

PPAP: Production release under the automotive industry's rejection and approval process

PPAP (Production Part Approval Process) is a standardised release process for volume production parts that originally comes from the automotive industry and is now applied in many sectors of the supply industry. The supplier uses it to demonstrate that they can manufacture a part reproducibly in series production in accordance with the agreed specifications. For buyers, PPAP is a central instrument for making production readiness demonstrably verifiable before the start of production and for reducing the risk of scrap, delays and complaints.

Key facts

- PPAP stands for Production Part Approval Process and is defined in the AIAG standard, but is used across industries.
- The process typically comprises 18 elements, including measurement reports, capability analyses, sample inspection reports and the Part Submission Warrant (PSW).
- There are five levels (1–5), which define the scope of the documents to be submitted to the customer to varying degrees.
- PPAP becomes necessary again for new parts, changes to design or process, and after supply interruptions of usually twelve months or more.
- The result is the customer's declaration of approval, usually with the status 'approved', 'interim approved' or 'rejected'.
- PPAP is closely linked with APQP, FMEA, SPC and MSA and forms the backbone of series production qualification.

Definition: PPAP

PPAP denotes the process by which a supplier demonstrates to the customer that they understand the requirements for a volume production part, have mastered the manufacturing process and can reliably reproduce the required quality. The term originates from the AIAG standard (Automotive Industry Action Group) and is part of the quality requirements of many OEMs.

Distinction from sample approval and first article inspection

The classic first article inspection (FAI) checks whether a first sample meets the specification. PPAP goes beyond this: it additionally documents process capability, control planning, the production process and ongoing control, so that series production is reproducibly secured. In practice, the PPAP scope is therefore often understood as 'first article inspection plus'.

Legal and contractual integration

PPAP requirements are typically agreed as binding via drawings, company standards and supplier

quality agreements. Buyers should anchor clear approval milestones in the supply contract so that an approved PPAP status exists before the start of series production. Whether an interim approval status is sufficient must be examined on a case-by-case basis in contract terms.

Procedure and elements of the PPAP process

The procedure follows a fixed scheme: the customer defines requirements and level, the supplier produces a significant production run (frequently 300 parts or an agreed quantity), documents the results and submits the PPAP package. The customer reviews the documents and grants approval.

The five levels

Level 1 comprises only the Part Submission Warrant, Level 3 – the most common in practice – the PSW plus complete measurement and process documentation. Levels 4 and 5 extend the scope with additional documents or assessments on site at the supplier. The customer defines the level depending on the risk assessment, new part status and criticality.

Key elements of the PPAP package

Among the most important of the 18 elements are design records, engineering change documents, the process flow diagram, the Process FMEA, the control plan, MSA studies for measurement systems, measurement reports (Dimensional Results), material and performance test reports, first article samples, the process capability studies (Cp/Cpk) and the PSW as the summary and signature document.

- Process FMEA: systematic risk analysis of the manufacturing process
- Control Plan: control of process and product characteristics
- MSA studies: evidence of the suitability of the measurement systems
- Process capability: typically Cpk $\geq$ 1.33 or Ppk $\geq$ 1.67 required for safety-relevant characteristics

Triggers for a renewed PPAP

A new PPAP is required for design changes, process or site relocations, changes to the suppliers' own suppliers, tooling changes or after a supply suspension of typically twelve months. After critical quality problems, too, the customer may require a renewed approval – this should be anchored in the supplier's corrective action pipeline from a quality perspective.

PPAP from the buyer's perspective: planning and requirements

For procurement, PPAP is not purely a quality matter: the timing of the approval determines the production launch, and the costs for samples, measurements and documentation are part of the supplier assessment. Those who communicate PPAP requirements early and unambiguously avoid follow-up requests for documents and time pressure during the launch.

Specify requirements clearly

The PPAP level, the deadline and the form of submission (paper, portal, filing structure) belong in the tender documents and in the sequence of enquiries. This reduces bidder queries and ensures comparable offers, since all providers cost in the same qualification effort. The cost arrangements for rejected submissions should also be clarified in advance.

Link deadlines to the launch plan

PPAP approval is a milestone in the launch schedule, typically before the final tooling approval and before the start of delivery schedule releases. Buyers should plan in buffers, as a rejected submission can trigger a correction loop of several weeks. In practice, a pilot project with the supplier before submission significantly increases the success rate.

Managing follow-up requests and deviations

For incomplete PPAP packages, a structured follow-up request for documents with a deadline is sensible instead of informal queries. Until approval, deviations may only run via a documented, temporarily approved procedure – this includes clear volume restrictions and identification of the deviating parts.

Key KPIs around PPAP

PPAP results can be measured and integrated into supplier management. Buyers and quality managers typically track on-time submission, the first-time approval rate and the subsequent field and volume production quality.

Submission and approval rates

Key figures such as 'PPAP submitted on time' or 'First Time Approval' show how reliably a supplier manages the series production qualification. Declining rates are an early indicator of process problems at the supplier and should be factored into the supplier assessment.

Link to volume production key figures

After approval, the value of PPAP is reflected in the complaint rate and in the supplier PPM target. A cleanly documented process with MSA and Control Plan frequently leads in practice to significantly lower early failure rates. Also relevant: the length of time in incoming goods inspection until reduction to trusted status after successful approval.

Risks and controls in the PPAP process

The biggest risk factor is formally approved but substantively weak PPAP: the documents are complete but do not reflect the real series production. Other typical problems are timing conflicts in the launch, pre-production with altered parameters and unclear responsibilities for changes.

Typical sources of error

Frequently, capability studies are produced on pre-series machines that run differently in series production, or measurement reports are submitted without functioning MSA. A lack of traceability of subcontractors – for example for heat treatment or surface finishing – is also a classic point of criticism. Tooling changes or changes of material source without a new approval violate the PPAP requirements.

Controls and effectiveness checks

Effective controls are: review of the documents by supplier quality on site (Level 5 or process audit), spot-check verification of the reported figures at incoming goods, and a clear rule on the control of nonconforming product for deviating parts. Following complaints after approval, the customer may, depending on the context, request renewed evidence or capability data.

Deviation and change management

Every change after PPAP approval – process, material, site, subcontractors – must be reported to the customer and, where necessary, newly approved. Without disciplined change management, the PPAP status quickly loses its validity; this should be contractually enshrined and set out in the quality requirements.

Current developments and industry outlook

PPAP remains the de facto standard of the automotive industry, but is increasingly spreading to mechanical engineering, medical technology and energy as customers adopt the advantages of the structured series production release. At the same time, handling is increasingly shifting to digital supplier portals.

Digital PPAP handling

Many OEMs and Tier 1s require submission via portals, which gives buyers and quality departments a central status overview. For smaller suppliers, this means additional effort; standardised filing structures and clear naming conventions reduce the rework. Digital processes also support a comprehensible PO cycle time and a rapid PO flip after approval, since volume orders can be linked to the PPAP status.

PPAP in the context of new supplier relationships

For supplier relocations, new factory sites or quality-critical second sources, the PPAP process is run through again. In the context of sustainable procurement, too – for example with requirements for a supplier ESG improvement plan – the documentation requirement is growing; PPAP and evidence obligations can be bundled in a single qualification process. For international suppliers and customs matters, aspects such as AEO status are additionally relevant.

Cross-industry adoption

In mechanical engineering and medical technology, PPAP elements are often adapted to the sector's own standards – for example Design History File or Process Validation in medical technology. The core remains the same: evidence of process control before the start of series production. Buyers who understand the PPAP logic can apply it across industries to new part qualifications.

Typical metrics

PPAP submitted on time: $\geq 95\%$

Proportion of packages submitted on time before the launch milestone

First Time Approval: $\geq 85\%$

Approvals without rework on the first submission attempt

Process capability Cpk: ≥ 1.33

Customary minimum value for certain characteristics; frequently Ppk ≥ 1.67 for safety-relevant features

Complaint rate after PPAP approval: well below 1%

Effectiveness indicator for the quality of the approval during the first months of series production

Practical example

A medium-sized mechanical engineering company qualified a new supplier for a high-precision

aluminium die-cast part. During the first launch, a delay threatened because the supplier only produced capability studies late. Procurement responded with four targeted measures:

- PPAP Level 3 with a fixed deadline was already included in the invitation to tender, so that all bidders could cost in the effort
- A pilot project with the supplier including a pre-review of the FMEA and the Control Plan four weeks before submission
- Structured follow-up requests for documents with a deadline at the first submission instead of informal emails
- Linking the PO flip for volume orders to the status 'approved', so that no unsecured series deliveries started

Conclusion

PPAP is more than a documentation exercise: it is the evidence that a manufacturing process is under control and reproducible before volume production is released. For buyers, early integration into the tender, launch plan and supplier assessment pays off because it reduces follow-up requests, launch delays and complaints. The effort should be steered on a risk-based basis via the PPAP levels. Discipline in change management and honest data rather than formally ticked checklists are important. Those who apply PPAP consistently measurably reduce complaint rates and PPM figures in practice and strengthen the reliability of the supply chain.

Frequently asked questions

What does PPAP mean?

PPAP stands for Production Part Approval Process, the standardised release process for volume production parts originating in the automotive industry. The supplier uses it to demonstrate that they can manufacture the part in series production in conformity with the specification and in a reproducible manner. The result is a documented approval status at the customer.

What is the difference between PPAP and the first article inspection report (FAI)?

The EMPB (first article inspection report) only checks the conformity of the first samples against the drawing. PPAP additionally includes the Process FMEA, Control Plan, MSA, process capability and the PSW as the overall evidence. PPAP therefore secures production readiness of the process, not just of a single sample.

When is a PPAP required?

Typically for new parts, design or process changes, changes of site or tooling, changes of subcontractors, and after a supply interruption of usually twelve months or more. The customer may also require a renewed approval after serious quality problems. The exact triggers are usually defined in the quality agreement.

Which PPAP levels are there?

There are five levels: Level 1 comprises only the PSW, Level 3 – the most common in practice – the PSW plus complete measurement, process and control plan documentation. Levels 4 and 5 extend the scope with additional documents or assessments at the supplier. The customer defines the level on a risk-based basis.

How long does a PPAP process take?

The duration depends on complexity, pre-series quantities and correction loops; in practice, several weeks to months should be allowed from sample production to approval. A rejected submission typically extends the process by several weeks. Buffers in the launch schedule are therefore important.

What happens if a PPAP is rejected?

The supplier receives a documented justification and must derive corrective actions, then resubmit. Until approval, deviations are only permitted via a temporarily approved process with volume restrictions. Volume orders should only be released after full approval or a clearly regulated exceptional delivery.