

# Ford Motor Company Customer-Specific Requirements

## For use with PPAP 4.0

### Scope

The US English language version of this document is the official version..

Any translations of this document shall:

- be for reference only,
- reference the English version as the official language,
- include Ford Motor Company in the copyright statement.

Copies of this document are available from Ford Motor Company at [https://web.qpr.ford.com/sta/Phased\\_PPAP.html](https://web.qpr.ford.com/sta/Phased_PPAP.html) through the Ford Supplier Portal and International Automotive Oversight Board at <http://www.iaob.org/>.

PPAP 4.0 is applicable to organizations supplying all regions and brands within Ford Motor Company. Wherever the term "Ford" is used throughout this document, it refers to "Ford Motor Company".

### References

Note: unless otherwise noted, all references listed throughout these Ford Specific Requirements refer to the latest edition.

- International Automotive Task Force **ISO/TS 16949:2002**, Quality Systems - - Particular Requirements for the Application of ISO 9001:2000 for automotive production and relevant service part organizations
- Ford Motor Company **FMEA Handbook**, are available on [FSP](#) , log into FSP Library Services, and then paste in the following link:  
[https://us.library.covisint.com/LibraryServices/secured?cmd=MY\\_DOCUMENTS&action=docdetails&nodeID=2112](https://us.library.covisint.com/LibraryServices/secured?cmd=MY_DOCUMENTS&action=docdetails&nodeID=2112).
- Chrysler, Ford Motor Company, General Motors Corp. **Measurement Systems Analysis** reference manual
- Chrysler, Ford Motor Company, General Motors Corp. **Statistical Process Control (SPC)** reference manual.
- DaimlerChrysler, Ford Motor Company General Motors Corp. **Production Part Approval Process (PPAP)** requirements manual.
- **ISO/IEC 17025:1999** General Requirements for the Competence of Calibration and Testing Laboratories, available through ISO <http://www.iso.ch/iso/en/ISOOnline.frontpage> (search for "17025" in the standards search).
- Q1: available on <https://web.qpr.ford.com/sta/Q1.html> through the Ford Supplier Portal.

The latest copies of PPAP, SPC, MSA and other related manuals are available from AIAG at 01-248-358-3003 and <http://www.aiag.org/>, and Carwin Continuous (UK) at 44-1708-861333.

Some hypertext links within this document may only be accessible on FSP (Ford Supplier Portal) by organizations shipping directly to Ford Motor Company (typically Tier 1). Lower tier organizations may need to gain access to FSP (Ford Supplier Portal) through a Tier 1. The Ford Supplier Portal is available through Covisint (<http://www.covisint.com/>)

# **Ford-Specific PPAP 4.0 Requirements**

## **1 Applicability (PPAP section "Introduction")**

For software separate from the hardware – e.g., control module software, not all PPAP clauses apply. PPAP for software guidance is available on [https://web.qpr.ford.com/sta/Phased\\_PPAP.html](https://web.qpr.ford.com/sta/Phased_PPAP.html) through the Ford Supplier Portal.

The "authorized customer representative" is the Supplier Technical Assistance (STA) engineer (for both Vehicle and Powertrain) assigned to the organization site. STA engineers are identified in SIM (Supplier Improvement Metrics) on the Ford Supplier Portal for each organization manufacturing site. Internal suppliers to Ford Assembly Plants (e.g., Powertrain and Stamping Business Unit facilities) should contact their responsible approval activity or the Ford corporate Quality Office.

Note: In this document, in alignment with PPAP 4.0, unless otherwise noted, the term "organization" refers to the manufacturing sites of external suppliers manufacturing production or service parts and products for Ford Motor Company.

## **2 Submission of PPAP (PPAP section 1.1)**

The organization shall submit PPAP per Ford's *Phased PPAP*, available at [https://web.qpr.ford.com/sta/Phased\\_PPAP.html](https://web.qpr.ford.com/sta/Phased_PPAP.html), through the Ford Supplier Portal.

## **3 Design Record (PPAP – section 2.2.1)**

For a Design Record to be acceptable, the design must be released and authorized for production in the appropriate Ford design system (for example, at production authority level in WERS – Worldwide Engineering Release System).

The organization shall ensure that the release level of the product specified by Ford Product Development Engineering matches the product release level specified in the Purchase Order from Ford.

## **Packaged Service Parts**

**Service Kits with Packaged Chemical Components:** FCSD (Ford Customer Service Division) Package Material Specification L1794 (Labeling Instructions for Kits with Chemical/Regulated Components) will be specified on the individual service kit's packaging specification. The L1794 requires the chemical component supplier and/or FCSD Contract Packager to develop the appropriate warning label for these products. The FIR # (FIR #: "Ford Internal Reference Number" also known as Toxicology Number) must be included on the supplier developed warning label for the packaged chemical components, e.g. greases, lubricants, adhesives, solvents, butyl tape, etc. The L1794 label Package Material Specification can be found at: <http://web.pkginfo.ford.com/specs/specspdf/specs06/11794.pdf> through the Ford Supplier Portal.

**Dry Friction Materials:** A unique FCSD developed toxicology label or a generic toxicology label will be specified on individual dry friction service part's packaging specifications. The generic label for brake and clutch parts will be L1853. The Package Material Specification for L1853 can be found at <https://web.pkginfo.ford.com/specs/specspdf/specs06/11853.pdf> through the Ford Supplier Portal. Uniquely developed toxicology labels will have their own label number specified on the parts packaging specification. The generic labels are used whenever a FIR # (FIR #: "Ford Internal Reference Number" also known as Toxicology Number) has not yet been established, otherwise, the unique labels will include the applicable FIR #.

## **Branding**

Organizations shall comply with the E108 Branding directive, available on <https://web.purinfo.ford.com/> through the Ford Supplier Portal and specified in the E-3 drafting standard, available at <http://web.standards.ford.com/cgi-bin/index.cgi> through the Ford Supplier Portal.

Organizations shall complete the branding checklist, form available on <https://web.purinfo.ford.com/documents/brandprot/compcheck.xls> through the Ford Supplier Portal.

## **4 Reporting of Part Material Composition (PPAP section 2.2.1.1)**

Ford materials reporting requirement and compliance details are specified in Ford's Restricted Substance Materials Standard (RSMS) WSS-M99P9999-A1 available (without a Covisint account) on Ford Supplier Portal

(<https://portal.covisint.com/wps/public/fsp/1/en>). Acceptable evidence of materials reporting and compliance includes IMDS (International Material Data System) certification, a Ford Materials Engineering approved materials declaration, or GMIR (Global Materials Integration Reporting) approval. The organization should contact Ford Materials Engineering to determine which method of declaration is appropriate. The current Ford RSMS package is released each year in the "News" section of IMDS, at: [http://www.mdsystem.com/html/en/home\\_en.htm](http://www.mdsystem.com/html/en/home_en.htm)

#### **5 Marking of Polymeric Parts (PPAP section 2.2.1.2)**

Design record requirements for marking of polymeric parts are specified in the E-4 drafting standard available at <http://web.standards.ford.com> through the Ford Supplier Portal.

#### **6 Customer Engineering Approval (PPAP section 2.2.3)**

The organization shall obtain documented Ford Product Development Engineering approval of DV (Design Verification) and PV (Production Validation) tests of the initial sample parts. The organization shall conduct the PV testing on parts/products which were produced at "run at rate" (see [Ford's Phased PPAP](#) (phase 0) for a definition of "run-at-rate").

Note 1: Where appropriate, Ford Product Development Engineering records initial sample part approval on the ESER – form 2973 (Engineering Sample Evaluation Report), form available internally to Ford through Ford Forms on EKB – Enterprise Knowledge Base.

#### **7 Failure Mode and Effects Analysis (PPAP sections 2.2.4 and 2.2.6)**

Organizations shall meet the requirements of the Ford FMEA handbook when developing DFMEAs, and PFMEAs (available through Ford Supplier Portal Library Services, [https://us.library.covisint.com/LibraryServices/secured?cmd=MY\\_DOCUMENTS&action=docdetails&nodeID=2112](https://us.library.covisint.com/LibraryServices/secured?cmd=MY_DOCUMENTS&action=docdetails&nodeID=2112)).

#### **Design FMEA**

Authorization to create a single DFMEA for a family of similar parts or materials used in similar applications, environments, etc. is available from Ford Product Development Engineering. Design FMEA(s) for safety and regulatory component(s) prepared by design responsible organizations require Ford Product Development Engineering approval. Ford reserves the right to review and approve all organization-developed DFMEAs.

#### **Process FMEA**

For all PPAP submission levels (1 through 5), Process FMEA(s) for safety and regulatory (inverted delta) component(s) require Ford Product Development Engineering & STA approval. Ford reserves the right to review and approve all organization-developed PFMEAs. Characteristic traceability is required from the DFMEA through the PFMEA to the Control Plan. Such traceability can be documented on the "Supplement K" available on [https://web.qpr.ford.com/sta/Phased\\_PPAP.html](https://web.qpr.ford.com/sta/Phased_PPAP.html).

#### **8 Control Plan (PPAP section 2.2.7)**

For all PPAP submission levels (1 through 5), Control plan(s) for safety and regulatory (inverted delta) component(s) require Ford Product Development Engineering & STA approval. The Control Plan shall include provisions for on-going monitoring of process capability, stability and control. Ford reserves the right to review and approve all organization-developed Control Plans.

#### **9 Measurement Systems Analysis Studies (PPAP 2.2.8)**

Where measurement analysis studies are performed using software, the software is to be validated using standard input data sets and checked using corresponding expected output results. Example validation data sets are available on <https://web.qpr.ford.com/sta/Statistics.html> through the Ford Supplier Portal

The preferred method for calculating Gauge R&R is by using the ANOVA method, since the ANOVA method allows identification of the operator contribution, whereas the Average and Range or Range methods do not. Refer to the AIAG published SPC manual, and the ANOVA method is available through commercial statistical software packages and the AIAG APQP forms disk available from AIAG.

The organization shall report the number of distinct categories. All variable gauge R&R studies should have a minimum of 5 distinct categories (See Measurement Systems Analysis Reference Manual published by AIAG, refer to "ndc" in the index).

Gauge R&R as a percent of study < 10% is acceptable (the parts used for the Gauge R&R study must be representative of a production run). If Gauge R&R as a percent of study is greater than 10%, but less than 30%, contact STA to determine if the Gauge R&R is acceptable. If Gauge R&R as a percent of study > 30%, it is unacceptable and the organization shall implement a corrective action plan to improve measurement capability.

#### **10 Material Test Results (PPAP section 2.2.10.1)**

Where Ford specifies that materials are to be purchased from an approved supplier, the organization should contact the buyer to determine appropriate materials suppliers.

#### **11 Initial Process Studies (General) (PPAP section 2.2.11.1)**

##### **Designation of characteristics for demonstration of process capability**

Where the part does not have any Ford-designated special characteristics, the organization shall control part quality through the designation of appropriate control characteristics, including them in the Control Plan and demonstrating process capability on those organization-designated control characteristics.

##### **Demonstration of process capability (Capability Index)**

The organization shall demonstrate process capability per 2.2.11.3 of PPAP 4<sup>th</sup> Edition using the  $P_{pk}$  process capability index.

Where process capability index calculation software is used, it is to be validated using standard input data sets and checked using corresponding expected output results. Example validation data sets are available on <https://web.qpr.ford.com/sta/Statistics.html> through the Ford Supplier Portal

##### **Demonstration of process capability (Calculation of $P_{pk}$ )**

The  $P_{pk}$  index of the initial process study must be calculated using a data set that is statistically stable, in control and normal. Stability, control and normality are determined using a data set of at least 25 subgroups (typical sub-group size is 5) per the guidance in the AIAG published SPC manual. For example, for a 5 sample sub-group X bar R control chart, 125 measurements would be required..

Note: If the data collected are not normally distributed, either transform the data to a normal distribution, or determine if the data match another known distribution, such as Weibull, before calculation of  $P_{pk}$ .

The initial process study data set of 25 subgroups is to be developed to include the expected inherent variation of the manufacturing process (e.g., the actual manufacturing environment, including all shifts, expected operating patterns.)

##### **Demonstration of process capability (When the $P_{pk}$ data set requirements are not met)**

If part size or other factors prevent the collection of 25 subgroups covering the expected inherent variation of the manufacturing process, the process is classified as unstable and 100% inspection is required (see section 13 below). Later demonstration of process stability and acceptable capability will remove the need for 100% inspection.

##### **Inverted Delta parts**

For parts designated as inverted delta (parts with Critical Characteristics), the organization shall prevent the shipment of non-conforming product to Ford.

Note: this is typically accomplished by using error and/or mistake proofing techniques integrated into the organization's manufacturing and material handling processes.

##### **Parts without inverted delta designation**

This error proof approach described for inverted delta designated parts above is recommended for all parts, not just parts designated as inverted delta.

#### **12 Actions to be taken when acceptance criteria are not satisfied (PPAP 2.2.11.6)**

The modified control method shall include techniques to incorporate mistake proofing methods into the manufacturing process to prevent the shipment of non compliant product to Ford facilities.

Note: examples of mistake proofing methods include the modification of manufacturing processes to detect and discard non compliant product (e.g., poke-yoke), or a gauge to ensure product compliance to specification where the

process does not meet the capability requirements. This is not the addition of a temporary manual inspection process at the end of the line.

The organization shall continue to determine sources of variation, improve the process with permanent corrective actions, and improve the process to meet the capability requirements.

**The following are examples of measurement equipment mistake proofing methods**

**For Variable Gauges**

**Two sided tolerances:** Tolerances used for 100% inspection gauges can be reduced by the extent of the gauge R&R as a percent of tolerance of the gauge(s) being used in the 100% inspection methodology. The typical practice is to remove half the gauge R&R as a percent of tolerance from the upper specification limit and the other half from the lower specification limit.

Example: A variable gauge is used to check a product characteristic of 600 microns +/- 40 microns (this equates to 80 microns specification tolerance spread). Additionally, this variable gauge has a gauge R&R as a percentage of tolerance of 20%. The upper limit compensated for gauge capability would be 632 microns ( $600 + 40 - 80 \times 0.2/2$ ) (Upper Specification – (Specification tolerance spread  $\times$  (% tolerance Gauge R&R)/2)) and the lower limit compensated for gauge capability would be 568 microns ( $600 - 40 + 80 \times 0.2/2$ ) (Lower Specification + (Specification tolerance spread  $\times$  (% tolerance Gauge R&R)/2)). This example assumes the gauge error is equally distributed. Continue process variation reduction efforts until a  $P_{pk}$  greater than 1.67 is achieved, or until STA approval is received.

**One-sided tolerances:** For a "less than" tolerance specification (e.g. length less than 20 mm) subtract three gauge R&R standard deviations from the tolerance specification. For a greater than tolerance specification (e.g. plating thickness greater than 10 microns) add three gauge R&R standard deviations to the tolerance specification.

"Greater than" example: A variable gauge is used to check the length of a product characteristic. The product specification is greater than 150 microns. The gauge R&R standard deviation is 2 microns. The specification compensated for gauge error would be greater than 156 microns ( $150 + 3 \times 2$ ) (Specification + 3  $\times$  gauge R&R standard deviation).

"Less than" example: A variable gauge is used to check the length of product characteristic. The product specification is less than 150 microns. The gauge R&R standard deviation is 2 microns. The specification compensated for gauge error would be less than 144 microns ( $150 - 3 \times 2$ ).

If business reasons exist to deviate from the recommendations listed above, contact STA to obtain concurrence.

Continue process variation reduction efforts until an acceptable process capability is achieved, or until STA approval is received.

**13 Qualified Laboratory Documentation (PPAP 2.2.12)**

The external laboratory shall be in compliance with the latest ISO/IEC 17025 (or national equivalent).

**14 Appearance Approval Report (AAR) (PPAP 2.2.13)**

All parts/products having appearance criteria shall be reviewed and approved by the appropriate Ford activity. The completed Appearance Approval Report (form CFG-1002) shall accompany all submissions. After approval signatures have been obtained from the designated Ford representative, the AAR form shall be included with Warrant.

NOTE 1: Appearance items are: all interior, exterior, luggage compartment, and select under-hood components which are visible to the customer. Appearance approval includes, but is not limited to: overall appearance, surface quality, color, texture, and gloss.

NOTE 2: Visual "match-to-master" is the specified requirement for AAR sign-off. Numeric evaluations should only be used for on-going quality control after visually acceptable parts/products are attained.

Refer to the North American Decorative Component Approval Process (DCAP) manual for detailed instructions and regional contacts.

For additional information, contact: North American Corporate Design - Design Quality, Ford Motor Company, Product Development  
Center, Mail Drop 533, PO Box 2110, Dearborn, MI, 48123; fax: 313-594-7705

## **15      Part Submission Warrant (PPAP section 2.2.18 and section 5)**

See Phased PPAP [https://web.qpr.ford.com/sta/Phased\\_PPAP.html](https://web.qpr.ford.com/sta/Phased_PPAP.html) available through the Ford Supplier Portal for PPAP level and PSW submission requirements.

For post Job#1 PPAP submissions, the organization is not to ship production quantities to the Ford facilities until after PPAP and functional trial approval or functional trial waiver are obtained. The functional trial approval or functional trial waiver is obtained after PPAP approval, and is managed by Plant Vehicle Team (PVT at VO plants) or Local Vehicle Team (LVT) and the Product Development Resident Engineer (Powertrain plants) or equivalent. Contact the PVT or LVT or the Resident Engineer for instructions.

For PPAP submissions during a vehicle launch, the launch builds constitute the "functional trials" and therefore provide approval to ship parts subject to plant releases.

Organizations are permitted to submit multiple part numbers (same family of parts) on a single PSW with all part specifics (e.g., prefix, base, suffix) clearly noted on the PSW or on an attachment to the PSW.

Tables 1A and 1B below summarize submission practices and methods for notifying the appropriate Ford system of completion of the PSW:

The organization must allow for STA approval timing (at least 1 week) ahead of the sample promise date.

## **16      Change Notification (PPAP – section 3)**

Tier 1 and Ford-Directed Tier 2 (or lower tier) suppliers to Ford are required to obtain Ford approval prior to implementation of any organization-initiated or supplier-initiated change per the Ford SREA Process (Supplier Request for Engineering Approval). The requirements of section 3.1 in PPAP are met by following the SREA process (the SREA requirements are available on <https://web.qpr.ford.com/sta/SREA.html>, Ford Supplier Portal).

## **Service Part Deviation (SREA) Process**

Service parts that are also used for normal production or for Original Equipment warranty repair should be treated as production parts for the purposes of an SREA.

FCSD Service-Unique parts are parts released by FCSD and not common with production parts (i.e. remanufactured components, service chemicals, etc.) and past model parts no longer used for Ford production or for Original Equipment warranty repairs, but still produced for service, should be processed via the FCSD Service Part Deviation SREA process website found at <https://web.purinfo.ford.com/> through the Ford Supplier Portal.

## **17      Appendix A – Completion of the Part Submission Warrant (PPAP sections 2.18 and 3)**

Customer tool tagging/numbering is not applicable to Ford internal suppliers such as Powertrain and Stamping Business Unit.

See Ford's Phased PPAP for instructions on PPAP and PSW submission requirements, available through [https://web.qpr.ford.com/sta/Phased\\_PPAP.html](https://web.qpr.ford.com/sta/Phased_PPAP.html), Ford Supplier Portal

## **18      Appendix G – Tires – Specific Requirements**

Organizations supplying tires to Ford Motor Company shall meet all requirements of PPAP.

The tire appendix is not applicable to organizations supplying tires to Ford Motor Company.

## **19      Special Characteristics (PPAP Glossary)**

Ford's special characteristics are defined in the Ford FMEA handbook (available through Ford Supplier Portal [https://us.library.covisint.com/LibraryServices/secured?cmd=MY\\_DOCUMENTS&action=docdetails&nodeID=2112](https://us.library.covisint.com/LibraryServices/secured?cmd=MY_DOCUMENTS&action=docdetails&nodeID=2112)).

## **20      Labeling Requirement**

Organizations supplying Ford of Europe facilities are required to affix orange labels (Form EU 3441, minimum A5 size) on all four sides of the packaging for all shipments of new or changed product to each using Ford of Europe facility. Organizations supplying Ford of Europe Powertrain are required to include their unique supplier generated PSW number on each label of the PSW shipment (ongoing shipments are excluded from this requirement).

Organizations supplying North America and Asia Pacific are required to follow local practices – contact the local MP&L (Material Planning and Logistics).

**Table 1A**  
Summary of submission practices and methods for notifying the appropriate Ford system of completion of the PSW:  
**See section 15 above of this document.**

PPAP LEVEL	ORGANIZATION	STA ENGINEER APPROVAL OF PPAP DATA PACKAGE	DATA ENTRY OF APPROVAL
<u>Level 1</u> DDL (Direct Data Link)	<ul style="list-style-type: none"> <li>– Prepare PPAP data package/self approve.</li> <li>– Enter approval in Ford system.</li> <li>– Maintain the completed PPAP data package on file.</li> </ul>	Signature not required. Organization self certifies.	Organization enters in Ford system.
Non-DDL	<ul style="list-style-type: none"> <li>– Prepare PPAP data package/self approve.</li> <li>– Contact Ford STA and report PPAP data package approval status to Purchasing.</li> <li>– Maintain the completed PPAP data package on file.</li> </ul>	Signature not required. Organization self certifies.	Purchasing support function enters approval, per local practice.
<u>Level 2-5</u> DDL	<ul style="list-style-type: none"> <li>– Prepare PPAP data package.</li> <li>– Get STA approval.</li> <li>– Enter approval in Ford system after STA approval of PPAP data package.</li> <li>– Maintain the completed PPAP data package on file.</li> </ul>	<ul style="list-style-type: none"> <li>– Approve PPAP data package/sign warrant</li> <li>– Return PPAP data package to organization.</li> </ul>	Organization enters in Ford system after STA approval of PPAP data package.
Non-DDL	<ul style="list-style-type: none"> <li>– Prepare PPAP data package.</li> <li>– Get STA approval.</li> <li>– Maintain the completed PPAP data package on file.</li> <li>– Contact the Purchasing support function and report PPAP data package approval status.</li> </ul>	<ul style="list-style-type: none"> <li>– Approve PPAP data package/sign warrant</li> <li>– Return PPAP data package to organization</li> </ul>	Local Practice (Purchasing support function) enters approval in Ford system.



Table 1B

Summary of submission practices and methods for notifying the appropriate Ford system of completion of the PSW:  
**See section 15 above of this document.**

## PSW SUBMISSION LOCAL PRACTICES

Organization or STA Engineer will handle approved warrant per local practices below:

Purchase Orders Issued in North America		Purchase Orders Issued in Europe
PTO	Vehicle Operations	All Operations
<b>NON-DDL ORGANIZATIONS:</b> <ul style="list-style-type: none"> <li>– Fax or equivalent (or hand deliver to onsite PTO plant drop box) copy of the approved warrant to MP&amp;L Timing Analyst</li> <li>– Analyst enters approval.</li> </ul>	<b>NON-DDL ORGANIZATIONS:</b> <ul style="list-style-type: none"> <li>– Notify Material Follow-up Analyst when PPAP data package is approved.</li> <li>– Analyst will enter approval in the Ford PPAP tracking system</li> </ul>	<ul style="list-style-type: none"> <li>– Send copy of Approved Warrant to Buyer</li> <li>– Buyer enters PPAP data package approval</li> <li>– Buyer files copy of Warrant</li> </ul>



## **Commodity Specific**

### **Stamping**

Internal Stamping suppliers shall meet the requirements of Ford Motor Company, Vehicle Operations' Operating Procedure VOPQUN-050, "Production Part Approval Process (PPAP) / Part Submission Warrant (PSW) Process"

### **FORD GLOSSARY**

**Critical Characteristics** are those product requirements (e.g., dimensions, performance tests) which are part characteristics or process parameters that can affect compliance with government regulations or safe vehicle/product function, and which require specific organization, assembly, shipping, or monitoring and are included on Control Plans. Critical Characteristics are identified by either the inverted delta symbol (▼) or CC designation.