Ford Motor Company
Customer Specific Requirements for Suppliers (Tier$_n$)

Global Supplier Manual - Appendix L

extracted from **Ford Motor Company CSR for IATF 16949:2016 – 01 March 2024**
https://www.iatfglobaloversight.org/oem-requirements/customer-specific-requirements/

1 Scope of this document

The scope of this document is to ensure compliance to customer requirement by sub-suppliers of SMP Automotive who are supplying for any Ford project. This document is listing requirements for these suppliers in addition to standard IATF16949 requirements and in addition to standard SMP requirements.

2 Responsibility

Suppliers who are supplier for SMP of a component for a Ford product shall meet all requirements listed in this document during the whole project lifetime. This includes but not limited to:

- Regularly check for updates of this document on www.smp-automotive.com
- Ensure availability and awareness of related Ford standards and requirements mentioned in this document
- Ensure requirements are met in their supply chain

3 Corporate Responsibility (IATF 16949 section 5.1.1.1)

The organization shall comply with Basic Working Conditions in the Global Terms and Conditions and the related Supplier Social Responsibility and Anti-Corruption Requirements Web-Guide https://web.fsp.ford.com/gtc/docs/hrandwc.pdf. The organization is also encouraged to adopt and enforce a similar code with Ford's Policy Letter #24 available through https://corporate.ford.com/social-impact/sustainability.html (search for "policy letter 24").

4 Contingency plans (IATF 16949 section 6.1.2.3)

The Organization shall notify the SMP receiving plant, the buyer and the SQA within 24 hours of organization production interruption. The organization shall communicate the nature of the problem to SMP and take immediate actions to assure supply of product to SMP.

Note: Production interruption is defined as an inability to meet the Ford specified production capacity volume.

5 Measurement system analysis (IATF 16949 section 7.1.5.1.1)

Gauging requirements

All gauges used for checking Ford components/parts per the control plan shall have a gauge R&R performed in accordance with the appropriate methods described by the latest AIAG Measurement Systems Analysis Manual (MSA) to determine measurement system variability. The Gauge R&R is to be completed using Ford parts. The control plan identifies which gauges are used for each

measurement. Any measurement equipment not meeting the MSA guidelines must be approved by SQA.

Acceptability criteria for Gauge R&R

To help assess the gauge, the organization shall report the value of +/- 2 Total Gauge R&R Standard Deviations to understand the 95% prediction interval (uncertainty) of any one measurement. This value can be used in conjunction with engineering judgment to help assess the distance between the edge(s) of the process distribution and the specification limit(s). The organization shall report gauge R&R as both a percent of study variation and a percent of tolerance.

Gauge R&R as a percent of tolerance < 10% is acceptable (the parts used for the Gauge R&R study must be representative of a production run with all known sources of variation).

If Gauge R&R as a percent of tolerance is greater than or equal to 10%, but less than or equal to 30%, contact the SQA engineer to determine if the Gauge R&R is acceptable.

If Gauge R&R as a percent of tolerance > 30%, it is unacceptable and the organization shall implement containment actions and a corrective action plan to improve measurement capability until the Gauge R&R requirements are met.

Calculation for Gauge R&R with One-sided Tolerance for GD&T Dimensions (e.g. Position, Profile, Flatness, Parallelism, Roundness, Straightness, etc.)

In these cases, calculate the tolerance by taking the upper specification limit and subtracting the lower boundary of zero.

$$Gauge\ R\&R\ \%\ Tolerance = \frac{6\ Total\ Gauge\ R\&R\ Standard\ Deviation}{USL - Lower\ Boundary\ Of\ Zero}$$

Acceptability criteria for Gauge R&R with One-sided Tolerance

Upper specification limit with no lower boundary: In these cases, calculate percent tolerance by dividing 3 Gauge R&R standard deviation by the difference between the upper specification limit and the mean of the data.

$$Gauge\ R\&R\ \%\ Tolerance = \frac{3\ Gauge\ R\&R\ Standard\ Deviation}{|USL - \bar{\bar{X}}|}$$

Lower specification limit with no upper boundary: In these cases, calculate the percent tolerance by dividing 3 Gauge R&R standard deviation by the difference between the mean of the data and the lower specification limit.

$$Gauge\ R\&R\ \%\ Tolerance = \frac{3\ Gauge\ R\&R\ Standard\ Deviation}{|\bar{\bar{X}} - LSL|}$$

Determining Gauge Acceptability for One-sided Tolerances when Ppk <1

When Ppk is less than 1, the one-sided % tolerance will be artificially high. The team will need to use engineering judgment to assess gauge acceptability. Use +/- 2 Total Gauge R&R Standard Deviations to understand the 95% prediction interval (uncertainty) of any one measurement. This value can be used to help assess gauge acceptability by:

- Comparing the +/- 2 Total Gauge R&R Standard Deviations and the distance between tail of the distribution and the specification limit.
- Comparing the +/- 2 Total Gauge R&R Standard Deviations to the spread of the process (+/- 3 Standard Deviations).
- Use +/- 2 Total Gauge R&R Standard Deviations to compare different gauging methods or technology.

Family of gauges

Where multiple gauges of the same make, model, size, method of use and application (including range of use) are implemented for the same part, use of a single gauge R&R covering those multiple gauges (family of gauges) requires SQA approval.
Parts and operators for Gauge R&R studies
At a minimum:

- Variable gauge studies should utilize a minimum of 10 parts, 3 operators and 3 trials.
- Attribute gauge studies should utilize a minimum of 50 parts, 3 operators, 3 trials.

See the Ford PPAP customer specifics for details on attribute gauge measurement systems analysis requirements
https://web.qpr.ford.com/sta/Ford_Specifics_for_PPAP.pdf

6 External laboratory (IATF 16949 section 7.1.5.3.2)

The organization shall approve commercial/independent laboratory facilities prior to use. The acceptance criteria should be based on the latest ISO/IEC 17025 (available through ISO https://www.iso.org/), or national equivalent, and shall be documented.

Accreditation to ISO/IEC 17025 or national equivalent is not required.

7 Record retention (IATF 16949 section 7.5.3.2.1)

Inspection and Measurement Records

The organization shall retain records of process control data, product inspection data and records of appropriate reaction actions to readings outside the specification in a recoverable format for a minimum of 2 years, available to Ford Motor Company upon request. The organization shall record the actual values

of process parameters and product test results (variable or attribute). Simple pass/fail records of inspection are not acceptable for variable measurements.

Audits

The organization shall retain records of internal quality system audits and management review for three years.

APQP

The organization shall maintain the final External Supplier APQP/PPAP Readiness Assessment (Schedule A) for the life of the part (production and service) plus one year as part of the PPAP record.

Training

The organization shall retain records of training for 3 years from the date of the training.

Job set up

The organization shall retain records of job set-up verifications for 1 year.
Retention periods longer than those specified above may be specified by an organization in its procedures.

Maintenance

The organization shall retain records of maintenance for 1 year.
The organization shall retain records of measurement equipment calibration for one calendar year or superseded, whichever is longer.
Ford reserves the right to modify specific record retention requirements.
These requirements do not supersede any regulatory requirements.

8 Customer-designated special characteristics (IATF 16949 section 8.2.3.1.2)

Symbols

The organization is to contact Ford Engineering to obtain concurrence for the use of Ford Motor Company special characteristics symbols defined in the table below.

Characteristic	Symbol
CRITICAL CHARACTERISTIC – (CC) (With Safety or Legal Consideration)	∇
SIGNIFICANT CHARACTERISTIC – (SC) (Not Relating to Safety or Legal Considerations)	None
High Impact (HI) Characteristics	None
Operator Safety Characteristics (OS)	None

For internal use, the organization may develop its own special characteristics symbols. The Special Characteristics definitions are available in the Ford FMEA Handbook.

Ford Designated Special Characteristics

Critical Characteristic (∇) Parts

Ford designated Control Item Parts are selected products identified by Ford Engineering, concurred by Ford/ organization manufacturing and identified on drawings and specifications with an inverted delta (∇) preceding the part. Control Item products have Critical Characteristics that may affect safe vehicle operation and/or compliance with government regulations. Unique symbols identifying safety and regulatory characteristics on components equivalent to the inverted delta (∇) symbol.

Fasteners with Critical Characteristics

For fasteners, base part numbers beginning with “W9” are to be treated as inverted delta.
Critical Characteristics for fasteners may be designated by methods defined in Ford Engineering Fastener Specifications available through Ford Global Materials and Fastener Standards.

Other Special Characteristics

Significant and High Impact and Operator Safety Characteristics are described in the Ford FMEA Handbook.

9 Design and development of products and services — supplemental (IATF 16949 section 8.3.1.1)

The organization should consider Incoming inspection when developing control strategies to prevent the use of non-conforming incoming material.

10 Design and development planning — supplemental (IATF 16949 section 8.3.2.1)

FMEA and Control Plan Development

FMEAs and Controls Plans shall ensure that the manufacturing process complies with Critical to Quality process requirements as specified in the Supplier Manufacturing Health Charts located at https://web.qpr.ford.com/sta/Supplier_Manufacturing_Health_Charts.html.

Families of FMEAs

The organization may write FMEAs for families of parts, where typically the only difference in the parts is dimensional, not form, application or function. The organization should obtain SQA review and concurrence prior to use of family process FMEAs.

Foundation FMEAs

Organizations are required to have foundation FMEAs. Foundation FMEAs are typically created for each process type (e.g., stamping, riveting, injection molding, etc.). See the AIAG/VDA FMEA manual for more information. Foundation FMEAs are also known as corporate, generic, baseline, core, master, or best practice FMEAs and contain knowledge of the organization from prior developments and problem-solving activities. They play a critical role in the Prevent Recurrence process by capturing knowledge from problem solving and making sure the errors are not repeated in future launches. Knowledge gained from problem solving processes (8D, 6-Sigma, Shanin, etc.) shall be documented in both the part and the foundation FMEAs. The foundation FMEAs are not a replacement for the part FMEA but are a starting point for a part FMEA on a new launch.

FMEA Information Flow and Linkage

The Part and Foundation FMEAs shall be living documents that are always aligned. An update to the Foundation FMEA shall result in a review of the applicable information for the Part FMEA. This process also shall work backwards from the part FMEAs to the Foundation FMEA in that any updates to the part FMEAs result in updates of the applicable information in the Foundation FMEAs. In addition, FMEAs shall be aligned to the control plans and work instructions/visual aids.

FMEA Software

Suppliers shall use FMEA software which ensures the alignment of the Foundation FMEA, Part FMEA, control plan and other applicable documents.

Reverse FMEA Process (RFMEA)

Organizations are required to have a process in place that ensures all new launches complete an RFMEA event once the equipment is installed and running. This process should be first completed at the equipment manufacturer and then after final installation on the organization's plant floor. The reverse FMEA involves design and process engineers working with operators and attempting to make bad parts, beat the error proofing and find new failure modes, causes, and develop controls. The goal is to discover opportunities and implement improvements in the FMEA that were not previously discovered. Evidence of Reverse FMEA events must be available starting July 1, 2022 for forward model programs which have not yet completed Job 1.

Implementation for Foundation and FMEA Software

All Foundation PFMEAs for all manufacturing processes (current and forward model) and subsequent updates to all FMEAs must be available in the FMEA software.

FMEA documentation

Organizations are to provide copies of FMEA documents to SMP / Ford Motor Company upon request.

Special Characteristic traceability for build to print organizations

For build to print organizations, the organization shall obtain from SMP DFMEA information (including potential Critical Characteristics – YCs and potential Significant Characteristics – YSs) to develop the PFMEA and special characteristics (CC, SC, HI and OS, as appropriate). The organization shall document special characteristics on the Special Characteristics Communication and Agreement Form – SCCAF (FAF03-111-2) including where special characteristics are controlled at sub-tier suppliers, and obtain SMP approval. The SCCAF template is available through APQP/PPAP Evidence Workbook (through https://web.qpr.ford.com/sta/APQP.html)

This also applies to Ford-directed sub-tier suppliers without a Multi-Party Agreement

Documentation of Controls for Critical Characteristics

Both build-to-print and design responsible organizations identify in the APQP/PPAP Evidence Workbook the special controls to prevent shipment of any nonconformance to Ford specified Critical Characteristics, regardless of the location of the special controls in the supply chain (tier 1 through tier N).

Control Plans

All Ford Motor Company parts shall have Control Plans (or Dynamic Control Plans – DCP if required by Powertrain).

Special Characteristic Traceability

Special Characteristics and control approach are traceable from the DFMEA through the PFMEA and the SCCAF to the Control Plan and recorded in the APQP/PPAP Evidence Workbook.

Ongoing Engineering Specification testing documentation

Any revisions to the Product Validation Engineering Specification or other inspection frequencies in the Control Plans and PFMEAs require SMP/Ford approval through the Supplier Request for Engineering Approval (SREA)

Lot Traceability

The organization shall maintain lot traceability.

11 Product approval process

Product Part Approval Process

For production parts and approval of components from sub-tier suppliers, the organization shall comply with the AIAG Production Part Approval Process (PPAP) manual and Ford's Global Phased PPAP available through https://web.qpr.ford.com/sta/Phased_PPAP.html. Additional requirements are specified in Q1 https://web.qpr.ford.com/sta/Q1.html.

For service parts, in addition to meeting the requirements of the AIAG Production Part Approval Process (PPAP) manual, the organization must comply with the AIAG Service Production Part Approval Process (Service PPAP) manual.

Submission of Sub-tier supplier PPAP

Evidence of sub-tier component part approvals may be a summary (approved PSWs, a listing of PSW approvals or equivalent).

12 Type and extent of control — supplemental (IATF 16949 section 8.4.2.1)

The organization shall have incoming product quality measures and shall use those measures as key indicators of sub-tier supplier product quality management.

13 Statutory and regulatory requirements (IATF 16949 section 8.4.2.2)

Applicable regulations shall include international requirements for export vehicles as specified by Ford Motor Company, e.g. plastic part marking (E-4 drafting standard –WSS-M99P9999-A1 and European End of Life of Vehicle (ELV) –available on FSP (Ford Supplier Portal https://fsp.covisint.com).

Material reporting requirements for ELV are specified by WSS-M99P9999-A1 under "Important Documents".

14 Standardized work – operator instructions and visual standards (IATF 16949 section 8.5.1.2)

Operators shall use the most current work instructions.

The organization shall ensure that work instructions contain reaction plans for non-conformances showing the specific required steps.

15 Layout inspection and functional testing (IATF 16949 section 8.6.2)

The organization shall perform annually a layout inspection (to all dimensional requirements) on at least 5 parts.

Where tooling has multiple cavities, tools or centers, the organization conducts the annual layout on at least one part from each cavity, tool or center, with a minimum overall sample of 5 parts.

Note: 5 parts are not required from each cavity; tool or center, only a minimum of 1 part is required from each cavity, tool or center.

The measurements are to be documented on the APQP/PPAP Evidence Workbook (Prototype or Production Measurement Results section), available through https://web.qpr.ford.com/sta/APQP.html.

16 Acceptance criteria (IATF 16949 section 8.6.2)

For guidance on product monitoring and reaction plan techniques for product conformance to specification, see the references AIAG SPC and APQP.

For ongoing process capability requirements, see Table A of this document.

17 Monitoring and measurement of manufacturing processes (IATF 16949 section 9.1.1.1)

Table A of this document details the on-going process capability requirements.

All process controls shall have a goal of reduction of variability, using 6-sigma or other appropriate methods.

All process metrics are to be traceable to Ford requirements.

18 Identification of statistical tools (IATF 16949 section 9.1.1.2)

The organization shall use the latest edition of the following references as appropriate:

See IATF 16949 for applicable references

Process Capability

The capability index for reporting launch process capability and ongoing production process capability is Ppk (Performance Index)

See Ford's PPAP customer specifics for the launch process capability requirements. https://web.qpr.ford.com/sta/Ford_Specifics_for_PPAP.pdf

See table A for ongoing process capability requirements.

The organization shall maintain ongoing process capability at Ppk > 1.33.

The requirement for maintenance of ongoing process capability is to be included in the production Control Plan and the capability results recorded in the APQP/PPAP Evidence Workbook.

The results of monitoring process capability are to be available to SMP/Ford upon request.

When investigating a process capability issue it is advisable to use multiple indices, e.g. Pp, Ppk, Cp, and Cpk. When used together, the indices assist in the determination of sources of variation (see references on Statistical Process Control).

Table–A - Ongoing Process and Product Monitoring
Control Chart Interpretation and Reaction

The Control Chart indicates that the process:	ACTIONS ON THE PROCESS OUTPUT Based on Process Capability (Ppk)	
	Less than 1.33	Equal to or Greater than 1.33
Is in control	100% inspect*	Accept product Continue to reduce product variation
Has gone out of control	IDENTIFY SPECIAL CAUSE 100% inspect* all product since the last in-control sample	

*The organization ensures that the 100% inspection methodology prevents shipment of any non-conforming product to Ford. The 100% inspection methodology would typically include error proofing, such as a poka-yoke.

The organization ensures that Critical Characteristics (CC) have controls which prevent the shipment of non-conforming product, regardless of the location in the supply chain (tier 1 through tier N) of the manufacture of the physical characteristic(s) associated with the Critical Characteristic. The organization records the CC controls in the APQP/PPAP Evidence Workbook.

Statistical process control on product characteristics without continuous manufacturing process controls is not appropriate or sufficient for Critical Characteristics

19 Change log

Revision	Date	Description
1	30.07.2021	first issue
2	20.01.2022	FMEA updates: - Foundation FMEAs - FMEA Information Flow and Linkage - FMEA Software - Reverse FMEA Process (RFMEA) - Implementation for Foundation and FMEA Software
3	02.09.2022	Format adapted
4	06.07.2023	Updated “Chapter 5 Measurement system analysis” & “Chapter 10 Design and development planning — supplemental” according to Ford CSR 01-Jul-2023
5	14.06.2024	New Ford CSR 01-March-2024