further details must be agreed with PRETTL.

The minimum requirements are as follows:

Traceability must be assured for every delivery for

- all components, materials and modules
- all process parameters which have impact on distinctive characteristics and test characteristics

The batch size must not be greater than the volume produced

- either in a single shift or
- a single day and
- the volume of 50,000 units / batch must not be exceeded. If necessary, further definitions will be agreed between the Supplier and PRETTL.

First in / first out principle

- shall be observed in every process step.

Mixing of parts:

- Parts shall not be mixed when making the transition from once process step to another.

The smallest packaging unit

- contains a maximum of two separate batch numbers.

The following production data have to be provided within one day on request:

- Production data, changed conditions (man, material, machine, method)
- Records in relation to the production line (e.g. line, machine, tool, nest, measurement system
- Records in relation to the components, parts or materials used in each production step
- Records in relation to the key process conditions for each production step
- Records in relation to reworking and repairs, prompt return of the reworked parts to the original production batch.

Marking:

- An appropriate marking system shall be used by the Supplier in its production and its function will be explained on request.
- For deliveries to PRETTL, the format and the type of marking shall be approved by PRETTL on the basis of a proposal from the Supplier.
- The VDA label is mandatory for electronic components and optional for other parts.

8 Requalification (Layout Inspection and Functional Testing)

Unless otherwise specified, products supplied to PRETTL must undergo a verifiable annual requalification check (in accordance with IATF 16949) in which all the dimensions, functional characteristics and material specified by PRETTL must be checked for compliance, based on criticity, if no agreement with PRETTL is communicated.

A requalification system in accordance with all PRETTL reference numbers / product families with annual planning (active reference numbers) must be available and agreed with PRETTL. It must also contain provisions for requalification on the subcontractor side.

At least one reference number is to be selected for each product family. The selection can roll over from year-to-year. If it is not possible to form product families, the selection of the products to be requalified can be based on a risk analysis. In this case complaints and scrap quotas are to be taken into account.

The results of the requalification tests are to be archived and must be sent to PRETTL upon request within one working day. A retention sample is to be archived for the last version of the requalified reference part number.

The requalification check/system must be included in the production control plans.

If deviations are identified during a requalification check, PRETTL must be notified immediately (declaration by the supplier) and further measures are to be defined and agreed upon.

9 Delivery and Incoming Inspection (Goods Receipt)

Supplier shall supply the goods in suitable transportation containers in accordance with the relevant PRETTL delivery and packaging specifications in order to avoid damage and reductions in quality (e.g. dirt, corrosion, chemical reactions).

Goods receipt inspection at PRETTL shall be limited to externally visible transport damage and verification of compliance in terms of the volume and identity of the products ordered based on the delivery papers as a minimum. Any defects detected are communicated immediately to the supplier.

Defects not detected in incoming goods inspection shall be reported to supplier immediately as soon as they are found in accordance with the conditions of the regular business process. To this extent supplier shall waive objection to a delayed formal complaint.

Supplier shall organize its quality management system and quality assurance measures to include this reduced goods receipt check.

10 Scrap and Rework

The handling of scrap and rework of products must be clearly regulated. Rework must always be avoided and is only permitted if approved corresponding process descriptions are available.

Particular care is required in ensuring that a FMEA and a production control plan are in place for dismantling rejected products and re-introducing them to the production process, that the reworking time is limited and takes place on a standard system. Traceability must be assured. If the rework process is required on a permanent lasting basis, it is to be transferred to a standardized process.

Unplanned rework requires a special release from PRETTL. Marking for deliveries of unplanned reworked parts has to be agreed with PRETTL.

Scrap must be disposed of according to the standard; unauthorized further use of these products must be prevented (e.g. through destruction).

11 Quality Deviations and Complaints

Supplier shall analyze process disruptions and deviations in quality, determines the root causes, initiates corrective measures and documents this procedure. The analysis includes scrap parts, reworked parts (if allowed), set-up parts and any internal surplus.

11.1 Deviations from agreements

If it becomes apparent that Supplier cannot meet its supply obligations regarding, for example, quality features, schedules, delivery quantities, or packaging requirements, the supplier shall so inform PRETTL promptly and always before delivering parts that may potentially be unusable. However, this information shall not release the Supplier from the need to adhere to its contractual obligations.

In some cases, a special release (concession) will be issued in relation to the reported deviation

11.2 Deviations from the agreed Delivery Condition

The Supplier shall immediately inform PRETTL of all deviations detected after delivery. In the interests of a speedy resolution, the Supplier shall disclose all the necessary facts and figures. The notice shall be sent to the relevant Purchasing Quality Assurance Departments at the affected plants.

11.3 Interim Deviation Approval – Concession

If Supplier is unable to provide products according to specification, supplier must obtain a special release (concession) from PRETTL before making a delivery. This requires a precise description of the variation and details of the volume or period affected.

Further procedure will be closely coordinated with PRETTL. A delivery can only be made after approval by PRETTL. The deliveries must be marked appropriately after agreement with PRETTL.

11.4 Complaints, Problem Solving, 8D-Report

11.4.1 Complaints

If PRETTL reports defects to the Supplier, the Supplier shall immediately perform an error analysis. PRETTL provides support within PRETTL's range of capacities, if needed.

Supplier sorts claimed parts as an immediate containment action (D3). For the sorting activities, Supplier has to draw up and use inspection instructions, agreed by PRETTL. Claimed products will be returned to the Supplier.

Marking for deliveries of sorted parts has to be agreed with PRETTL.

11.4.2 Problem Solving / 8D-Report

Complaints must always be processed according to the 8D method. The following rules in relation to processing times shall apply unless otherwise agreed with PRETTL (e.g. shortened processing times for customer complaints, safety-related deliveries or new deliveries):

- No later than 2 calendar days after the information / parts arrive, an initial response must be made to PRETTL, outlining the immediate measures.
- No later than 14 calendar days after the complaint has been made by PRETTL an interim report on the cause of the error must be provided.
- No later than 60 days after the complaint is made by PRETTL the definition of measures must be complete and planned dates for the introduction of the final measures and measures to avoid repeated error must be defined if they have not yet been introduced and the date for the conclusion of the complaint must be defined.

11.4.3 Root Cause Analysis

The Supplier must provide evidence of the root cause analysis using the 5-Why and Ishikawa method and, on request, must also perform a process analysis or process audit. During root cause analysis, both the technical causes (Technical Root Cause) and the management causes (Managerial Root Cause) for the occurrence and failure to detect the deviation are to be determined.

The Supplier will process all 8D reports by Email regarding to their local supply plant:

PRETTL GmbH Magnet und Schaltertechnik | 72793 Pfullingen, Germany:
info.qsms@prettl.com

Prettl Automotive Czech s.r.o | 460 06 Liberec, Česká republika:
info.qsms.cz@prettl.com

PRETTL Automotive Components (Wuhu) Co.,Ltd. | Anhui P.R.China 241060
cnwh-pwh.Coil-info.qsms@prettl.com

As part of the lessons learned, the Supplier shall apply the information gained to other works / products / processes (where appropriate).

11.4.4 Complaints at Sub-Suppliers

Complaints shall immediately be made by Supplier directly to the sub-supplier. In response to inquiries, Supplier shall notify PRETTL of the current status of complaint processing, which must comply with the specifications of PRETTL (see above).

Supplier is also responsible for the quality of the purchased products when using supply sources specified by PRETTL or negotiated by PRETTL in a transaction.

11.4.5 Completion of the complaint

The PRETTL contact person responsible must approve the final 8-D report from a supplier before closing a complaint. All 8-Ds that are open for more than 30 days can negatively affect the supplier's performance assessment.

When the 8-D detects a change to the process or part, the requirements of PRETTL Change Management MUST be followed.

• The supplier can be requested to present his corrective measures on site to PRETTL.

• PRETTL and its customers reserve the right to check the product conformity with the requirements in the factories of the supplier and his sub-suppliers.

• The corrective measures carried out on site at the supplier can be checked during subsequent visits.

• If corrective actions are taking more than two (2) weeks to implement, a progress report may be required.

• When the corrective action is complete and verified to be effective, the PRETTL 8-D Champion is responsible for approving the 8-D deal and notifying the supplier contact of the closure.

The quality of the 8D reports must be at least 90%. Otherwise the 8D report will not be accepted.

MS 06_00021_00_Self_assesment_8D_Checklist evaluation sheet.

11.5 Controlled Shipping Level (CSL)

If defects repeatedly occur and if the measures taken are not effective, PRETTL may demand additional 100% tests in order to improve the quality situation. Corresponding agreements shall be reached between PRETTL and the supplier in accordance with events. Both the test criteria and the criteria for lifting the additional test are defined individually.

100% tests can be carried out either by the Supplier or a service provider commissioned to do so.

11.5.1 Controlled Shipping Level 1 (CSL 1)

Controlled Shipping Level 1 (CSL 1) means:

- Supplier has to install additional tests to the normal scope of control
- The scope of the additional tests has to be agreed upon with PRETTL, including the part numbers and the characteristics
- The tests have to be done for and prior to every delivery.
- Full documentation of the tests and their results has to be available
- Marking for these deliveries has to be agreed upon with PRETTL

11.5.2 Controlled Shipping Level 2 (CSL 2)

Controlled Shipping Level 2 (CSL 2) means:

- Supplier has to install an additional 100% check on top of the normal scope of control carried out by an external provider accepted by PRETTL,
- part numbers and characteristics have to be agreed upon with PRETTL,
- tests have to be done for and prior to every delivery,
- Full documentation of the tests / results has to be available,
- Marking for these deliveries has to be agreed upon with PRETTL,
- Stock on both sides, Supplier and PRETTL, has to be inspected as well as goods currently in transit,
- For the sorting activities, Supplier has to draw up instructions for the service provider, agreed by PRETTL,

- Supplier is responsible for the orderly implementation of sorting tasks, the documentation of the results and the quality of the products supplied.

12 Change Management - Information and Documentation

12.1 Supplier information about changes – Supplier Initiated Change Request Prior to

- modifications of the product or packaging,
- change of sub-suppliers throughout the supply chain,
- change of production methods, production equipment, processes with influence on form, fit,
- function, performance and reliability (including at sub-suppliers in the supply chain),
- relocating or setting up production and development sites (only for development facilities responsible for PRETTL projects during development period) the Supplier obtains the written approval of PRETTL and provides the agreed quality documentation in this regard.

Prior to

- changes of production methods, production equipment, processes without influence on form, fit, function, performance and reliability (including at sub-suppliers in the supply chain),
- changes of test methods and test equipment,
- relocating or setting up of production equipment at the same site,
- suspension of development and/or maintenance of digital goods (legacy support), the Supplier notifies PRETTL well in advance, so that PRETTL can check whether the planned changes could have a negative effect.

The Supplier Initiated Change Request (“SICR”) form and further information about change management are available here:

The SICR must be used in order to provide notice of any planned changes.

Examples of notifiable changes are given as well in VDA Volume 2 (current version).

12.2 Electronic components

ZVEI “Guideline for Customer Notifications of Product and /or Process Changes (PCN) of Electronic Components specified for Automotive Applications” (revision 3, January 2015 or newer) applies to change management for electronic components in automotive applications.

12.3 Labeling of Deliveries after Changes

The first deliveries after the start of a series and after the aforementioned change measures must be marked according to PRETTL specifications (Specifications in accordance with the logistics manual below or separate agreements).

In addition, the papers accompanying the first three deliveries after a change must be marked as follows:

- 1., 2., 3. Delivery after change [number of the change, revision level].

12.4 Documentation of a Change

All changes to the product and process chain and any validation measures will be documented by the Supplier and made available to PRETTL upon request.

13 Digital Goods

13.1 Scope

New business cases associated with Connected, Autonomous, Shared and Electrified mobility solutions are drivers for particular emphasis on handling of digital goods in supplier quality management at PRETTL.

Under digital goods we consider the following classes:

- Software (incl. embedded-SW)
- Data (e.g. Map-Data)
- IT-Services.

For each of those classes corresponding quality models apply:

- Software Automotive SPICE®

- Data CMMI DMM SM
- IT-Services ISO 20000

Depending on the specific project needs, additional quality requirements for

- Functional Safety (e.g. ISO 26262)
- Cybersecurity (e.g. ISO 21434)

are applicable.

13.2 Preventive Quality

In the project specific Request for Quotation Supplier will receive a Quality-Book which is based on the quality model named above and contains additional PRETTL specific requirements. The Software, Data and IT-Service Q-Book respectively contains non-functional, process related quality requirements. The corresponding Q-Book is a part of project specific contracting and is a precondition for sourcing.

Before sourcing, additionally to the agreement on a corresponding Q-Book, Supplier will be evaluated on his process capability on SW development, Data Management or IT-Service Management. Results of those capability evaluation (e.g. ASPICE Assessment) will be used in risk evaluation and considered in the sourcing decision.

After sourcing the fulfillment of in the corresponding Q-Book agreed quality requirements will be evaluated and the evaluation results will be considered in the PPA/PPAP release or corresponding Quality Gate.

13.3 Complaint Management

A complaint for digital goods is a severe (customer, safety or security related) deviation or a frequently occurring deviation from PRETTL requirements.

Complaints for digital goods must always be processed according to the 8D method. The rules in relation to processing times as defined in the “Agreement on Quality and Corporate Social Responsibility” shall apply unless otherwise agreed with PRETTL (e.g. shortened processing times for customer complaints, safety- or security-related deliveries).

Bug-Fixing will be managed on project level.

14 Sub-Supplier Management

The requirements of this guideline also applies if the Supplier purchases parts or services from sub-suppliers. Supplier establishes appropriate sub-supplier management in order to ensure quality.

Production process and product approval (PPA/PPAP) must be implemented.

The manufacturing and delivery chain must be presented to PRETTL on request.

Supplier shall be held responsible for a failure on the part of its sub-supplier to the same extent as if it were itself directly responsible for the failure. This principle shall apply equally to sub-suppliers specified by PRETTL.

In the event of deviations from the agreed quality, Supplier develops its sub-suppliers using agreed targets and development programs.

15 Cooperation for Quality Improvement

15.1 Quality Targets

Just as PRETTL is committed to a zero defect target in the interests of its customers, the Supplier has a similar commitment to PRETTL and communicates this both internally and to its subcontractors.

If zero-defect delivery cannot be guaranteed, PRETTL may agree interim targets with the Supplier (e.g. upper limits for error rates within specific time frames). The Supplier shall introduce measures for continuous improvements and for achieving the zero defect target.

15.2 Upper Limits

Adherence to agreed upper limits shall not relieve the Supplier from its obligation to process all complains or from its liability for all defective deliveries. If the agreed upper limits are exceeded, the Supplier will introduce effective improvement measures at short notice at its own expense and will keep PRETTL informed of progress on an on-going basis.

15.3 Liability / escalation

The liability of the Supplier for all defective deliveries shall remain unaffected by the agreed upper limits.

Quality talks focusing on topics such a preventive quality assurance, the assessment of replaced quality data, error meetings, discussions relating to current topics, etc. will take place at the request of a contract partner. In the event of escalation, the Supplier should attend discussions at management level+.

15.4 Development Programs

Supplier development programs are intended to improve cooperation in quality questions between PRETTL and the Supplier and continuously improve the performance of the supply chain. Fundamental cooperation takes the form of so-called Standard Quality Cooperation (SQC) where standard day to day business is handled.

In the event of quality and process problems with the Supplier and when the Supplier's overall situation is assessed by PRETTL, it may be possible to include the Supplier in a supplier development program:

- In order to improve maturity of a specific quality topic, the Supplier can be included in EQC (Extended Quality Cooperation) which is a strategic supplier development and support program.
- If upcoming incidents make it necessary to escalate the quality problems (for the criteria see below), the Supplier may be included in SQIP (Supplier Quality Improvement Program).

15.4.1 EQC (Extended Quality Cooperation)

As part of Extended Quality Cooperation, PRETTL's Q activities with the Supplier will be intensified supporting Supplier strategically to achieve better maturity in Q-Topics.

- Extended and preventive Q activities
- Regular reviews with the involvement of: quality engineers, senior managers (Supplier & PRETTL)

15.4.2 SQIP (Supplier Quality Improvement Program)

Important part of the escalation management is the inclusion of management representatives from both sides (Supplier and PRETTL) into the quality improvement process. Aim of the escalation status is to improve quality performance (e.g. reduce number of quality incidents) and to achieve an acceptable level of quality.

Open and unlimited cooperation is accepted. A quality agreement between supplier and PRETTL defines criteria to achieve to be able to exit the escalation stage.

The Quality performance and escalation stage also are used for of supplier evaluation.

16 Other Requirements

In addition to the existing contractual agreements, PRETTL also requires compliance with the requirements listed below.

16.1 Special Process Assessments (AIAG CQIs)

Some special and critical production processes need high attention. For such processes self-assessment of the suppliers according to the AIAG CQI rules shall be carried out in the whole supply chain.

Confirmation from supplier to work accordingly will be requested yearly by PRETTL. Upon request copies of the performed special process assessment cover sheet need to be provided within one day.

CQI Assessments and instructions are available via www.aiag.org.

Listed special production processes in CQIs:

ISSUE	CONTENT (LISTED PROCESSES)		
CQI-9 Heat Treatment	1. Carburizing 2. carbon correction 3. neutral hardening 4. tempering 5. precipitation hardening	6. aging 7. nitriding (Gas) 8. Ferritic birtrocarburising (Gas/Salt) 9. Aluminium heat treatment 10. Induction heattreatment	11. Annealing 12. Normalizing 13. Stress relieving 14. low pressure carburizing 15. Sinter hardening 16. Ion nitriding
CQI-11 Plating	1. Zinc&Zinc Alloy plating 2. Mechanical plating 3. Surface conditioning of Metals for decorative Plating 4. Surface conditioning of plastics for decorative Plating	5. Decorative plating for metal/plastics 6. Electropolishing 7. hard chrome plating 8. electroless Nickel 9. Hydrogen embrittlement relief bake process	10. process control and testing equipment Hint: typical platings for contacts as gold, silver or tin are not listed!
CQI-12 Coating	1. Pretreatment (Aqueous) 2. Pretreatment (mechanical) 3. conversion coatings 4. Powder 5. Spray	6. electrocoat 7. Dip/Spin 8. Autodeposition 9. Cure	10. Anodizing and hard coat anodizing 11. Equipment 12. Part Inspection and Testing
CQI-15 Welding	1. Gas Metal Arc Welding 2. Laser Welding 3. Drawn Arc Welding 4. Resistance Welding 5. Friction Welding (without friction stir welding	6. Induction/High Frequency Magnetically Impelled Arc Butt Welding 7. Friction Welding (without friction stir welding)	8. Induction/High Frequency Magnetically Impelled Arc Butt Welding 9. Tube Welding 10. Fastener Projection Welding
CQI-17 Soldering	1. Paste printing 2. Inspection 3. Surface Mount device placing 4. Reflow 5. Glue dispensing 6. Flux application for wave soldering	7. Pre heating 8. Wave 9. Fountain 10. Dip 11. Selective 12. automated iron 13. manual iron	14. laser and soft beam 15. induction 16. conformal coat and test 17. PCB separation 18. ICT – In-Circuit-Test 19. Rework
CQI-23 Molding	1. Injection Molding 2. Blow Molding 3. Vacuum Forming	4. Compression Molding 5. Transfer Molding (Thermoset materials)	6. Extrusion 7. Equipment 8. Part inspection and testing
CQI-27 casting	1. Sand Casting (Iron/Steel) 2. Centrifugal Castings 3. Centrifugal Liners 4. Investment Castings (Iron/Steel)	5. Aluminum SPM Cylinder Heads 6. Aluminum Sand Castings 7. Aluminum Metal Mold	8. Aluminum High Pressure Die Cast 9. Magnesium High Pressure Die Cast 10. Zinc High Pressure Die Cast

16.2 Product Safety & Conformity Representative

A Product Safety & Conformity Representative (PSCR) must be available at all production sites that produce for PRETTL. Product safety officers must be familiar with product manufacturing, methods for risk assessment and the relevant rules for product safety and reliability.

PSCR are members of the supplier management team or report directly to this team or to senior quality management.

16.3 Retention (Archiving)

Supplier shall define the general handling of information and documentation. This includes retention (archiving).

The retention must ensure that documents are safe from manipulation, access by third parties. Their contents must remain available over the entire retention period.

Storage locations should ensure adequate protection against possible risks such as fire and/or water (storm damage, floods, firefighting water) and should prevent unauthorized access and changes to the documentation with appropriate protective measures.

Notes on procedure can be found in VDA Volume 1 current version.

17 Sources

Sources for the present document, including quotes passages and content:

- VDA Volume 1 “Documented Information and Retention”
- VDA Volume 2 “Securing the Quality of Supplies”
- AIAG "Production Part Approval Process, 4th Edition"
- VDA Volume 4 "FMEA”
- VDA Volume 4 "Cost-effective Tolerance Process"
- VDA Volume 6.3 "Process Audit"
- VDA Volume "Process Description for Special Features (BM)"
- Automotive SPICE®
- CMMI DMMS CM
- ISO 20000
- ISO 26262
- ISO 21434
- VDA - Robust manufacturing processes

Sources and notes on further reading are also available within the chapters.

18 final provisions

Changes and additions to this agreement must be made in writing.

Should provisions of this agreement be wholly or partially ineffective, the validity of the remaining provisions shall not be affected; in this case the partners will agree on an effective provision that comes closest to the economic purpose of the ineffective provision. The same applies to any gaps.

This agreement is subject exclusively to German law, excluding conflict of laws and the UN Sales Convention (CISG). The place of jurisdiction for all legal disputes arising directly or indirectly from this agreement is Tübingen. The Reutlingen District Court (72764 Reutlingen) is responsible for proceedings before the local courts. However, PRETTL is entitled, at PRETTL's option, to sue the SUPPLIER at his place of business or at the place of his branch office or at the court of the place of performance.

Applicable specifications and documents

MS 05_00010_Herstellbarkeitsanalyse_feasibility study
MS 06_00077_Measurement_Allignment
MS 06_00011_PPAP_PPF_Sampling_agreement_EN_DE
MS 06_00021_Self_assesment_8D_Checklist
MS 04_00003_Supplier_self_assessment_DE_EN
MS 06_00064_Product_specific_note

PRETTL	
Date / Datum	
Department / Abteilung	***Signature / Unterschrift***
Purchasing / Einkauf	
Logistics / Logistik	
SQM / SQM	

SUPPLIER	
Date / Datum	
Department / Abteilung	***Signature / Unterschrift***