

Automating quality inspection: Where to start and what to expect

A practical guide for manufacturers considering machine vision: What can it realistically do, what it costs you not to act, and how to get it right without overcomplicating it.



Let's be direct: manual quality inspection is a challenge. Customers expect zero defects. Regulators expect documented evidence. And the volume and variety of products running through most production lines has increased to the point where consistent human inspection is genuinely difficult to sustain.

Machine vision is the practical answer for most manufacturers. But the technology has a reputation — sometimes deserved — for being complex to deploy, expensive to maintain, and frustrating when it doesn't perform as promised. This guide is an honest look at what automated inspection can and can't do, what questions you need to answer before you commit, and what a realistic deployment actually looks like.

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1. Is automated inspection right for you right now?

Before anything else, it is worth being honest about whether the timing and the application actually make sense. Machine vision delivers strong results in the right conditions. In the wrong ones, it creates frustration and a project that gets quietly shelved.

Signs the timing is right:

- You have recurring defects reaching customers that your current inspection process is missing, and you can describe what those defects look like.
- Your manual inspection creates a bottleneck on an otherwise efficient line, or requires more headcount than you can reliably staff.
- You are under pressure from customers or regulators to provide inspection records, traceability data, or statistical evidence of quality performance.
- Your scrap and rework costs are measurable and significant, enough that an investment in automated inspection has a credible payback period.
- Your products are consistent enough that a camera can be taught what 'good' looks like, even if there is some acceptable variation.

When it may be too early:

- Defect rates are very low and customer complaints are rare, the economics may not yet justify the investment.
- Products change so frequently and unpredictably that no stable reference for 'good' can be established.
- The defects you are trying to catch are genuinely random in appearance, size, and location, and you have no examples to train from.



2. What does it actually cost you not to inspect?

One of the most useful exercises before evaluating any inspection system is putting a number on the status quo. Most manufacturers underestimate what poor or incomplete inspection actually costs, because the costs are spread across different budget lines and not always directly attributed to quality.

Work through these categories with your own numbers:

- **Warranty claims and returns:** What is your average cost per returned product, including logistics, rework, and the cost of the customer relationship? Multiply by annual return volume.
- **Scrap and rework:** What percentage of your production is rejected internally or reworked before shipment? What does that cost per year in materials and labour?
- **Manual inspection labour:** How many hours per shift are spent on manual visual checks? At what fully loaded labour cost? Over how many shifts per year?
- **Line stoppages:** How often does a quality escape cause a downstream stoppage, a customer line stoppage, or an emergency sorting exercise?
- **Compliance and audit risk:** If your process is audited and you cannot produce inspection records, what is the consequence? Financial penalty, loss of certification, loss of a customer contract?

For most manufacturers who run through this exercise honestly, the business case for automated inspection becomes clearer than expected. The investment in a vision system is typically recovered within one to three years. Sometimes faster if a single avoided recall is factored in.

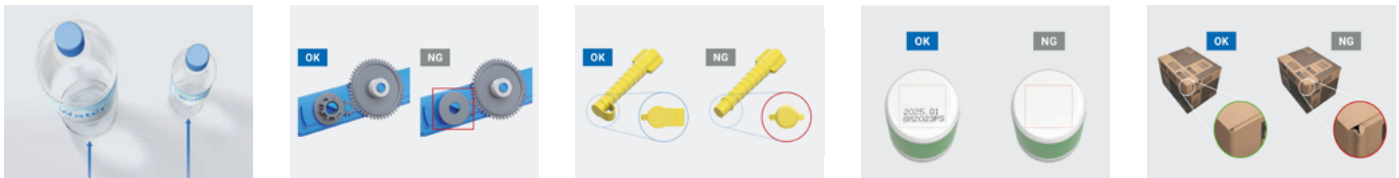


3. What can machine vision actually detect?

It is worth being specific here, because machine vision is often described in ways that either oversell or undersell its capabilities.

What it handles reliably:

- Presence or absence of components: a cap, a label, a fastener, a seal
- Surface defects, such as scratches, dents, contamination, tears, discolouration, when the defect is visually distinguishable from the background
- Dimensional and positional verification. Is this component within the correct position and orientation tolerance?
- Label, barcode, and date code reading and verification, including print quality grading
- Colour confirmation. Is this the correct product variant for this packaging?
- Fill level inspection. Is the container filled within acceptable limits?



Where it needs careful setup or AI assistance:

- Highly reflective or transparent surfaces. Standard lighting often creates glare that masks defects; specialist lighting geometries or AI-based image processing can help
- Defects with no consistent shape or size. AI-based detection trained on real defect examples handles these far better than traditional rule-based approaches
- High product variety on a single line. Modern systems with autofocus and programmable multi-colour lighting handle this through parameter switching rather than hardware changes

The introduction of AI-based inspection – as found in systems like the OMRON FHV7-AI – has significantly expanded what machine vision can reliably detect, particularly for surface defect applications where the defect appearance is inconsistent. AI learns from real product images rather than requiring precise rules to be manually programmed.



4. What does a real deployment look like?

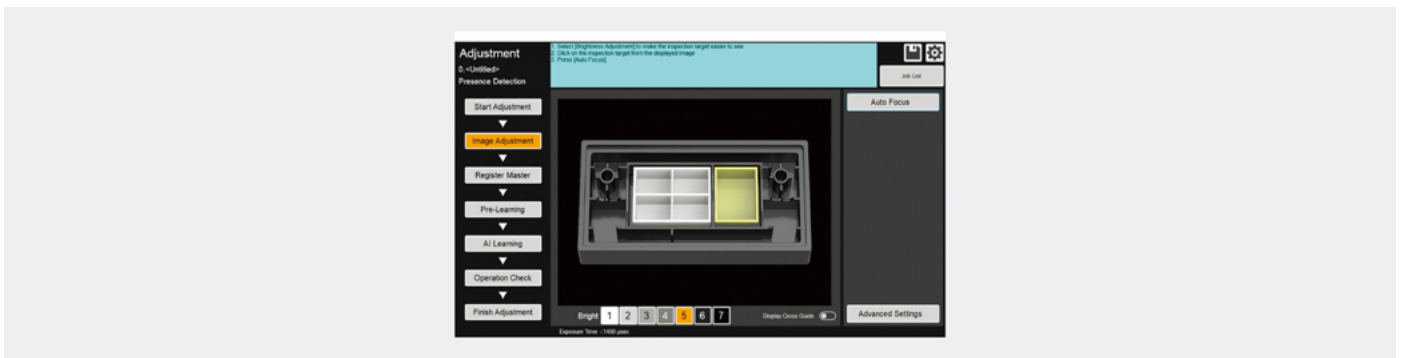
Here is a realistic picture of what to expect.

Before installation:

- You will need to provide sample parts — both good and defective — for a feasibility test. This is non-negotiable.
- The inspection point on the machine needs to be defined: where will the camera be positioned, what is the working distance, how is the product presented?
- Your PLC or line controller communication protocol needs to be confirmed so that pass/fail signals and data outputs are mapped correctly before installation day.

Setup and commissioning:

Traditional vision systems required vision specialists, days of parameter tuning, and a tolerance for early-phase instability. That picture has changed significantly with modern smart cameras. The OMRON FHV7-AI, for example, uses a guided step-by-step interface where an operator teaches the system what a good part looks like, what acceptable variation looks like, and initiates AI learning from a small set of images. Setup time for standard applications is measured in hours, not weeks.



That said, the first few days of production running are important. Run the system alongside your existing inspection process initially. Do not replace manual inspection immediately. This lets you validate that the system is catching what it should catch, and not rejecting parts it should accept, before you rely on it fully.

Day-to-day operation:

- Modern smart cameras are designed for operator use, not specialist use. Your existing line operators can monitor results, respond to alerts, and perform basic adjustments.
- Product changeovers are handled through parameter switching, selecting a saved recipe for each product variant, rather than physical reconfiguration.
- When something looks wrong, an increase in rejections, unusual alerts, the system provides image logs of what it saw, so the cause can be investigated quickly.

A word on false rejects:

False rejects, good parts being flagged as defective, are one of the most common causes of frustration in the early stages of a vision deployment. They are almost always caused by one of three things: inconsistent product presentation, lighting variation, or an inspection threshold set too tightly during setup. All three are solvable, and an experienced supplier will help you tune the system during the commissioning period. The key message: expect some false rejects early, and treat them as calibration data, not system failure.

5. Standards and regulations

This is an area where getting clarity early saves significant rework later. Depending on your industry and your customers, your inspection process may need to meet specific documented requirements, and the vision system you choose needs to support them.

- **ISO 9001:** If you operate under ISO 9001, your inspection process is part of your quality management system. Inspection results need to be recorded, traceable, and available for audit. Your vision system's data logging capability becomes part of that evidence.
- **IATF 16949 (automotive):** Automotive quality requirements are among the most demanding. Zero-defect targets, 100% inspection of critical characteristics, full part traceability, and statistical process control data are typically required. Vision system selection and configuration needs to reflect this from the start.
- **FDA 21 CFR Part 11 / EU GMP Annex 11 (pharmaceutical and medical):** Electronic inspection records must be tamper-evident, access-controlled, and audit-ready. If your products fall under these frameworks, confirm explicitly with your supplier that the vision system's data management meets these requirements.
- **GS1 print quality standards:** If you supply to major retailers or logistics networks, your barcodes and labels may need to meet GS1 print quality grades. Vision systems with integrated verification tools can grade labels in-line and flag non-conforming codes before products are shipped.

Practical tip: bring your quality manager into the vision system evaluation process early. The inspection data the system produces is useful for quality control, and also becomes part of your compliance evidence. Getting the data structure and logging right from the start is much easier than retrofitting it later.

6. Questions to ask before you commit

When you sit down with a vision system supplier, ask these questions:

- Can you show me a similar application to mine, ideally in the same industry?
- What sample parts do you need from me to run a feasibility test, and when can we do one?
- What is a realistic setup time for my application, and who carries out the commissioning?
- What training do my operators need, and how long does it take?
- What happens when my product range changes in 12 months? How is the system updated, and can my team do it without calling you?
- What does ongoing support look like, and what are the response times if something stops working on a production line?
- Are there any ongoing licensing or subscription costs I should budget for?

Readiness checklist

Before moving to supplier conversations, confirm you can answer yes to these:

- I can describe clearly what a defective part looks like, with physical examples available
- I have quantified, even roughly, what poor inspection currently costs in scrap, returns, or labour
- I know which quality standards or regulatory frameworks apply to my process
- I know my cycle time and the throughput the inspection system needs to match
- I have identified who will operate and maintain the system day-to-day
- I know which PLC or line controller the system needs to communicate with
- I have a realistic budget range in mind, including installation and commissioning



Final thought

The technology has moved on considerably. Setting up a modern smart camera for a standard inspection application no longer requires a vision specialist or weeks of engineering time. What it does require is a clear problem definition, honest sample parts, and a supplier who takes the time to understand your application before making recommendations.

To get the most from automated inspection, you don't need complex systems, but you definitely need to define the problem clearly before starting.

For more information on OMRON machine vision solutions including the FHV7 and FHV7-AI Smart Camera series, visit [industrial.omron.eu](https://www.industrial.omron.eu)

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