

Traceability: systematically building traceability in supply chains

Traceability refers to the seamless traceability of products, components and materials along the entire supply chain. For technical buyers it is a central instrument for quality assurance, risk minimisation and meeting regulatory requirements. In practice, traceability extends from the batch of a raw material to the installed component in the end product. Those who build it up in a structured way can respond faster in the event of a defect and limit costly recall campaigns.

Key facts

- Traceability describes the verifiable linkage of material, process and product across all stages of the supply chain.
- Typical carriers of traceability are batch numbers, serial numbers, material documents and work order references.
- Industries such as automotive, medical technology, aerospace and food prescribe traceability through regulation or customer requirements.
- A complete system comprises defined traceability levels (e.g. batch, individual item, process step) and clear responsibilities in procurement.
- Digital methods such as barcode, RFID or data matrix codes are increasingly replacing paper-based accompanying documents.
- Traceability is an important building block of supply chain resilience management and supplier evaluation.

Definition: traceability

Traceability is the ability to clearly demonstrate the origin, application and whereabouts of an object – such as a material, component or batch – across all process stages. It runs in two directions: forward (tracking, from the supplier to the end customer) and backward (tracing, from the end product to the cause).

Distinction from tracking and tracing

Tracking refers to the forward capture along the material flow, tracing the backward reconstruction of an actual state. In professional practice, the English umbrella term traceability is often used for both. It is important for buyers that contractual partners contractually assure both directions – for example via supply requirements or a supplier quality agreement with documented information deadlines.

Traceability level and depth

The effort depends heavily on the required level: batch traceability is often sufficient for standard components, while safety-critical parts require item-level traceability (serial numbers, material test certificates). Traceability depth determines how many supplier tiers (sub-tier) must be evidenced. These requirements belong early in the specification and the source-to-contract (S2C) process.

Methods and approach in procurement

Traceability is not achieved 'on the side' but follows a structured build-up: define the requirement, anchor it contractually with the supplier, implement it technically and check it continuously. Procurement takes responsibility for the requirements and contract level, while quality and logistics handle operational implementation.

Requirements in drawing and specification

Traceability begins in the requirement specification: suppliers must know which level (batch, individual item), which documents (e.g. material certificate to EN 10204, declarations of conformity) and which marking (data matrix, laser engraving, label) apply. For new parts, this is part of the PPAP coordination scope in the automotive and supply industry. Without unambiguous specification, additional costs quickly arise in practice through retrospective re-marking.

Contractual anchoring

Supply contracts and framework agreements should govern information and documentation obligations, retention periods for records (frequently 5–15 years depending on the industry) and consequences in the event of breach. A risk mitigation plan for critical parts defines which alternative sources apply if a batch is blocked. A right to audit secures the right to inspect the supplier's production and document management systems.

Technical implementation and data flows

In practice, barcode and DataMatrix marking with scan events at goods receipt, production and dispatch has proven effective; RFID is used at high throughput rates or for reusable items. What is decisive is the seamless linkage in one's own ERP/WMS with order and lot numbers – including an obligation to confirm orders, so that lot and batch information is already reliably documented in the ordering process.

Key traceability KPIs

Traceability can be measured. Common KPIs check how quickly and completely an affected stock can be identified and quarantined – and how reliably suppliers document.

Traceability completion rate

This KPI indicates what proportion of incoming and outgoing line items is fully recorded with batch or serial reference. In practice, values above 98% are considered a good level; below that, the risk of having to block excessive quantities in the event of damage increases.

Recall time and blocking rate

'Time-to-trace' measures how long elapses from the alert to complete stock identification – good systems typically achieve less than 24 to 48 hours. The blocking rate shows how much material must be blocked beyond the actually affected quantity due to insufficient assignment; high values indicate data gaps.

Documentation rate at the supplier

In addition, many buyers assess in supplier evaluation how often supplier documents (e.g. supplier certificate, inspection certificates) arrive complete and correct. Missing documents at goods receipt should be systematically recorded and made visible in the rating.

Risks and controls

Missing or incomplete traceability costs time, money and reputation in an emergency. The typical weak points lie less in the technology than in interfaces, behavioural discipline and sub-tier transparency.

Chain breakage in contract manufacturing and sub-tier

With contract manufacturing or multiple processing steps, traceability is often lost at stage changes – for example, when the upstream supplier is not visible in one's own data landscape. Countermeasure: pass traceability requirements contractually to every tier and reduce the number of critical, hard-to-audit sources through supplier consolidation.

Criminal or unintentional mix-ups

Risks range from mixed-up batches to forged material certificates to undeclared material substitutions. Controls include sample-based certificate checks, material analyses for critical parts, cycle counting of documented stock, and coordinated goods receipt inspections. Anomalies belong in a structured 8D report with effective preventive measures.

Regulatory and contractual consequences

In regulated industries, inadequate traceability can affect market approvals, certifications or liability positions – have the legal assessment reviewed by experts on a case-by-case basis. Contractually helpful are penalty clauses and service credits (SLA) for late or incomplete information, supplemented by documented escalation paths and roles in procurement (RACI).

Current developments

Traceability is evolving from isolated silos to a networked, digital data chain. Drivers are tightening regulation, product responsibility and the pressure for more resilient supply chains.

Digital product passport and evidence obligations

European regulations are gradually increasing documentation obligations for products and materials, including the concept of a digital product passport. Buyers should clarify data requirements early with strategic partners and check which information is already covered today by supplier certificates and works certificates. Concrete obligations in individual cases must always be checked against the applicable legal situation.

Resilience and supply chain transparency

In the context of supply chain resilience management and supply chain due diligence, visibility across sub-tier suppliers is becoming a standard topic. Traceability data feeds into stock analysis and inventory management: those who know which batches are in stock can plan more precisely and use sound foundations for onshoring or requalification decisions.

Automation and AI

Automatic data capture (scanning, RFID, machine data) significantly reduces recording errors. In addition, analytics and AI tools support pattern recognition, for example with frequent batch conflicts or conspicuous delivery note/document discrepancies. Data quality at the source remains crucial – automated noise is no substitute for defining mandatory fields in the ordering process.

Typical metrics

Traceability Completion Rate: > 98%

Proportion of line items fully recorded with batch/serial reference

Time-to-Trace: < 24–48 h

Time from alert to complete stock identification

Supplier Documentation Rate: > 99%

Proportion of evidence correctly and completely provided at goods receipt

Blocking Rate upon Incident: as low as possible, < 2× affected quantity

High values indicate data gaps in traceability

Practical example

A medium-sized mechanical engineering company supplies special machinery to the food industry. After a component material was suspected at one customer, complete stock identification took several days, as batch numbers were only partially recorded on the delivery notes. As a result, the procurement department established traceability as a mandatory feature.

- The traceability level (batch level for standard parts, item level for safety-critical components) is stored in the drawing and specification system.
- Supply contracts include documentation obligations, retention periods and a right to audit; breaches trigger defined service credits (SLA).
- Goods receipt systematically checks batch and serial information; missing evidence blocks posting until the supplier certificate is available.
- A risk mitigation plan defines alternative sources and blocking processes for A-parts; the traceability completion rate is reported monthly.

Conclusion

Traceability is not purely a quality topic but a procurement strategy one: it protects against costly recalls, shortens response times in the event of damage and strengthens your position towards customers and authorities. What matters are clear requirements in specification and contract, technical implementation without data gaps, and continuous control through measurable KPIs. Buyers should enforce requirements across tiers and integrate them into supplier evaluation and resilience strategy. Those who build robust traceability today also meet growing regulatory evidence obligations. The investment typically pays for itself upon the first major avoided loss.

Frequently asked questions

What does traceability mean in simple terms?

Traceability means that every product or component can be traced back to its origin via batch or serial numbers. This makes it possible to determine precisely which stock is affected in the event of a defect. It covers both backward tracing and forward tracking.

When is traceability required by law or by the customer?

In industries such as automotive, medical technology, aerospace, and food and feed, traceability is required in full or in part. In addition, many OEMs demand traceability from their suppliers contractually.

The specific obligations depend on the product, market and standard and should be legally reviewed on a case-by-case basis.

What is the difference between batch and serial traceability?

With batch traceability, a quantity manufactured together is treated as a single unit – this is more cost-effective but less precise. Serial traceability identifies each individual item separately and is common for safety-critical products with long service lives. The required level is determined by risk, customer requirements and regulation.

How can procurement enforce traceability with the supplier?

The key levers are unambiguous requirements in the specification and drawing, contractual documentation and information obligations with deadlines, and a right to audit. Compliance can be managed via incoming goods inspections, sampling and supplier evaluation. In the event of breaches, penalty clauses or service credits (SLA) act as sanctioning instruments.

Which technologies are used for traceability?

Common solutions include barcodes and DataMatrix codes, RFID labels, laser engraving, and connected ERP, WMS and MES systems. What matters is less the technology than seamless capture at every transfer point. Digital accompanying documents such as supplier certificates and inspection certificates are increasingly replacing paper records.

What does establishing traceability typically cost?

The costs depend heavily on the level and stock depth: batch labelling via barcode can usually be implemented in practice at moderate effort, while serial traceability with metrology and system integration requires significantly higher investment. In addition, ongoing effort is incurred for maintenance, inspection and record retention. A target cost calculation per component group helps with prioritisation.