TENNECO PPAP GUIDELINES FOR SUPPLIERS
WHAT IS PPAP AND WHEN IS IT REQUIRED?

PPAP (Production Part Approval Process) – evidence that all customer engineering design records and specification requirements are properly understood by the supplier and that the manufacturing process has the capability to produce consistently meeting these requirements during an actual production run at the quoted production rate.

Suppliers may be requested for PPAP submission based on the following but not limited to:

1. New Part/Product or New Tool
2. Engineering Changes to design records,
3. Tooling Transfer, Replacement, Refurbishment
4. Correction of Discrepancy
5. Material change
6. Sub-supplier change
7. Change in Part Processing
8. Material Source Change
9. Supplier Manufacturing location change
PURPOSE AND SCOPE

• Purpose: Explanation of Tenneco Supplier’s PPAP Requirements.
• Scope: Tenneco PPAP & relevant documentation.

• Each PPAP element will be explained in detail:
  1. Design Records
  2. Engineering Change Documents
  3. Customer Engineering Approval
  4. Design FMEA (dFMEA)
  5. Process Flow Diagram (PFD)
  6. Process FMEA (pFMEA)
  7. Control Plan (CP)
  8. Measurement Systems Analysis Studies (MSA)
• Each PPAP element will be explained in detail:
  9. Dimensional Results
  10. Records of Material / Performance Test Results
  11. Initial Process Studies
  12. Qualified Laboratory Documentation
  13. Appearance Approval Report (AAR)
  14. Sample Product Parts (PPAP samples)
  15. Master sample
  16. Checking Aids
  17. Records of Compliance with Customer-Specific Requirements
  18. Part Submission Warrant (PSW)/Bulk Material Checklist
Tenneco additional requirements to be fulfilled. (Identified by Tenneco Purchasing). These requirements are listed below:

- A1. Launch Containment Plan
- A2. Capacity Verification (as required)
- A3. APQP Tracker
- A4. IMDS Documentation
- A5. Packaging Plan Proposal
- A6. Vendor Tooling Registration Form
- A7. Manufacturing Review Form (nothing is required in this section)
- A8. Process Change Notice (used only for PPAP’d due to a Process Change)
- A9. Conflict of Minerals (if applicable)
- A10. Subcontractors/Suppliers PPAP
- A11. Other Specified Requirement (as required)

Detailed information about each item can be found @ https://www.tenneco.com/suppliers or by contacting the respective plant representative or Supplier Development Specialist.
ABBREVIATIONS AND TERMS

AIAG – Automotive Industry Action Group
PPAP - Production Part Approval Process
APQP – Advanced Product Quality Planning
TSM – Tenneco Supplier Manual
GRR – Gauge Repeatability & Reproducibility
MSA – Measurement System Analysis
CP – Control Plan
PFD – Process Flow Diagram
FMEA – Failure Mode and Effect Analysis
RPN – Risk Priority Number
RFQ – Request for Quote
SDE – Supplier Development Engineer
SQE – Supplier Quality Engineer
PCN – Process Change Notification
CC – Critical Characteristic
SC – Significant Characteristic
PTC – Pass Through Characteristics
Cpk – The capability index for a stable process - sigma is based on subgroup variation
Ppk – The performance index – sigma is based on total variation
ISO/IEC 17025:2005 – General requirements for the competence of testing and calibration laboratories
A2LA – American Association for Laboratory Accreditation
• PPAP levels differ only on the document Submission vs Retention. Hence it is the responsibility of the supplier to keep updating all the necessary documents at their end per Level 3 requirements and ensure it is readily available for Tenneco upon request within 48 hours.

• PPAP Submission Levels:
  ➢ Level 1: PSW only (and for designated appearance items, an Appearance Approval Report)
  ➢ Level 2: PSW with sample products and limited supporting documents
  ➢ Level 3: PSW with sample products and complete supporting documents (standard submission level)
  ➢ Level 4: PSW and requirements as defined by the customer
  ➢ Level 5: PSW with sample products and complete supporting documents available for review at supplier location
### Retentions/Submission Requirements - Table 4.2 (from AIAG PPAP Fourth Edition hand book)

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
<th>Level 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Designed Records</td>
<td>R</td>
<td>S</td>
<td>S</td>
<td>*</td>
<td>R</td>
</tr>
<tr>
<td>a) for proprietary components/details</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>*</td>
<td>R</td>
</tr>
<tr>
<td>b) for all other components/details</td>
<td>R</td>
<td>S</td>
<td>S</td>
<td>*</td>
<td>R</td>
</tr>
<tr>
<td>2. Engineering Change Documents</td>
<td>R</td>
<td>S</td>
<td>S</td>
<td>*</td>
<td>R</td>
</tr>
<tr>
<td>3. Customer Engineering Approval</td>
<td>R</td>
<td>R</td>
<td>S</td>
<td>*</td>
<td>R</td>
</tr>
<tr>
<td>4. Design FMEA</td>
<td>R</td>
<td>R</td>
<td>S</td>
<td>*</td>
<td>R</td>
</tr>
<tr>
<td>5. Process Flow Diagrams</td>
<td>R</td>
<td>R</td>
<td>S</td>
<td>*</td>
<td>R</td>
</tr>
<tr>
<td>6. Process FMCA</td>
<td>R</td>
<td>R</td>
<td>S</td>
<td>*</td>
<td>R</td>
</tr>
<tr>
<td>7. Control Plan</td>
<td>R</td>
<td>R</td>
<td>S</td>
<td>*</td>
<td>R</td>
</tr>
<tr>
<td>9. Dimensional Results</td>
<td>R</td>
<td>S</td>
<td>S</td>
<td>*</td>
<td>R</td>
</tr>
<tr>
<td>10. Material, Performance Test Results</td>
<td>R</td>
<td>S</td>
<td>S</td>
<td>*</td>
<td>R</td>
</tr>
<tr>
<td>11. Initial Process Studies</td>
<td>R</td>
<td>R</td>
<td>S</td>
<td>*</td>
<td>R</td>
</tr>
<tr>
<td>12. Qualified Laboratory Documentation</td>
<td>R</td>
<td>S</td>
<td>S</td>
<td>*</td>
<td>R</td>
</tr>
<tr>
<td>14. Sample product parts</td>
<td>R</td>
<td>S</td>
<td>S</td>
<td>*</td>
<td>R</td>
</tr>
<tr>
<td>15. Master Sample</td>
<td>R</td>
<td>R</td>
<td>S</td>
<td>*</td>
<td>R</td>
</tr>
<tr>
<td>16. Checking Aids</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>*</td>
<td>R</td>
</tr>
<tr>
<td>17. Records of Compliance With</td>
<td>R</td>
<td>R</td>
<td>S</td>
<td>*</td>
<td>R</td>
</tr>
<tr>
<td>Customer-Specific Requirements</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Part Submission Warrant (PSW)</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>*</td>
<td>R</td>
</tr>
<tr>
<td>Bulk Material Checklist</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>*</td>
<td>R</td>
</tr>
</tbody>
</table>

*S= The organization shall submit to the customer and retain a copy of records or documentation items at appropriate locations.*

*R= The organization shall retain at appropriate locations and make available to the customer upon request.*

* = The organization shall retain at appropriate locations and submit to the customer upon request.*
1. After receiving ePPAP Requests from Tenneco, suppliers are required to log onto the TITAN portal and review carefully the following:
   a) PPAP Request details and PPAP c-folder documents related to the PPAP
   b) Tenneco Global and/or Regional Terms and Conditions
   c) Tenneco Standard PPAP/APQP Process Guidelines and Requirements

2. Initial Response (First PPAP Response) is required within **3 working days** after receiving the ePPAP Request. Tooling PO will not be issued to supplier until this initial response is submitted. This response is to answer the questions in TITAN “PPAP Request overall Status” and “Overall Status Red or Yellow due to”. Response to these questions acknowledges acceptance to the PPAP request.

3. Document Sharing takes place via **C-Folder in TITAN PPAP Request**. Suppliers are not allowed to use the c-folder for any other purposes, except for the specific PPAP and product launch related processes.

4. Whenever a document is assessed as 100% complete, suppliers are required to submit the completed documentation by uploading it electronically into the corresponding PPAP c-folder.

5. Suppliers are required to have all documents uploaded into TITAN and PPAP Samples at Tenneco Plant no later than the PPAP due date. Acceptable samples can be delivered prior to completed documentation in Titan, with goal of Documentation and samples both submitted no later than due date to the Tenneco Plant.
Approved

- Indicates that part and submitted documentation meets all Tenneco requirements. Supplier is authorized to ship production quantities of the product, according to Tenneco’s scheduling agreement (with this status supplier will not be able to remove or upload any documents in the c-folders).

Interim Approval

- Permits the shipment of material for production requirements on a limited time period or quantities.
- If an interim approval is due to Supplier PPAP issues then supplier is responsible for implementing containment actions to ensure that only acceptable material is being shipped to Tenneco. Additionally supplier has to prepare an action plan agreed with Tenneco. PPAP corrections are required to obtain a status “approved” within agreed time frame.

Returned

- It means that PPAP submission does not meet Tenneco requirements. In such cases, the submission must be corrected to meet the requirements and obtain a status „approved“ within agreed time frame.
1. Fully “ballooned” drawing (all dimensions, notes, specs) must be submitted as part of a PPAP for every submission level where Dimensional Results are required.

2. Where Customer Specific Requirements are noted, a statement needs to be provided confirming that their product conforms to that Customer Specific Requirements.

3. All balloons must match with numbers used in Dimensional Results report.

4. Check if drawing number and revision level are the latest available.

5. Make sure that on the drawing “production release” stamp is present.

6. Upload ballooned drawing in Section 1a of the APQP folder. If Sections 1b and 1c are not applicable upload a blank document stating “N/A”. Examples below:
1. Supplier shall have authorized engineering change documents for those changes not yet recorded in the design record but incorporated in the product, part or tooling e.g. supplier change requests, specifications updates, sub assembly drawings.

2. If there are any deviations that are not corrected at the time of PPAP and/or if there are dimensions out of specification but covered by approved deviation, only interim approval can be given.

3. If no changes required, please upload into PPAP submission one page document saying “Not required/Not applicable”.

4. Any approved engineering change or deviations should be uploaded into section 2 of TITAN PPAP C-folder.

   Example below:

   Not required/

   Not applicable
PPAP REQUIREMENTS:
3. CUSTOMER ENGINEERING APPROVAL

1. If specified by the customer (OEM), supplier should have evidence of customer engineering approval.

2. In most cases this section will be left blank. However a single page document should be uploaded into PPAP submission saying “Not required/Not applicable”.

3. Elements from this paragraph should be uploaded into section 3 of TITAN PPAP C-folder. Example below:

   Not required/
   Not applicable
If supplier is responsible for the part/product design, completion and submission of dFMEA according to customer-specified requirements is required

1. Design FMEA should be done according AIAG FMEA handbook (the latest version available at [www.aiag.org](http://www.aiag.org)).
2. If the supplier does not want to upload the dFMEA due to confidentiality, a cover page confirming that the FMEA was done according to AIAG standard and/or listed RPN levels (at least top 10) can be submitted instead.
3. In any case dFMEA should be available for Tenneco representative to review at supplier location.
4. During review following points will be checked: part number and revision level (it should match with the latest drawing), items with highest RPN/severity level must be covered with actions.
5. When there is a design step where the Severity = 5 - 8 AND an Occurrence = 4 - 10, this step must be highlighted in the pFMEA for team focus. Also if Severity = 9 or 10 this design step must be highlighted in the pFMEA for team focus.
6. If Tenneco is responsible for the design, this section will be left blank. However a single page document can be uploaded into PPAP submission stating “not required/not applicable“.
7. Elements from this paragraph should be uploaded into section 4 of TITAN PPAP C-folder.
PPAP REQUIREMENTS:
5.PROCES FLOW DIAGRAM (PFD)

Process Flow Diagram is a way to visualize a process and must meet specified customer needs. After review, it should be clear what the process includes:

1. Each step in the process, (receiving of raw material, part manufacturing, inspections and checks, assembly, packaging, shipping).
2. If there are any production steps done externally (outsourced operations).
3. If there are any abnormal handling processes such as rework, offline activities (measurement, inspection, handling) and scrapping.
4. If there are any transport or storage of semi-finished products.
5. In which step of production processes are put together, sub-assembly or the addition of materials occurs (e.g. the welding nut #2 is added on during welding)
6. Which operations contain special characteristics (Critical, Significant, Manufacturing) and Pass Through Characteristics (PTC).
7. Part number and revision level should match the latest drawing.
8. Link between PFMEA, Process Flow and Control Plan (same step numbers, names and processes) is confirmed.

PFD should be uploaded into section 5 of TITAN PPAP C- folder
PPAP REQUIREMENTS:
5. PROCES FLOW DIAGRAM (PFD) (CONTINUED)

- This is an example of a PFD.
- Content and flow is important.
- Supplier can use their own format.
PPAP REQUIREMENTS:
6. PROCES FMEA (PFMEA)

Supplier shall develop a process FMEA in accordance with, and compliant to, customer-specified requirements.

Requirements:

1. pFMEA must be done according to AIAG FMEA handbook in terms of severity, detection and occurrence ratings (the latest version available at www.aiag.org).

2. The rankings must be equal to or higher than the Tenneco dFMEA rankings for particular items from the drawing.

3. Critical Characteristics should have severity: 9-10; Significant Characteristics: should have severity: 7-8; Pass Through Characteristics: should have severity 5 at least. All above should be indicated in PFMEA.

4. If severity level is greater than 8, an error proofing (Poka-Yoke) is required unless Tenneco approves in writing alternative solution.

5. If the supplier does not want to upload the pFMEA due to confidentiality, a cover page confirming that the FMEA was done according to AIAG standard and/or with listed RPN levels (at least top 10) can be submitted instead as pFMEA.

6. In any case pFMEA should be available for Tenneco representative review at supplier location.

7. Part number and revision level should match with the latest drawing. Items with highest RPN/severity level must be covered with actions.

8. Link between PFMEA, Process Flow and Control Plan (same step numbers, names and processes) is confirmed.

9. PFMEA should be uploaded into section 6 of TITAN PPAP C-folder.
## PPAP REQUIREMENTS:
### 6. PROCES FMEA (PFMEA)

Example of pFMEA below:

<table>
<thead>
<tr>
<th>Op #</th>
<th>Op Name</th>
<th>Requirement</th>
<th>Potential Failure Mode</th>
<th>Potential Effects of Failure</th>
<th>Severity</th>
<th>Score</th>
<th>Potential Causes / Mechanism(s) of Failure</th>
<th>Control / Prevention</th>
<th>Occur</th>
<th>Current Process Controls</th>
<th>Detection</th>
<th>Recommended Action(s)</th>
<th>RPN</th>
<th>Action Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RECEIVE INCORRECT MATERIAL FROM SUPPLIER</td>
<td>INCOMPLETE MATERIAL</td>
<td>PREMATURE FAULT, UNABLE TO PRODUCE PART TO PRINT</td>
<td>6</td>
<td>MISLABELED COIL</td>
<td>SUPPLIER PROCESS CONTROLLED PARTING SYSTEM</td>
<td>5</td>
<td>SUPPLIER PROVIDED STEEL CERTIFICATION</td>
<td>8</td>
<td>80</td>
<td>NONE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>VERIFY RECEIVED PARTS (OPERATOR)</td>
<td>INCOMPLETE MATERIAL</td>
<td>PREMATURE FAULT, UNABLE TO PRODUCE PART TO PRINT</td>
<td>6</td>
<td>MISLABELED COIL LABEL</td>
<td>SUPPLIER PROCESS CONTROLLED PARTING SYSTEM</td>
<td>5</td>
<td>VERIFICATION TO RECEIVE MATERIAL</td>
<td>8</td>
<td>80</td>
<td>NONE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>INCOMPLETE MATERIAL</td>
<td>PREMATURE FAULT, UNABLE TO PRODUCE PART TO PRINT</td>
<td>6</td>
<td>MISLABELED COIL LABEL</td>
<td>SUPPLIER PROCESS CONTROLLED PARTING SYSTEM</td>
<td>5</td>
<td>SUPPLIER PROVIDED STEEL CERTIFICATION</td>
<td>8</td>
<td>80</td>
<td>NONE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>INCOMPLETE MATERIAL</td>
<td>PREMATURE FAULT, UNABLE TO PRODUCE PART TO PRINT</td>
<td>6</td>
<td>MISLABELED COIL LABEL</td>
<td>SUPPLIER PROCESS CONTROLLED PARTING SYSTEM</td>
<td>5</td>
<td>SUPPLIER PROVIDED STEEL CERTIFICATION</td>
<td>8</td>
<td>80</td>
<td>NONE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>INCOMPLETE MATERIAL</td>
<td>PREMATURE FAULT, UNABLE TO PRODUCE PART TO PRINT</td>
<td>6</td>
<td>MISLABEL COIL</td>
<td>SUPPLIER PROCESS CONTROLLED PARTING SYSTEM</td>
<td>5</td>
<td>SUPPLIER PROVIDED STEEL CERTIFICATION</td>
<td>8</td>
<td>80</td>
<td>NONE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

© 2019 Tenneco, Inc. | Data Classification: 7/21/2023
Supplier must have a control plan that defines all methods used for process control and complies with customer-specified requirements. Elements which will be checked:

1. One-to-one match of the operation numbers between Process Flow Chart and PFMEA.
2. The whole production process is included - incoming of raw material, manufacturing process, in-process controls, final inspection, packaging, product and contamination audits, revalidation and rework (if applicable).
3. All part characteristics and notes provided on the drawing are listed in the Control Plan.
4. Controls must be clearly defined (what, how, by what, when/how often will be measured and where records will be stored).
5. If work instructions are linked to the Control Plan - they are included in the PPAP package; “control in accordance with internal procedure” is not acceptable.
6. Control Plan reflects all special and PTC characteristics defined on the drawing.
7. Part number and revision level should match with the latest drawing and refer to Tenneco part information.
8. Welding quality verification shall be included as applicable.
9. Any planned rework must be part of the control plan.
10. Annual Revalidation should be a part of the Control Plan.
11. Control Plan is uploaded into section 7 of TITAN PPAP C-folder.
## PPAP REQUIREMENTS: 7. CONTROL PLAN (CP)

### Example of Control Plan below:

**CONTROL PLAN**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>INSPECT INCOMING COIL, STEEL FROM SUPPLIER</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>CORRECT MATERIAL</td>
<td>55900717673-499</td>
<td>REVIEW MATERIAL CERTIFICATION</td>
<td>ONCE</td>
<td>RACK COIL, IF A MATERIAL ISSUE OCCURS</td>
</tr>
<tr>
<td>6</td>
<td>VERIFY STAGED COIL OPERATOR (COIL)</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>CORRECT MATERIAL</td>
<td>49551 (BN1: 1,4810)</td>
<td>VISUAL - STEEL TAG TO ROLLER</td>
<td>ONCE</td>
<td>RACK COIL</td>
</tr>
<tr>
<td>10</td>
<td>TRANSFER 2-OUT WITH ACTS 15985</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>SETUP OF MACHINE</td>
<td>SEE SETUP INSTRUCTIONS</td>
<td>VERIFY TO PARAMETERS ON SETUP INSTRUCTION</td>
<td>BACH SETUP</td>
<td>FIRST PIECE APPROVAL</td>
</tr>
<tr>
<td>A</td>
<td>LEAD CHECK</td>
<td>INCH 0.050 / 0.665</td>
<td>MICROMETER</td>
<td>ONCE (LOCATION X)</td>
<td>RECORD AT SETUP, BEGINNING OF SHIFT AND AFTER ANY MACHINE ADJUSTMENTS</td>
<td>INSPECTION SHEET</td>
<td>ADJUST AND RESET MACHINE, VALIDATE FIRST PIECES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>FEED DISTANCE (PITCH) PRESSURE</td>
<td>INCH (MPS 827-1,789</td>
<td>PRESS 33.3-7,600)</td>
<td>VISUAL</td>
<td>ONCE</td>
<td>RECORD AT SETUP, BEGINNING OF SHIFT AND AFTER ANY MACHINE ADJUSTMENTS</td>
<td>INSPECTION SHEET</td>
<td>ADJUST AND RESET MACHINE, VALIDATE FIRST PIECES</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>SBX-50 SETTINGS</td>
<td>MANUALLY ON/OFF WITH CORRECT WINDOWS PER SETUP SHEET</td>
<td>VISUAL</td>
<td>ONCE</td>
<td>RECORD AT SETUP, BEGINNING OF SHIFT AND AFTER ANY MACHINE ADJUSTMENTS</td>
<td>INSPECTION SHEET</td>
<td>ADJUST AND RESET MACHINE, VALIDATE FIRST PIECES</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
PPAP REQUIREMENTS: 8. MEASUREMENT SYSTEM ANALYSIS

Supplier should complete MSA studies (e.g. Gage R&R) for all new or modified gages, measurement and test equipment. Gage studies shall comply with AIAG guidelines (MSA manual the latest version) and end-user customer specific requirements: **All measurement and test equipment called out on the Control Plan must have Gage R & R completed.**

1. Variable gauge studies should utilize: 10 parts (as a minimum), 2 operators and 3 trials.

2. Acceptance criteria based on variable gage R&R studies are (calculation with ANOVA):
   - $< 10\%$ of tolerance → accepted
   - $10 - 30\%$ of tolerance → may be acceptable, contact Tenneco
   - $> 30\%$ of tolerance → unacceptable
   - NDC (Number of Distinct Characteristics) $> 5$

3. Attribute gauge study should utilize: 30 pieces (as minimum, from entire tolerance range and 20% out of the spec), 3 operators, 3 trials. Acceptance criteria:
   - Kappa value $> 0.75$ → acceptable
   - Kappa value $< 0.75$ → not acceptable and improvement plan needed

Elements to be checked:
- Studies performed on all gages used on SC/CC features (as minimum, including on-line gages and testers)
- Work instruction for gauge and picture of gauge should be part of PPAP see chapter 17 Checking Aids
- Raw data available for each study - All studies should be uploaded into section 8 of TITAN PPAP C-folder.
PPAP REQUIREMENTS:
8. MEASUREMENT SYSTEM ANALYSIS

Example of MSA study generated with CAQ software:
Supplier should be able to provide evidence that all measurements/test have been done in accordance with the Control Plan and results indicate compliance with specified requirements.

Elements to be checked:

1. The Dimensional Results must correlate with ballooned drawing including all characteristics including specifications and notes.
2. Each data point must indicate: “in spec/out of spec”, “ok/nok” and/or “pass/fail”.
3. The report must include only measured values - ranges are not allowed.
4. All PPAP samples are measured; in case of multiple cavity tool – 1 part per cavity, as minimum.
5. Base for the measurements is 2D drawing.
6. The submitted PPAP Samples must be measured and numbered per the dimensional layout,
   • minimum number of parts laid out per the PPAP Request
   • or 1 per cavity of multiple cavity tools.
7. All the supported documents as datum system for CMM, measurement strategy (best fit not allowed), sketches, inspection points must accompany the Dimensional Reports and should be uploaded into section 9 of TITAN PPAP C-folder.
Example of Dimensional Results below:

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DIMENSION / SPECIFICATION</th>
<th>SPECIFICATION / LIMITS</th>
<th>TEST DATE</th>
<th>QTY. TESTED</th>
<th>ORGANIZATION MEASUREMENT RESULTS (DATA)</th>
<th>OK</th>
</tr>
</thead>
<tbody>
<tr>
<td>1B_6MM</td>
<td>Ø112.500 ±0.500</td>
<td>Diameter</td>
<td>0.500</td>
<td>0.500</td>
<td>18-Aug-2016</td>
<td>6</td>
</tr>
<tr>
<td>2B_6MM</td>
<td>ø112.500 Ø AB 0, 0</td>
<td>True Position</td>
<td>1.500</td>
<td></td>
<td>18-Aug-2016</td>
<td>6</td>
</tr>
<tr>
<td>5 Max</td>
<td>2.000 AB 0, 0</td>
<td>Vector (Profile)</td>
<td>1.000</td>
<td>-1.000</td>
<td>18-Aug-2016</td>
<td>6</td>
</tr>
<tr>
<td>5 Min</td>
<td>2.000 AB 0, 0</td>
<td>Vector (Profile)</td>
<td>1.000</td>
<td>-1.000</td>
<td>18-Aug-2016</td>
<td>6</td>
</tr>
<tr>
<td>6 Max</td>
<td>1.000</td>
<td>Vector (Profile)</td>
<td>0.500</td>
<td>-0.500</td>
<td>18-Aug-2016</td>
<td>6</td>
</tr>
<tr>
<td>6 Min</td>
<td>1.000</td>
<td>Vector (Profile)</td>
<td>0.500</td>
<td>-0.500</td>
<td>18-Aug-2016</td>
<td>6</td>
</tr>
<tr>
<td>7 Max</td>
<td>1.000 AB 0, 0</td>
<td>Vector (Profile)</td>
<td>0.500</td>
<td>-0.500</td>
<td>18-Aug-2016</td>
<td>6</td>
</tr>
<tr>
<td>7 Min</td>
<td>1.000 AB 0, 0</td>
<td>Vector (Profile)</td>
<td>0.500</td>
<td>-0.500</td>
<td>18-Aug-2016</td>
<td>6</td>
</tr>
<tr>
<td>8 Max</td>
<td>1.000 AB 0, 0</td>
<td>Vector (Profile)</td>
<td>0.500</td>
<td>-0.500</td>
<td>18-Aug-2016</td>
<td>6</td>
</tr>
<tr>
<td>8 Min</td>
<td>1.000 AB 0, 0</td>
<td>Vector (Profile)</td>
<td>0.500</td>
<td>-0.500</td>
<td>18-Aug-2016</td>
<td>6</td>
</tr>
<tr>
<td>9</td>
<td>±1.245 Z-BASIC</td>
<td>Y Coordinate</td>
<td>18-Aug-2016</td>
<td>6</td>
<td>-43.036</td>
<td>-43.071</td>
</tr>
<tr>
<td>10</td>
<td>152.545 X-BASIC</td>
<td>X Coordinate</td>
<td>18-Aug-2016</td>
<td>6</td>
<td>152.256</td>
<td>152.289</td>
</tr>
</tbody>
</table>
PPAP REQUIREMENTS:  
9. DIMENSIONAL RESULTS

Supplier should provide a measurement strategy and upload with the dimensional results into the C-folder.

Minimum information needed:

1. Measuring System:
   1. Taktile
   2. Contactless
   3. CMM (Coordinate-measuring machine)
   4. Mobil Measuring equipment (Measuring arm, e.g. FARO, Romer, etc)
   5. Other

2. Orientation of Part for Measurement: **Parts are clamped only if print states – with Part Restrained.**
   1. A picture of the part showing the component in its measurement orientation.
   2. Additional information to support the clamping.
      1. (constraints must not distort the form of the part)
      2. (light magnets or light spring loaded clamps may be used)

3. Alignment of the Component:
   1. Alignment acc. which reference system
   2. Best Fit
   3. Other
   4. Amount of points taken per measurement

   V. Method of calculation for the results (e.g. average, minimum, maximum, .. etc)

4. Software:
   1. Which software was used and with which revision level.
PPAP REQUIREMENTS:
10. RECORDS OF MATERIAL / PERFORMANCE TEST RESULTS

Supplier should have records of material and/or performance test results for tests specified on design records or Control Plan.

Elements to be checked:

1. Part number and revision should match the drawing (for all submitted documents)
2. Material certificate must be in English or bilingual.
3. Material certificate must contain the chemical composition and mechanical properties of the material as per drawing.
4. No data should be older than one year (prior to PPAP submission supplier should contact Tenneco representative, if material certificate is older).
5. Material certifications and results for product validation
   1. Welding joints on the components weld seam metallography reports shall be attached
   2. All Weld seams shall be numbered and for each a report shall be attached, specification with limit and assessment OK/ NOK shall be included
   3. (for example tests results such as Weld Cut & Etch) or design validation testing should be attached here (section 10 of TITAN PPAP C-folder).
6. Examples of Material Certificate and Material test results attached: next slide...
PPAP REQUIREMENTS:
10. RECORDS OF MATERIAL / PERFORMANCE TEST RESULTS

<table>
<thead>
<tr>
<th>MATERIAL SPEC. NO. / REV. DATE</th>
<th>SPECIFICATION LIMITS</th>
<th>TEST DATE</th>
<th>TESTED</th>
<th>SUPPLIER TEST RESULTS (DATA)</th>
<th>OK</th>
<th>NOT OK</th>
</tr>
</thead>
<tbody>
<tr>
<td>C 0.050 Max</td>
<td>0.0502</td>
<td>6/20/2019</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mn 0.100 Max</td>
<td>0.1100</td>
<td>6/20/2019</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P 0.040 Max</td>
<td>0.0570</td>
<td>6/20/2019</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Si 0.030 Max</td>
<td>0.0913</td>
<td>6/20/2019</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cr 0.500 Min</td>
<td>0.3490</td>
<td>6/20/2019</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ni 0.500 Min</td>
<td>0.1790</td>
<td>6/20/2019</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mo —</td>
<td>6/20/2019</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Al —</td>
<td>0.0530</td>
<td>6/20/2019</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N 0.040 Max</td>
<td>0.0427</td>
<td>6/20/2019</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ti —</td>
<td>6/20/2019</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tension Strength 410 MPa Min</td>
<td>455.5 MPa</td>
<td>6/20/2019</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yield Strength 250 MPa Min</td>
<td>264.5 MPa</td>
<td>6/20/2019</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elongation Percentage 10% Min</td>
<td>12.3%</td>
<td>6/20/2019</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Signature: [Signature]
Date: [Date]
If required by customer: (see Section from Tenneco Global Supplier Manual below)

- Supplier to provide in each PPAP the compliance confirmation for REACH & RoHS, uploaded into section 10 of TITAN PPAP APQP-folder.


  RoHS & REACH requirements apply to some products of certain of our OE Customers.
  This means that suppliers that provide certain parts, components, assemblies and products will continue to be asked for part chemical content information.

  As per our Tenneco Supplier Manual, Section 9.2.1 & 9.2.2 suppliers are obligated to ensure that products supplied meet all regulations applicable to the suppliers' manufacture and sale of these products. The Tenneco Supplier Manual also requires that suppliers provide Tenneco with all the information and documentation necessary for Tenneco to comply with applicable regulations, including REACH and RoHS.


  **RoHS:**
  Please use the RoHS compliance overview templates (link sheet) to confirm compliance with the RoHS regulations for the components on part number level that you deliver to Tenneco.

  **REACH:** To confirm compliance with the REACH regulations please provide a copy of the REACH compliance certificate.
PPAP REQUIREMENTS:
11. INITIAL PROCESS STUDIES

In case of identified critical, significant or pass through dimensions, supplier must perform a process capability study. If there are no critical features called out on the print, Tenneco reserves the right to require initial process capability on other characteristics.

Elements to be checked:
1. Sampling: for variable data a minimum 125 (or as agreed with Tenneco) readings from consecutive parts of the significant production run is required for the study.
2. Sampling: for attribute data a minimum 300 (or as agreed with Tenneco) readings from consecutive parts of the significant production is required for the study.
3. Normality test must be performed and P-value must be greater than 0.05.
4. Raw data should be available for each study.
5. Acceptance criteria:
   • Index Cpk, Ppk > 1.67 -- process currently meets the acceptance criteria
   • 1.33 <= Index Cpk, Ppk <= 1.67 -- process is not acceptable for Critical Characteristics, for another characteristics acceptable
   • Index Cpk, Ppk < 1.33 -- process does not currently meet the acceptance criteria
6. If process acceptance criteria are not met for one or more characteristics containment (e.g. 100% inspection) and action plan is required.
7. Each cavity of a multiple cavity mold or multiple tool process, must have its own capability study.
8. All relevant documents should be uploaded into section 11 of TITAN PPAP C-folder.
PPAP REQUIREMENTS:
11. INITIAL PROCESS STUDIES

Process Capability Sixpack Report for F

Capability Analysis for F

Check | Status | Description
--- | --- | ---
Stability | ✓ | The process mean and variation are stable. No points are out of control.
Number of Subgroups | ✓ | You have 30 subgroups. For a capability analysis, this is usually enough to capture the different sources of process variation when collected over a long enough period of time.
Normality | ✓ | Your data passed the normality test. As long as you have enough data, the capability estimates should be reasonably accurate.
Amount of Data | ✓ | The total number of observations is less than 100. You may not have enough data to obtain reasonably precise capability estimates. The precision of the estimates decreases as the number of observations becomes smaller.
PPAP REQUIREMENTS: 
12. QUALIFIED LABORATORY DOCUMENTATION

• If testing is performed in a supplier's internal lab, they must provide a copy of their quality certification. The supplier should also provide documentation of the appropriate laboratory scope.

• If an external lab is used, the supplier should send a copy of the outside lab certification and the scope of accreditation (must be ISO 17025/A2LA certified or regional equivalent).

• All relevant documents should be submitted into section 12 of TITIAN PPAP C-folder.
13. APPEARANCE APPROVAL REPORT (AAR)

- Appearance Approval Report shall be completed for each part, if the product/part has appearance requirements on the design records. **If AAR is not required then upload sheet with statement indicating N/A (Not applicable)**

- AAR is typically applied for parts with color, grain or surface appearance requirements. (Typically, exhaust components require an AAR report for polish/chrome/painted decorative exhaust tips that is signed-off by the customer).

- Parts to be evaluated in standardized condition such as: light intensity, control distance, control time etc. These conditions should be agreed with Tenneco and included in the report.

- If the AAR is requested, the samples should be submitted independently on PPAP level submission.

- All known failures related to supplier’s technology should be evaluated together with the supplier and approved by Tenneco in writing.

- Even though the appearance samples are agreed on, the launch containment should be focused on appearance to identify and evaluate unknown failures. The failures catalog should be developed by the supplier and shared with Tenneco for review and approval.

- Tenneco approved ARR/failure catalog should be uploaded into section 13 of TITAN PPAP C-folder.
PPAP REQUIREMENTS:
14. SAMPLE PRODUCT PARTS (PPAP SAMPLES)

• The supplier shall provide, either, a minimum of 6 samples or 1 sample per cavity for multi-cavity processes unless otherwise directed by Tenneco in writing.

• These samples must be defined as PPAP samples on all shipping documents. The PPAP sample label must be placed on the container near the part number label. PPAP samples must arrive at the Tenneco facility on or before PPAP due date.

• PPAP sample label (can be found in Tenneco Supplier Manual, section 4.3.2.15):

Each sample part must have a tag with following information listed below:
1. The part is identified as a PPAP Sample Part
2. Tenneco part number, revision level and part name
3. Project name and Customer
4. Date when manufactured
5. Supplier Name/Location
6. Customer Responsible Person (name/phone/email)

Into section 14 of TITAN PPAP C-folder supplier should upload shipment tracking information such as UPS; DHL; FedEx; etc. tracking numbers.
PPAP REQUIREMENTS:  
15. MASTER SAMPLE

• Supplier should retain master sample from the PPAP run.

• The master sample shall be identified as such, and shall show the customer approval date on the sample (picture of master sample with identification tag should be provided in this folder).

• One (1) master sample per cavity for multi-cavity processes should be retained, unless otherwise directed by Tenneco.

Master sample part must have a tag with following information listed below:
1. The part is identified as a Master Sample
2. Tenneco part number, revision level and part name
3. Project name and Customer
4. Date when manufactured
5. Date of PPAP Warrant signed off

Into section 15 of TITAN PPAP C-folder supplier should upload picture of the Master Sample, including label.
**PPAP REQUIREMENTS: 16.CHECKING AIDS**

- This PPAP element is used in order to certify that all aspects of these **Part Specific checking** aids comply with product requirements/specifications for testing as stated by the drawing.

Elements to be checked/uploaded:

1. Procedure or description how the checking aid or control gage is used should be submitted here.
2. All used gauges should agree with part dimensional requirements.
3. Gage master samples are visually color-coded as PASS (Green) or FAIL (Red)
4. MSA should be conducted for all gauges used according to Control Plan
5. Gauge Print
6. Gauge Certification by approved lab
7. Picture of Part in Gauge

- *List of control gauges with supportive documentation (calibration record within past year, gage instructions and photos) should be uploaded into section 16 of TITAN PPAP C-folder - “Checking Aids”*
PPAP REQUIREMENTS:
16. CHECKING AIDS

Example of checking aid and gauge instruction:

1. **GAGE COMPONENTS**: Three Stab Pins with Lock Pins, Two Go/No-Go Feeler, One Go/No-Go Plug, One Check Block, One Scribe, and One Flat Feeler.

2. **Instructions**:
   a. Check the size of the sensor port hole in the PC73661 with the 29.0/29.5mm Go/No-Go Plug (Photograph A, Number 1)
   b. Mate the PC73650 to the PC73661, and locate the assembly to the fixture (Photograph B, Number 2)
PPAP REQUIREMENTS:
17. COMPLIANCE WITH CUSTOMER-SPECIFIC REQUIREMENTS

- This section is for uploading any customer specific requirements which are called out on the print (coming from Ford, GM, Harley, etc.) and/or Tenneco.

- If none are called out, upload a blank document saying “Not required/Not applicable”.

Not required/
Not applicable
Part Submission Warrant – is a document required for all newly tooled and/or revised product in which the supplier confirms that inspections and tests on production parts show conformance to Tenneco requirements. USE the AIAG Format, **unless otherwise specified by Tenneco**.

- A Part Submission Warrant MUST be properly and FULLY filled out - no blank spaces.
- If information is not required, then enter N/A.
- Weight recorded in kg and four decimal places.
- For “Customer Name/Division” state “TENNECO”. (Do not add the specific plant)
- Electronic signatures are acceptable.
- PSW should be uploaded into section 18 of TITAN PPAP C-folder.
- In the next slides you will find how to fill in the details.
PPAP REQUIREMENTS:
18. PART SUBMISSION WARRANT – FOR EUROPE & SPECIFIC CUSTOMER

| Specific Customer | John Deere |

<table>
<thead>
<tr>
<th>CATIA V5 R19</th>
<th>1:1</th>
<th>1/2</th>
<th>AC</th>
<th>TOLERANCING ISO 8015</th>
</tr>
</thead>
<tbody>
<tr>
<td>PELLNUT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>X07</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.4301 X5CrNi 18-10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ø84.4 x 2 x 83.03 mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.380</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HYDROFORMED PIPE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TUBE HYDROFORME</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Issued on: 27-NOV-2017
Revision Date
Revision level
Engineer change level

© 2019 Tenneco, Inc. | Data Classification: 7/21/2023
PPAP REQUIREMENTS: 18. PART SUBMISSION WARRANT – FOR NORTH AMERICA ONLY

Revision Date (Production Release)  
Revision Level for Engineering Change
REASON FOR SUBMISSION (Check at least one) Check the appropriate box or boxes. For bulk materials additionally check "Other" and write "bulk material"

- Initial Submission
- Engineering Change(s)
- Tooling: Transfer, Replacement, Refurbishment, or additional
- Correction of Discrepancy
- Tooling Inactive > than 1 year
- Change to Optional Construction or Material
- Supplier or Material Source Change
- Change in Part Processing
- Parts Produced at Additional Location
- Other - please specify below

REQUESTED SUBMISSION LEVEL (Check one) First identify and then check appropriate submission level requested by Tenneco

- Level 1 - Warrant only (and for designated appearance items, an Appearance Approval Report) submitted to customer.
- Level 2 - Warrant with product samples and limited supporting data submitted to customer.
- Level 3 - Warrant with product samples and complete supporting data submitted to customer.
- Level 4 - Warrant and other requirements as defined by customer.
- Level 5 - Warrant with product samples and complete supporting data reviewed at organization’s manufacturing location.

SUBMISSION RESULTS Check boxes for elements which are a part of PPAP submission

The results for
- dimensional measurements
- material and functional tests
- appearance criteria
- statistical process package

These results meet all drawing and specification requirements: 

X Yes

NO (If "NO" - Explanation Required) If you check "No" explanation are needed

Mold / Cavity / Production Process

If production will be done from more than one mold/cavity/production line such information should be entered here.
PPAP REQUIREMENTS:
18. PART SUBMISSION WARRANT

DECLARATION
I hereby affirm that the samples represented by this warrant are representative of our parts which were made by a process that meets all Production Part Approval Process Manual 4th Edition Requirements. I further affirm that these samples were produced at the production rate of __________ / __________ hours. I also certify that documented evidence of such compliance is on file and available for review. I have noted any deviations from this declaration below.

EXPLANATION / COMMENTS: Firstly enter number of pieces manufactured during significant production run. Secondly enter number of hours which were taken for significant production run. If declaration is not met, explanation is required in “Explanation/Comments” field.

Is each Customer Tool properly tagged and numbered? Yes ☐ No ☐ n/a ☐ Check proper answer based on actual situation

Organization Authorized Signature ___________________________ Supplier representative signature to confirm that all required documents are submitted and correct. Additionally: date of signing, print name, title, phone and fax number, email.

Print Name ___________________________ Phone No. ___________________________

Title ___________________________ Fax No. ___________________________

E-mail ___________________________

FOR CUSTOMER USE ONLY (IF APPLICABLE)

Part Warrant Disposition: ☐ Approved ☐ Rejected ☐ Other ☐

Customer Signature ___________________________ Date ___________________________

Print Name ___________________________ Customer Tracking Number (optional) ___________________________
## Tenneco Global PPAP Upload Guide and Verification Checklist

**PPAP REQUIREMENTS:**

**18.PART SUBMISSION WARRANT – EXAMPLE OF PPAP VERIFICATION CHECKLIST – DOWNLOAD FROM SUPPLIER INFORMATION PAGE OF TENNECO.COM**

January 1, 2019

https://www.tenneco.com/suppliers

<table>
<thead>
<tr>
<th>Item</th>
<th>PPAP Folder Content</th>
<th>Form/Format of Input</th>
<th>*Page No.</th>
<th>Action Required</th>
<th>** Ok?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A</td>
<td>Design Records of Saleable Product</td>
<td>Upload a copy of Ballooned Drawing of Record. Ensure that Drawing in correct revision level.</td>
<td>11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1B</td>
<td>For Proprietary Components/Details</td>
<td>Attach a page that reads: 1b for Proprietary Components/Details - Note # 3 &quot;N/A&quot;</td>
<td>11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1C</td>
<td>For All other Components/Details</td>
<td>Attach a page that reads: 1c for all other Components/Details - Note # 3 &quot;N/A&quot;</td>
<td>11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Engineering Change Documents</td>
<td>Attach a page that reads: 2 for Engineering Change Documents - Note # 3 &quot;N/A&quot;</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Customer Engineering Approval</td>
<td>Upload a copy of Control Plan approved by Engineering if required, as called out in print notes for Engineering Approval. If not required, attach a page that reads - Customer Engineering Approval - N/A&quot;</td>
<td>13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Design FMEA (DFMEA)</td>
<td>Upload Supplier DFMEA if supplier is Design Responsible. If supplier not design Responsible upload page DFMEA- &quot;N/A&quot;</td>
<td>14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Process Flow Diagrams (PFD)</td>
<td>Upload Process Flow Diagram. Must have same Operation Flow as PFMEA &amp; CP</td>
<td>15, 16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Process FMEA (PFMEA)</td>
<td>Upload Process FMEA. Must have same Operation Flow linked to PFD &amp; CP</td>
<td>17, 18</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

© 2019 Tenneco, Inc. | Data Classification: 7/21/2023
A1. Launch Containment Plan  
A2. Capacity Verification (as required)  
A3. APQP Tracker  
A4. IMDS Documentation  
A5. Packaging Plan Proposal  
A6. Vendor Tooling Registration Form  
A7. Manufacturing Review Form (nothing is required in this section)  
A8. Process Change Notice (used only for PPAP’d due to a Process Change)  
A9. Conflict of Minerals (if applicable)  
A10. Subcontractors/Suppliers PPAP  
A11. Other Specified Requirement (as required)  

Detailed information about each item can be found in [Tenneco Enterprise Supplier Manual](#) or by contacting respective plant representative or SDE.
A1.Launch Containment

Launch Containment is a mandatory process which ensures that Tenneco facility receives 100% defect free product. It begins when the supplier has been awarded the part and ships to the Tenneco facility (including sample parts shipped during pre-launch).

Elements to be checked:

1. Supplier needs to develop a Launch Containment Plan in AIAG Control Plan format (with field “Pre-launch” checked in the header)

2. Controls in Launch Containment phase should be at least doubled in comparison to serial production controls (preferable 100% control for defined characteristics)

Supplier will document and maintain containment results in alignment with the approved Control Plan in the form of an I-Chart. Upon request from Tenneco, the Supplier will need to provide the I-charts. Launch Containment Form (see chapter 4.2.3.1 of TSM).

Launch Containment will continue for a minimum of 90 days after initial shipment and no less than 10 shipments (low volume) after SOP (at discretion of Tenneco facility).

If a problem is identified by the Tenneco receiving plant, the containment process will restart and must remain in effect until corrective actions are implemented and verified.

In any case Launch Containment should be uploaded into section A1 of TITAN PPAP C- folder.
• A1. Launch Containment

The yellow Launch Containment label must be used to identify parts containers throughout launch phase.
A2. Capacity Verification

The Capacity Verification will verify that the results of the supplier’s actual manufacturing process meet the requirements for on-going quality and quoted tooling capacity. This process applies for existing tooled parts and new non-tooled parts. This evaluation is being performed during the first trial runs at supplier’s process.

Tenneco reserves the right to be present during these trial runs to witness and evaluate results. Expectation is that the supplier demonstrate available output per day > Req'd good parts to support next process (MCR).

Tenneco requires a working standard as follow:

- Daily capacity is based on 20 hours per day. A “week” is defined as 5 days: Monday morning through Friday night. All capacity increase requests will be quoted.
- LCR = Least Capacity Rate = Estimated Annual Volume divided by 240 days
- MCR = Maximum Capacity Rate = LCR x 120%, plus any additional capacity that may be required

The Capacity Verification Form can be found in PPAP request under Tenneco PPAP/APQP Document Templates. When Capacity Verification is performed by supplier as self assessment it should be uploaded into section A2 of TITAN PPAP C-folder.
A3.APQP Tracker

Suppliers are required to use the APQP Tracker Template to monitor the APQP steps. This template contains progress status of both the required documentation and APQP milestones.

*The APQP Tracker is included in the zip file with the PPAP request and in the Tenneco Supplier Requirements Manual.*

*Review the Guidelines on the APQP Tracker Form.*

APQP Tracker must be submitted on a regular basis (monthly in general and weekly in the month before PPAP is due). APQP Phase also needs to be completed in Titan between Kick off and PPAP, when phases get completed.

Suppliers must indicate truthfully the actual overall status of the product launch in each PPAP Response:

- **Overall status “GREEN”** means PPAP preparation is on time
- **“YELLOW”** status means there are delays in individual PPAP & APQP elements, but such delays are recoverable
- **“RED” status** indicates PPAP is not expected to be on time and delays are not recoverable

Whenever updated or modified APQP tracker should be uploaded into section A3 of TITAN PPAP C-folder.
A4.IMDS Documentation

IMDS (International Material Data System) ensures that all materials used for automobile manufacturing are collected, maintained, analyzed and archived.

Using the IMDS, it is possible to meet the obligations placed on automobile manufacturers, and thus on their suppliers, by national and international standards, laws and regulations.

The components data must be uploaded into IMDS database as early as possible but not later than PPAP due date to be sure the MDS (Material Data Sheet) report is available on time.

Elements to be checked:

1. The MDS report is uploaded into TITAN C-folder.
2. The MDS report is checked by Tenneco for correct part number.
3. The MDS is approved (MDS status “accepted”) by Tenneco Clean Air.
4. If the same MDS ID number is written on PSW.

MDS report should be uploaded into section A4 of TITAN PPAP C-folder.
A5. Packaging Plan Proposal

Appropriate packaging to protect and preserve the quality of the product is to be considered during feasibility evaluation.

Supplier must use appropriate packaging, to assure that all products will arrive at Tenneco plants free of any damage and it can be transported, stored and used efficiently.

The packaging system needs to be approved by the Materials Group of the Tenneco receiving facility, as specified in the packaging plan (coordinated by PPAP reviewer). The signed off form must be uploaded into the c-folder.

Labels should include the following information: part number, revision level, PO number, supplier and customer addresses, batch number, number of pieces, production date.

Packaging proposal must include a picture of the container showing how parts will be shipped during production. Further details can be found in section 7.0 of TSM.

All relevant documents should be uploaded into section A5 of TITIAN PPAP C-folder.
A5. Packaging Plan Proposal

Examples of Packaging Plan Proposal:
A5. Packaging Plan Proposal

Example of label below (VDA format):

<table>
<thead>
<tr>
<th>(1) Senderadresse / Recipient</th>
<th>(2) Abfalleiste - Lagerort - Verwendungsbezeichnung / Case</th>
</tr>
</thead>
<tbody>
<tr>
<td>my-Fenix-Software Phoenix-Straße 4711 12345 Musterdorf</td>
<td>Postfach 123456 Tel. 999999</td>
</tr>
<tr>
<td>(3) Lieferscheine-Nr / Article no. (N)</td>
<td>(4) Lieferantenname / Supplier name</td>
</tr>
<tr>
<td>2581752</td>
<td>my-VDA-Label, Musterplatz, 12345 Musterdorf</td>
</tr>
<tr>
<td>(5) Sach-Nr / Part no. (P)</td>
<td>(6) Gewicht netto / net weight</td>
</tr>
<tr>
<td>765-HGD89-123</td>
<td>370 KG</td>
</tr>
<tr>
<td>(7) 140</td>
<td>(8) Gewicht brutto / gross weight</td>
</tr>
<tr>
<td></td>
<td>400 KG</td>
</tr>
<tr>
<td>(9) Beschreibung / Lieferung / Leistung / Description</td>
<td>(10) Bezeichnung, Lieferung, Leistung / Description</td>
</tr>
<tr>
<td>Gebraucht</td>
<td>Gebraucht</td>
</tr>
<tr>
<td>(11) Lieferanten-Nr / Supplier no. (V)</td>
<td>(12) Lieferant / Supplier part no. (V01)</td>
</tr>
<tr>
<td>4638141</td>
<td>0-123810-0</td>
</tr>
<tr>
<td>(13) Verpackung / Package reference no. (B)</td>
<td>(14) Änderungsstand Konstruktion / E. change</td>
</tr>
<tr>
<td>6099012</td>
<td>A43-275 XL</td>
</tr>
<tr>
<td>(15) Packkstück-Nr / Serial no. (B)</td>
<td>(16) Chargen-Nr / Batch no. (H)</td>
</tr>
<tr>
<td>258175201</td>
<td>(17) my-VDA-Label, Musterplatz, 12345 Musterdorf</td>
</tr>
<tr>
<td></td>
<td>Warneanhang VDA 4962</td>
</tr>
</tbody>
</table>
PPAP REQUIREMENTS:
A1 THRU A11 TENNECO SPECIFIC REQUIREMENTS

A5. Packaging Plan Proposal FOR NA CA PLANTS NEW PROCESS AND FORM
A5. Packaging Plan Proposal FOR NA CA PLANTS – NEW PROCESS AND FORM

Packaging Plan Proposal and Critical Elements

1) Initial proposal form template will be provided to “select” suppliers before sourcing.

2) The newly formatted packaging proposal form includes two tabs for every part number supplied for a particular program and plant (Standard and Alternate).

3) For all part numbers awarded, all initial packaging proposal form line items must be filled out entirely for both all standard and alternative proposed packaging (i.e., returnable, expendable, Tenneco Owned Container or CHEP).

4) Tenneco preferred standard packaging configuration is always returnable (specifically hand-held totes) for all applicable part sizes. Hand Held Totes are specified in the Tenneco Returnable Container Catalog.

5) Parts exceeding 23” in length are considered bulk items which require an approved expendable container or Tenneco-owned bulk packaging (large collapsible container). Approved expendable containers are to be used as an alternative container only, not to be used unless approved by receiving Tenneco Plant.

6) A packaging proposal form for alternative packaging must also include standard cost for all approved alternative packaging proposals based on IMC Container costs.

a) All Packaging proposal forms must include estimate of pack density, including part protection.
   i) The number of parts per Packaging Unit
   ii) The Number of Handling Units per Layer
   iii) The Number of Packaging Units per Handling Unit

7) Tabs listing carryover parts MUST be shaded in BLACK regardless of prior packaging proposal requests.

8) Proposal forms must be completed prior to sourcing nomination. Where applicable, i.e., for overseas suppliers, complete one form for shipment from manufacture location to North American warehouse and a second form from your North American warehouse to Tenneco plant. Select “reply to all” to insure buyer, Plant Material Manager and Tenneco Packaging Engineer receive your completed forms; dates to be specified on initial request email for supplier packaging proposal form.

9) The naming convention in the subject heading in the initial packaging proposal form request cannot be changed by the supplier and must remain uniform throughout the process: [Supplier Name (Supplier Vendor Code)_Program Name_OEM Customer Name – Packaging Proposal Form for Tenneco Plant Name.xlsx]

10) Tenneco reserves the right to provide supplier counter proposal to initial packaging proposals from the supplier. This includes changes to pack specification to supplier proposed packaging or changes to supplier proposed container. Changes in cost per part must be submitted to Tenneco with 48hrs. In instances where Tenneco proposes changes to expendable packaging, the supplier has 72hrs to submit cost variances from original proposal. Packaging cost changes exceeding 2% must include detailed rationale for favorable or unfavorable cost changes.

11) PPAPs are not to be finalized until all standard packaging proposal forms and alternative packaging proposal forms are approved. Both standard and alternative packaging proposal forms must be approved by ALL plant MP&L using the parts.

12) Once Standard and Alternative Packaging Proposal form approved, the supplier may then upload into TITAN as part of PPAP package for all applicable parts. Note: The Supplier is responsible for confirming an approved packaging proposal form for all the parts awarded in the final RFQ.

13) In instances where the supplier fails to adhere to the packaging procedures listed above, any associated cost that directly or indirectly impacting Tenneco will be considered a supplier non-conformance resulting supplier responsibility and supplier cost.
A6. Vendor Tooling Registration Form

This form contains various information such as product, tooling parts identification, location, and percentage ownership.

Suppliers must furnish complete photographs, tooling drawings, including all details, inserts, consumables, etc., to Tenneco as part of the PPAP approval.

This form must be completed for all customer owned tooling and **MUST** include the Tooling ID Numbers. Tooling ID Numbers are supplied by the Tenneco Plant.

Further details can be found in chapter 5.3 of TSM.

If TITAN is available in your region, this form shall be attached to the A6 section of TITAN PPAP C-folder, if TITAN is not available, contact the Tenneco plant for instructions.
# PPAP REQUIREMENTS: A1 THRU A11 TENNECO SPECIFIC REQUIREMENTS

**A6. Vendor Tooling Registration Form**

Example of VTRF:

<table>
<thead>
<tr>
<th>Vendor Name</th>
<th>Project</th>
<th>Purchase Order Copy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Project</td>
<td></td>
</tr>
<tr>
<td></td>
<td>item: 2010</td>
<td></td>
</tr>
<tr>
<td>Vendor Address</td>
<td>Project</td>
<td></td>
</tr>
<tr>
<td>DBXXXX</td>
<td>Project</td>
<td></td>
</tr>
<tr>
<td>DBXXXX</td>
<td>Project</td>
<td></td>
</tr>
<tr>
<td>Project Info</td>
<td>Supplier</td>
<td></td>
</tr>
<tr>
<td>BMW N47</td>
<td>Supplier</td>
<td></td>
</tr>
<tr>
<td>Tenneco</td>
<td>Supplier</td>
<td></td>
</tr>
<tr>
<td>Purchase order number</td>
<td>Supplier</td>
<td></td>
</tr>
<tr>
<td>1460251769</td>
<td>Supplier</td>
<td></td>
</tr>
<tr>
<td>Tenneco product p/n</td>
<td>Supplier</td>
<td></td>
</tr>
<tr>
<td>267863</td>
<td>Supplier</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>Supplier</td>
<td></td>
</tr>
<tr>
<td>Front Bracket: 3 mm, 14512</td>
<td>Supplier</td>
<td></td>
</tr>
<tr>
<td>Tooling location</td>
<td>Supplier</td>
<td></td>
</tr>
<tr>
<td>Manufacturing plant of Balinga</td>
<td>Supplier</td>
<td></td>
</tr>
<tr>
<td>Tooling identification</td>
<td>Supplier</td>
<td></td>
</tr>
<tr>
<td>TEN 101777000</td>
<td>Supplier</td>
<td></td>
</tr>
</tbody>
</table>

## Project Info Details

- **3.** All filled are mandatory
- **4.** Tooling overall data (mm) Weight | Length | Height | Depth
- **5.** Type Press Brand | Capacity | 400T
- **6.** Type Press Brand | Capacity | 400T
- **7.** Description
- **8.** Tooling materials and tooling assemblies
- **9.** Can be more than one tool per operation step
PPAP REQUIREMENTS: A1 THRU A11 TENNECO SPECIFIC REQUIREMENTS

A7. Manufacturing Review Form (*obsolete*) N/A Form

A8. Process Change Notification
Supplier is requested to submit Tenneco Signed Process Change Notification when PPAP is due to a Process Change (section A8 of TITAN PPAP C-folder).

A9. Conflict of Minerals
This element is referring to Section 1502 of the Dodd-Frank Wall Street Reform and Consumer Protection Act. Questions regarding usage of conflict minerals (tantalum, tin, gold or tungsten) originating in the Democratic Republic of the Congo and certain adjoining countries. For a CMRT template or details regarding conflict materials, reference section 8 of the Supplier Requirements Manual for Tenneco. Upload a copy of your company's Conflict Mineral Statement or complete and upload the CMRT template, found at http://www.responsiblemineralsinitiative.org/conflict-minerals-reporting-template/

A10. Subcontractors/Suppliers PPAP Packages
Supplier has to uploaded PSW(s) (and other documentation, if requested by Tenneco) for each subcomponent of the final assembly (section A10 of TITAN PPAP C-folder)
PPAP REQUIREMENTS:
A1 THRU A11 TENNECO SPECIFIC REQUIREMENTS

A11.Other Specified Requirement
Supplier must provide bill of material of the part(s) delivered to Tenneco.

• If the supplier delivers an assembly to Tenneco, all parts included in the assembly must be part of the Bill of Material.
• Values for gross and net weight must be determined by weighing the components.

Bill of material must contain at least:

• Positions Number as per drawing;
• Part Description as per drawing;
• Tenneco Part Number(s) as per drawing;
• Material Grade as per drawing or Tenneco accepted equivalent;
• Gross Weight single components in kg and four decimal places;
• Net Weight single components in kg and four decimal places;

Note – Utilize the template in TITAN
If there are any other customer/region/plant specific requirements, they should be uploaded into this folder (e.g. CQI standards – section A11 of TITAN PPAP C-folder).
## Werkstoffstückliste / Bill of materials

<table>
<thead>
<tr>
<th>Stück</th>
<th>Artikel-Nr.</th>
<th>Beschreibung</th>
<th>Teilbezeichnung</th>
<th>Materialannahme (gem. Zeichnung)</th>
<th>Masse (kg)</th>
<th>Masse (l)</th>
<th>Gewicht (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>82599423</td>
<td>Shell Mixer Lower</td>
<td>DINEN 10080-2 1.45212B</td>
<td></td>
<td>0.0371</td>
<td>0.3175</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>82599422</td>
<td>Shell Mixer Upper</td>
<td>DINEN 10080-2 1.45212B</td>
<td></td>
<td>0.8452</td>
<td>0.3781</td>
<td></td>
</tr>
</tbody>
</table>

© 2019 Tenneco, Inc. | Data Classification: 7/21/2023
**PPAP REQUIREMENTS:**
**BOM EXAMPLE (BOTTOM HALF)**

---

**Bestätigung Lieferant / Confirmation by supplier**

<table>
<thead>
<tr>
<th>Name:</th>
<th>Tel / Phone:</th>
<th>Bemerkungen / Comments:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abteilung / Department:</td>
<td>Fax:</td>
<td></td>
</tr>
<tr>
<td>Datum / Date:</td>
<td>E-Mail / Email:</td>
<td>Freigabe / Approval:</td>
</tr>
</tbody>
</table>

**Legende/explanation:**

1. Die Positionsnr. muss dieselbe wie in der Zeichnung sein.
   - The position number must be the same as in the drawing.
2. Hier ist die Materialnummer des Zusammens der Einzelteile anzugeben. z.B. 82599421
   - Here you have to fill in the part number of the single components e.g. 82599421
3. Hier sind die Sachnummern der Einzelteile anzugeben. z.B. 82599423, 82599422
   - Here you have to fill in the part numbers of the single components e.g. 82599423, 82599422
   - Here you have to fill in the part description for the (sub) assembly as well for the single components acc. Drawing e.g. Shell Mixer Assy, Shell Mixer Upper, Shell Mixer Lower.
5. Hier ist die Materialbezeichnung einzugeben, die auf der Zeichnung angegeben ist z.B. DIN EN 10088-2 1.4521 2B
   - Here you have to fill in the material description acc. Drawing e.g. DIN EN 10088-2 1.4521 2B
6. Hier ist die Materialbezeichnung einzugeben, wenn ein von Tenneco freigegebener alternativer Werkstoff verwendet wird. z.B. (AISI) 444, (JIS) SUS 444
   - Here you have to fill in the material description if a Tenneco released alternative Material is used e.g. (AISI) 444, (JIS) SUS 444
7. Es darf nur der Werkstoff angegeben werden, der tatsächlich verwendet wird.
   - Only the material that is actually used may be specified.
8. Flüssigkeiten z.B. Klöben, Schweißen gem. Zeichnung
   - Jointing technology e.g. gluing, welding acc. Drawing
   - Here you have to fill in the gross weight in kg of the single components and the (sub)-assembly. The weight should be determined by weighing.
    - Here you have to fill in the net weight in kg of the single components and the (sub)-assembly. The weight should be determined by weighing.
If you still have any doubts or concerns, and need more information, please contact your respective Tenneco Plant PPAP coordinator or Program Buyer, in NA you may also contact your Supplier Development Specialist.
For NA Ford Programs

- PSW - Use the Ford phased PSW format current revision- correct template included in with TITAN PPAP request.

- The format will have areas to input - APW / MPW & APPC / MPPC - values that are carried over from the Ford Capacity Form. Reference page 62.

- Capacity Analysis – Use the Ford Capacity Form current revision must be used - correct template included in with TITAN PPAP request. The Run@Rate called out should be in sync with the APW / MPW & APPC / MPPC values and the cycle times that are reported on the capacity Ford capacity analysis. Reference page 63.

- Attribute studies for Ford product requires a 50 piece study with 3 Operators and 3 Trials.

For Europe if not defined, then the Tenneco Forms are used.
### CUSTOMER SPECIFICS REQUIREMENTS - CSR

**Ford Phased PSW Format**

with APWF/MPW & APPC/MPPC Values from Ford Capacity Analysis for NA Ford Programs (Next Page)

**INSTRUCTIONS:**

- All fields of this form are to be completed: either enter the appropriate value or enter N/A (“not applicable“)
- Pay attention to detail, all areas must be filled out and correct
- Complete the form by either typing (preferred) or clearly printing the required information.

**SPECIFIC POINTS TO NOTE WHEN COMPLETING THIS FORM**

NOTE: If you have questions - contact your Tenneco SDS or Program Buyer for Clarification

- This is a Phased PSW – Phases [ ] Phase 1 [ ] Phase 2 [ ] Phase 3 [ ] Interim (Non-PPAP)
  - Select the correct Phase at the top of the PSW Form
- Complete PSW per instructions above.
- Enter the APW / MPW & APPC / MPPV Values from Capacity Analysis in the appropriate location -Green Bordered areas shown to the left
CUSTOMER SPECIFICS REQUIREMENTS - CSR

Ford Capacity Template – Capacity Planning Page

Full format includes: Correct Revision Level is available in PPAP Request – Tenneco Template File.

- Introduction Page
- Capacity Planning Page
- Shared Loading Page (s)
- Phase 0 PPAP (Run @ Rate) Page
- Phase 3 PPAP (Cap Ver) Page

SPECIFIC POINTS TO NOTE WHEN COMPLETING THIS FORM

NOTE: If you have any questions - contact your Tenneco SDS or Program Buyer for Clarification.

Review Introduction Page prior to beginning, then complete the following in order.
1/ Complete Capacity Planning page first.
2/ Complete Historical Mfg Performance Page
3/ Complete 1 individual Shared Loading page for each operation identified on Capacity planning page.
4/ Complete Phase 0 or Phase 3 as required for Phase stage.

When completed with Capacity Analysis transfer the APW / MPW & APPC / MPPV Values to the Ford Phase PSW form.
Values found in Green bordered section of form at left.
For DAIMLER programs

- Self assessment sheets for product and process shall be submitted with PPAP
CUSTOMER SPECIFIC REQUIREMENTS - CSR

For Daimler Programs

- Test equipment list

<table>
<thead>
<tr>
<th>Prüfmaterialliste (produktbezogen)</th>
<th>Test equipment list (product specific)</th>
<th>Stand</th>
<th>Datum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lieferant / Produktionsstandort:</td>
<td>Supplier / Production site:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kundennummer / DUNS-Code:</td>
<td>Customer:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Id / DUNS-Code.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Berichts-Nr. / Report No.:</td>
<td>Index:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Benennung / Designation:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sachnummer / Part No.:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zeichnungsnr. / Drawing No.:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stand / Datum:</td>
<td>Status / Date:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ref. Nr.:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ref. No.:</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ref. Nr.:</th>
<th>Ref. No.:</th>
<th>Freigabe status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test equipment control no.</td>
<td></td>
<td>Approval status</td>
</tr>
</tbody>
</table>

© 2019 Tenneco, Inc. | Data Classification: 7/21/2023 68