Initial Sampling (EMPB): The Gateway to Series Production Start

Initial sampling, frequently referred to internationally as EMPB (Enhanced Modified Product Benchmark), first article sampling or First Article Inspection, is the first production and documented inspection of a component or assembly before the start of series production. It demonstrates that the supplier can manufacture the component reproducibly in accordance with the drawing, functional specification and agreed inspection plans. For technical buyers, it is a central milestone in supplier development and in the approval process prior to the start of series production (SOP). In practice, no series order should be released without successful

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initial sampling.

Key facts at a glance

01 Initial sampling provides the first documented evidence of a sample's conformity with all technical approval documentation.

02 Typically based on an inspection plan with 100 per cent measurement of relevant characteristics and complete documentation.

03 Many industries follow structured sample inspection procedures such as PPAP (automotive) or FAI (aerospace).

04 Approval is often multi-stage: preliminary samples (A-sample), B-sample and final series approval (C-sample).

05 A rejected initial sample typically blocks order release and delays the start of series production.

06 The results feed into supplier evaluation criteria and supplier performance evaluation.

Definition: Initial Sampling (EMPB)

Initial sampling is the procedure in which a supplier produces a first sample of a new or modified component and submits it together with comprehensive inspection documentation. The customer

checks whether the sample meets all technical specifications and whether the manufacturing process can achieve this reproducibly.

Distinction from other sample types

Initial sampling differs from sampling in ongoing operations: it takes place before the start of series production and tests the process, not just the individual part. Following this, change samples apply to modifications, and part samples or reference samples apply to ongoing production. First Article Inspection (FAI) and PPAP levels also describe related but not identical concepts – PPAP additionally includes process capability evidence and control plans.

Legal and contractual anchoring

In practice, initial sampling is contractually agreed as mandatory via the framework agreement or drawing specifications, including sample quantities, deadlines, inspection documentation and consequences in the event of non-approval. Binding deadline commitments with penalty clauses or a contractually regulated obligation to accept pre-series lots are common instruments. Tax and liability aspects should always be examined on a case-by-case basis.

Procedure and methods of initial sampling

A structured process reduces rework loops and shortens the path to the start of series production. A multi-stage process with clearly defined milestones and documented approval decisions has proven effective.

Sample stages and approval stages

A three-stage approach is common: the A-sample serves as a feasibility check with prototype character, the B-sample already comes from production-near tools and processes, and the C-sample comes from the final series process. Each stage has defined inspection scopes – from functional samples through parts with original tooling to parts under series conditions. Only after approval of the C-sample is order release for series lots typically granted.

Inspection planning and documentation

The basis is a joint inspection plan that defines all relevant characteristics with inspection methods, frequency and tolerances. The supplier typically provides measurement reports, material certificates, process capability indices, heat treatment and surface documentation as well as material data for the master data process. The depth of documentation depends on the risk profile of the component and should be bindingly agreed in the drawing or functional specification.

Roles in the sampling process

Purchasing coordinates deadlines and contractual matters, engineering evaluates drawing conformity and function, quality inspects measurement results and process capability, and logistics assesses packaging and quantities. Early alignment of supplier segmentation – risk-intensive components

receive more intensive support than C-parts – keeps the effort manageable. In complex developments, supplier co-innovation supports initial sampling through early coordination of drawing and process.

Key KPIs and metrics for initial sampling

Measurable KPIs make the sampling process manageable and later feed into regular supplier performance evaluation.

Deadline and process metrics

Key metrics are the deadline adherence rate of sample submission, the time to first approval and the proportion of samples approved on the first attempt. These KPIs can be captured via deadline monitoring in the sampling calendar. They provide early warning of whether the start of series production (SOP) is at risk and create a data basis for supplier evaluation criteria.

Quality-related metrics

Relevant are process capability values such as Cpk for critical characteristics, the number of documented deviations per sample and the proportion of reworked samples. Rework costs and internal failure costs from problems detected late should also be included. These values frequently feed into pricing and negotiation decisions, as stable sampling avoids rework in series production.

Risks and controls in initial sampling

Initial sampling involves typical pitfalls: late samples, incomplete documentation, changed drawing statuses and seemingly approval-ready processes. Targeted controls and clean coupling to the series start, close to order-to-cash, mitigate these risks.

Typical sources of error

Samples are often not produced under series conditions – incorrect tooling, deviating material lots or missing process control. Unclear drawing statuses, inadequate measuring equipment capability or incomplete inspection documentation also lead to rework. Anyone transferring samples into pre-series lots without documented approval risks series problems and subsequent liability issues.

Control mechanisms

Defined approval protocols with signatures from engineering and quality, a sample file with complete traceability and a four-eyes principle at acceptance have proven effective. For critical parts, a supplier credit check or an assessment of financial stability supplements the technical evaluation, as a failure before the start of series production jeopardises the SOP. Supplier de-risking here means qualifying second sources in parallel.

Integration into procurement processes

Initial sampling should be consistently interlinked with the master data process and parameter

maintenance (MRP): only after sample approval are material master records activated for series production, along with ordering policy and procurement parameters. Export handling and compliance documents (e.g. for dangerous goods under ADR or packaging regulations such as the PPWR declaration of conformity) belong in the sample documentation for affected parts. This creates a seamless transition from sampling to series orders.

Current developments and digitalisation of initial sampling

Digitalisation, geometrically defined product models and growing sustainability requirements are significantly changing the sampling process.

Digital sampling platforms

Many companies are moving sampling documentation into digital systems: inspection plans, measurement reports and approvals are managed centrally, and deadline monitoring is automated. This reduces media discontinuities and accelerates content enrichment of material master data, as verified technical characteristics can be transferred directly into the master data process. A prerequisite is clear material classification so that sampling obligations can be systematically derived per material class.

Sustainability and compliance in the sample

Sustainability and regulatory requirements are increasingly finding their way into initial sampling: evidence of packaging recyclability (PPWR declaration of conformity), substance declarations, origin certificates and CO2 relevance are requested together with sample submission. The sampling process thus also becomes an instrument of evidence for supplier segmentation according to sustainability criteria. Compliance information should be firmly anchored contractually and documented upon approval.

Contract manufacturing and new supply chains

In contract manufacturing and new supply chains – for example from regions with longer lead times – initial sampling is gaining importance as evidence of quality and delivery reliability prior to supplier commitment. Combined with network analysis and systematic supplier segmentation, it helps to make risks in critical supply tiers visible at an early stage. Ordering policies and acceptance obligations for pre-series lots are also increasingly linked to the outcome of initial sampling.

Typical metrics

Metric	Typical value
Sample submission deadline adherence rate	> 95 % *Proportion of samples submitted on time; a leading indicator of SOP security.*

First-time approval rate	> 90 % *Proportion of samples approved without rework on the first attempt.*
Process capability (Cpk) of critical characteristics	>= 1.67 *Common guideline value for safety- or function-critical characteristics; >= 1.33 for standard characteristics.*
Initial sampling lead time	4–12 weeks *Depending on complexity and tooling requirements; simple parts at the lower end, assemblies at the upper end.*

Practical example

A medium-sized mechanical engineering company commissions a new supplier to manufacture a load-bearing aluminium housing component. To date, a bearing specialist competitor has supplied this item; the switch results from a supplier performance evaluation with repeated quality problems. For the start of series production in nine months, the parties agree on a three-stage sampling plan with defined inspection documentation and a penalty clause in the event of late sample submission.

- Joint inspection plan with 18 critical characteristics, four of which require a process capability of Cpk >= 1.67.
- A-sample after eight weeks for functional verification; drawing change (cooling fins) is documented and incorporated in the B-sample.
- B-sample from production-near tools including measurement reports, material and heat treatment certificates; quality releases with a residual condition.
- C-sample under series conditions; after approval, the material master and parameter maintenance (MRP) are activated for series production and release for series orders is granted.

Conclusion

Initial sampling is more than a quality ritual: it is the central gate between development, procurement and series production. Those who structure the process in a structured, multi-stage and fully documented manner avoid expensive series errors and anchor the results sustainably in supplier evaluation criteria and master data. Risks can be managed through clear approval stages, deadline monitoring and targeted supplier de-risking. Digitalisation shortens lead times and improves traceability. For buyers, investing in a clean sampling process is particularly worthwhile for critical components and new suppliers – this is where it is decided whether the start of series production (SOP) succeeds on schedule.

Frequently asked questions

? What does initial sampling (EMPB) mean in procurement?

Initial sampling (EMPB) is the first prototype production and inspection of a component before the start of series production, including complete inspection documentation. It demonstrates that the supplier meets the specifications and masters the process in a reproducible manner. Only after successful approval is release for series orders typically granted.

? What is the difference between EMPB, PPAP and FAI?

FAI (First Article Inspection) describes the complete inspection of a first part against the drawing. PPAP is the structured automotive process with process capability evidence and approval levels. EMPB is an umbrella term for initial sampling procedures; in each individual case, the customer contractually specifies the procedure and level required.

? Who is responsible for initial sampling?

The supplier produces and documents the sample; the customer inspects and approves it. In practice, purchasing (coordination, contracts), engineering (technical evaluation), quality (measurement and inspection reports) and logistics (packaging, quantities) share the responsibility jointly. Clear definitions of roles and deadlines in the sampling plan are crucial.

? How long does initial sampling typically take?

The duration depends heavily on complexity, tooling and industry. Simple parts typically require a few weeks, while complex components with new tooling and multiple sampling stages often take three to nine months or more. The date should be planned backwards from the start of series production (SOP) in the project plan.

? What happens if initial sampling is rejected?

Following a rejection, the supplier typically creates a deviation and rework plan and submits a new sample. Release for series production remains blocked, which can jeopardise the start of series production. In practice, deadlines, cost coverage and, in critical cases, the parallel sampling of a second source are contractually regulated.

? Does initial sampling have to be repeated for every drawing change?

Not for every change – what matters is the impact on function, process and inspection. Significant changes to characteristics, tooling, material or process generally require renewed sampling or partial sampling. The scope should be clearly defined and documented in the change management process.

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