APPLICATION // 06

# Presence and absence detection and counting inspection

Missing components, wrong orientation and incorrect counts in assemblies, packs, trays and kits, with a camera system or a simpler vision sensor, on packing and assembly lines in South Africa.

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Request an assessment for this application

// SHORT ANSWER

Presence and absence detection checks that everything that should be there is there: every component in an assembly, the right way round and in place, and the right number of items in a pack, tray or kit. It works when each item is visible from the camera and sits in a predictable place. Items hidden under others, stacked or heavily overlapping cannot be counted reliably from one view. We confirm this on your samples before proposing a station.

// WHAT IT CHECKS

## What a presence and counting inspection station checks

Four checks, often combined in one image. Which you need is set at the sample test.

01 // PRESENCE

### Missing components

Screws, clips, seals, inserts, leaflets or labels missing from an assembly or pack.

NEEDS

**Each item visible from the camera**

02 // ORIENTATION

### Orientation and wrong part

Parts fitted upside down, rotated or of the wrong variant, told apart by shape, colour or marking.

NEEDS

**A visible difference between right and wrong**

03 // COUNT

### Count in pack, tray or kit

The number of items in a tray, blister, carton or kit compared with the count for the SKU.

NEEDS

**Items side by side, not stacked**

04 // POSITION

### Position and seating

Items in the right pocket or location; a part sitting proud can be seen from a side view.

NEEDS

**A defined position for each item**

## How presentation decides feasibility

| SITUATION | CAMERA CHECK | CONDITIONS |
|---|---|---|
| **Trays, blisters and pocketed kits** | Usually feasible: each pocket is checked for its item. | Pockets visible; items contrast with the tray. |
| **Assemblies on a fixture** | Usually feasible: each location is checked for its part. | Parts visible from one or more fixed views. |

| SITUATION | CAMERA CHECK | CONDITIONS |
|---|---|---|
| **Loose items in an open box** | Often feasible in a single layer. | Touching items must be told apart by shape or spacing. |
| **Stacked or overlapping items** | Not reliable from one view. | Needs single-layer presentation, several views or another method such as weighing. |
| **Closed or sealed packs** | Not feasible with a camera. | Check before the pack is closed. |

// CHOOSING THE TOOL

# Vision sensor, photoelectric sensor or camera system for presence detection

Many presence and counting problems start with a search for a sensor. This is where a simple sensor is enough and where a camera is needed.

| OPTION | QUESTION IT ANSWERS | SUITS | LIMIT |
|---|---|---|---|
| **Photoelectric sensor (photo eye)** | Is something at this point right now? | Counting products that pass one by one with gaps; triggering a camera. | Cannot tell a right item from a wrong one; touching products are counted as one. |

| OPTION | QUESTION IT ANSWERS | SUITS | LIMIT |
|---|---|---|---|
| **Vision sensor** | Is the item there, the right way round, and how many in one image? | One or a few checks on a stable product from one view; one vision sensor can replace several photo eyes or laser sensors at one point. | Fewer tools and usually one view; many variants or several views call for a camera system. |
| **Camera system with a vision controller or smart camera** | Are all items present, correct, in place and counted, for every SKU? | Kits, trays and assemblies, several views, recipes from the PLC, images logged. | More engineering; the sample test decides whether it is needed. |
| **Parts counting machine** | How many loose parts went into this bag or box? | Small loose parts fed one by one past a counting sensor. | A dedicated machine, not a camera station; we do not build these. |

## Counting products that touch or overlap on a conveyor

A photo eye counts gaps, so touching products are counted as one. A camera above the conveyor counts outlines in the image instead; a backlight or diffuse light helps separate one product from the next, and a faster belt before the camera can open gaps. Product piled in layers still cannot be counted from a single view.

| WHAT THE LINE REPORTS | WHAT A STATION CHECKS | WHERE IT STOPS |
|---|---|---|

| WHAT THE LINE REPORTS | WHAT A STATION CHECKS | WHERE IT STOPS |
|---|---|---|
| **“Sensor to detect bottles on a line”, “what sensor to count products?”** | Often a photoelectric sensor is enough to detect and count products that are spaced apart. | When products touch or overlap, a sensor merges them; a camera view from above is needed. |
| **“Count products on the conveyor when they touch”, “sensor for counting croissants”** | Counting vision system from above, with lighting that separates each outline, sometimes after a speed-up belt creates gaps. | Heavily stacked product cannot be counted from one view. |
| **“Scoop missing from the tin”, “insert not in the pack”** | The open tin or pack is checked for the scoop, leaflet or insert before the lid goes on. | Once the lid is on, the insert cannot be seen. |
| **“Glue missing on the carton flap”** | Presence and continuity of the glue bead, often with UV-fluorescent glue and UV lighting. | Glue strength and bond are not visible; only whether glue is there and where. |
| **“Leaflet or component missing from the kit”** | Each location in the kit or assembly is checked for its item. | Items hidden under others need a check at an earlier step. |
| **“Short count in the pack”, “miscount”** | Items in the open tray, blister or pack counted against the count for the SKU. | Closed opaque packs cannot be counted; weigh them instead. |
| **“Part fitted upside down”, “wrong way round”** | Orientation judged from shape, colour or marking against a taught reference. | Needs a visible difference between the right and wrong orientation. |

## // LIMITS

# Where presence and counting inspection stops

We agree these boundaries before a project starts, so nobody expects the camera to do what it cannot.

### × Not detectable with a camera

- **Hidden items.** Parts under other parts, behind covers or inside closed packs.
- **Stacks and heavy overlap.** Layers and items lying on top of each other cannot be counted from one view.
- **Function.** A part can be present and correctly placed but still not clipped, tightened or working.

### ✓ Works reliably when

- **Items have defined places.** Pockets, fixtures or single-layer presentation.
- **Items contrast with the background.** Colour, shape or lighting separates each item from what is behind it.
- **The trigger is timed right.** The image is taken when every item is in place and still.

// EVIDENCE

# What you can check before you ask us

How feasibility is decided on your own samples, and the published budgets of complete line solutions that use this check.

ENGINEERING METHOD

## How a sample test is judged

**Samples**
Good samples that show normal variation, and defective samples for each defect you need to catch, including borderline ones.

**Imaging**
Imaged under candidate lighting and optics; what is, and is not, visible is recorded.

BUDGET MODEL

## Installed budgets of line solutions that use this check

**Multipacks**
R 80 000 – R 660 000

**Bread bag closures**
R 80 000 – R 540 000

**Acceptance**
False rejects and missed defects are agreed in writing and measured at FAT and SAT.

**Outcome**
A written feasibility conclusion with example images, before any proposal.

`The method used on every project; not a measured result.`

**Assembly error-proofing**
R 100 000 – R 960 000

**Juice box straws**
R 110 000 – R 390 000

**Staple food bags**
R 110 000 – R 770 000

**Cement bags**
R 140 000 – R 840 000

**Basis**
Indicative budget for a typical application, in rand, excluding VAT, as at 2 October 2026, low to high configuration. A firm price follows the sample test.

`Each figure is for a complete station on that line, not a price for this check on its own.`

**How to prepare inspection samples →**

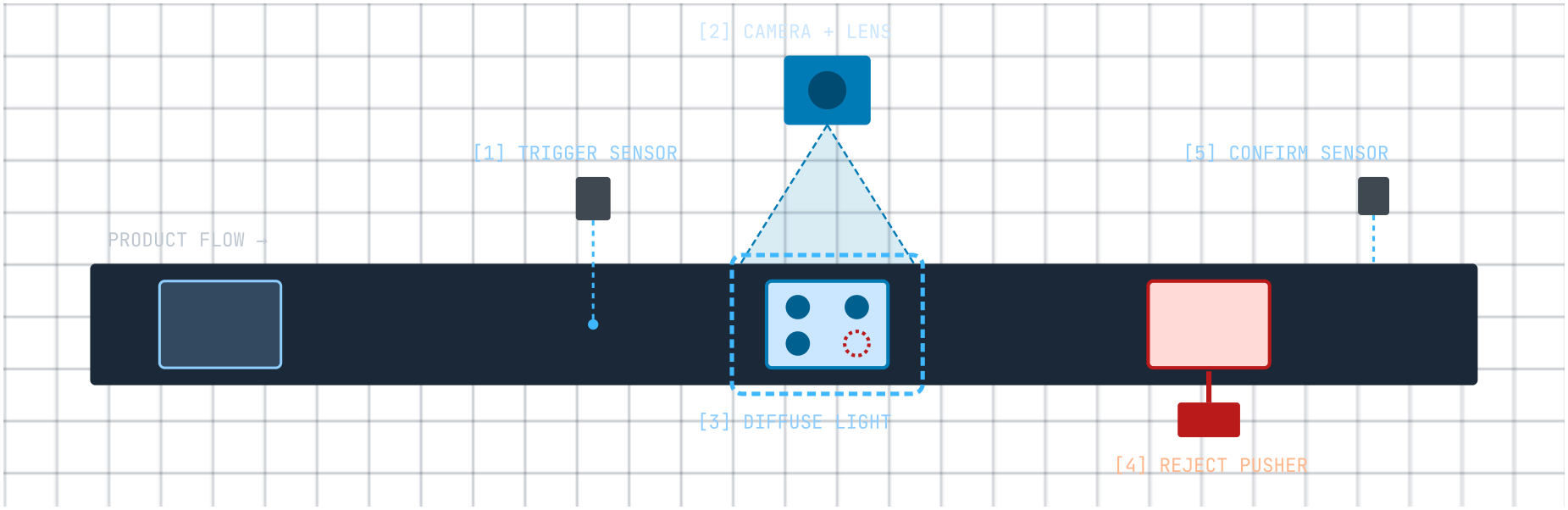
**All line solutions with budgets →**

`// STATION LAYOUT`

# How a presence and counting station is laid out

Plan view of a typical station for trays, under diffuse light. The real layout follows the site survey.

[Schematic] PLAN VIEW · NOT TO SCALE




**[1] Trigger sensor:** tells the station a tray has arrived.

**[2] Camera:** sees every pocket or location in one image, or with several cameras.

**[3] Diffuse light:** even light that reduces shadows between items.

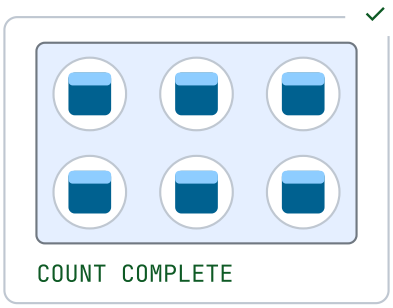
**[4] Reject:** removes incomplete trays; the PLC tracks each one.

**[5] Confirmation sensor:** proves that each rejected tray left the line.

// PASS AND REJECT [Illustrative examples]

# What a pass and a reject look like

Illustrations, not images from a real line. The expected count and orientation for each SKU come from your pack specification.

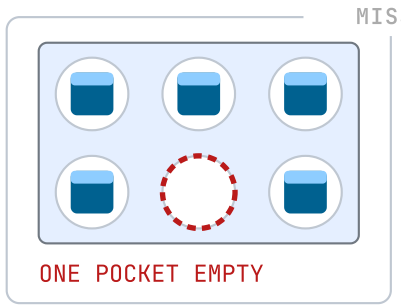



EXAMPLE // POCKETED TRAY

## Tray complete

Every pocket holds an item, all facing the same way. The count matches the SKU.

COUNT: COMPLETE ACTION: PASS

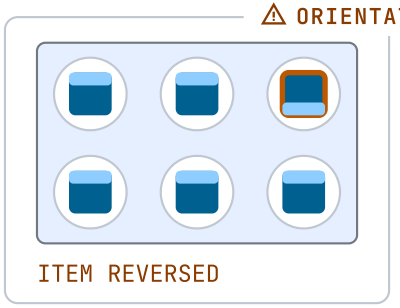



EXAMPLE // POCKETED TRAY

## Item missing

One pocket is empty, so the count is short. The tray is tracked to the reject.

COUNT: ✗ SHORT ACTION: REJECT




EXAMPLE // POCKETED TRAY

## Item reversed

All items are present, but one is upside down, detected from its marking.

ORIENTATION: ✗ WRONG ACTION: REJECT

// LINE INTERFACE

# What we need to know about your line

These conditions decide the station design. Each is confirmed on site or during the sample test.

| CONDITION | WHAT WE NEED TO KNOW | WHY IT MATTERS | CONFIRMED DURING |
|---|---|---|---|
| Pack or assembly format | Trays, kits, assemblies or cartons; how many variants. | Decides views, lighting and one recipe per variant. | Sample test |

| CONDITION | WHAT WE NEED TO KNOW | WHY IT MATTERS | CONFIRMED DURING |
|---|---|---|---|
| **Check position** | Where in the process the check can sit. | It must come after the last item is added and before the pack is closed. | Site survey |
| **Trigger** | Product sensor, machine-ready signal or indexing table. | The image must be taken when every item is in place and still. | Design review |
| **Speed and spacing** | Packs or assemblies per minute and the gap between them. | Sets exposure and trigger; each unit must be rejected on its own. | Site survey |
| **Reject and confirmation** | Reject mechanism or machine stop; PLC make and model. | Incomplete units must leave the line, or the machine must stop, with a sensor confirming it. | Design review |

// ACCEPTANCE

# How the station is accepted

False rejects and missed defects pull against each other. We define both, and how they are measured, before FAT and SAT.

01

### False reject rate

The share of complete units rejected, measured on agreed good samples at

02

### Missed defect rate

The share of incomplete units that pass, measured with a missing, reversed or

03

### Variant handling

A test that each SKU loads its own recipe and count, from the PLC or the operator screen.

line speed. The acceptable level is agreed per project.

extra item at each position. The target is set with you.

// EVIDENCE

# What a count check can prove: worked examples, tools and references

Challenge-test statistics, speed and blur, device capabilities and South African quantity rules.

**What does a clean challenge test prove?** At acceptance, known-bad units, for example trays with one item removed, are passed through and every one should be rejected. A run with no misses shows the station catches that fault. It cannot show the miss rate is zero: a finite test only bounds it. Using the Wilson method in NIST's handbook for a proportion (NIST e-Handbook, 7.2.4.1), a run of n challenges with no misses gives a one-sided 95 % upper bound of $z^2 / (n + z^2)$, with z = 1.645.

| CHALLENGE UNITS PASSED | MISSES | 95 % UPPER BOUND ON THE MISS RATE | WHAT IT SUPPORTS |
|---|---|---|---|
| 30 | 0 | up to about 8.3 % | Shows the station can catch the fault; says little about how often it misses |
| 100 | 0 | up to about 2.6 % | A reasonable start-up challenge for one fault type |
| 300 | 0 | up to about 0.9 % | A stronger acceptance claim, usually built up over shifts |

| CHALLENGE UNITS PASSED | MISSES | 95 % UPPER BOUND ON THE MISS RATE | WHAT IT SUPPORTS |
|---|---|---|---|
| 1,000 | 0 | up to about 0.27 % | Typically only reached by counting challenge passes over weeks |

The practical rule: decide the claim first, then size the challenge test, and keep counting challenge passes after go-live so the evidence grows with every shift.

**Worked example: speed and motion blur.** An item moving during the exposure smears by speed × exposure time. Smear blurs the outlines a counting tool separates touching items by, so the exposure is chosen from the conveyor speed. The figures below are arithmetic, for planning.

| CONVEYOR SPEED | EXPOSURE TIME | SMEAR ON THE ITEM | WHAT IT MEANS |
|---|---|---|---|
| 0.5 m/s | 200 µs | 0.1 mm | Sharp enough for counting and presence of most items |
| 1.0 m/s | 1 ms | 1.0 mm | Outlines smear; touching items merge; shorten exposure and add light |
| 2.0 m/s | 100 µs | 0.2 mm | Needs strong, often strobed, lighting |

## Which tool does which count?

Vision sensors and smart cameras differ mainly in their tools. HIKROBOT's own product pages list, for example, existence, count and measurement tools on the SC1000 (HIKROBOT SC1000), colour count and recognition on the SC2000E (HIKROBOT SC2000E), and learning-based and multi-object counting on the SC3000X (HIKROBOT

SC3000X). Glue presence is often checked with UV-fluorescent glue under UV light, which HIKROBOT's light catalogue describes (HIKROBOT light catalogue).

| DEVICE CLASS (HIKROBOT EXAMPLES) | COUNTING AND PRESENCE TOOLS LISTED BY THE VENDOR | TYPICAL FIT |
|---|---|---|
| **SC1000 vision sensor** | Existence, count, measurement, category recognition; no OCR or code reading | One check on a stable product, such as a scoop in a tin |
| **SC2000E colour vision sensor** | Colour measurement, size and count; colour recognition; OCR with character comparison | Items told apart by colour, such as a coloured cap or insert |
| **SC3000X smart camera** | Learning-based count, multi-object count, deep-learning classification and detection, anomaly detection | Irregular items such as baked goods, or several item types in one view |
| **Camera with VisionMaster on an industrial PC** | Full tool set, several cameras, recipes per SKU | Kits and assemblies with many locations and variants |

## How acceptance is measured

- **Miss rate (false accept):** incomplete or short-counted units passed as good. Bounded by the challenge test above.
- **False reject rate:** good units rejected, counted over a production run and reviewed from the saved images.
- **Reject confirmation:** every rejected unit seen leaving the line by a sensor; a missing confirmation stops the line.

## Counts and the law in South Africa

Where the quantity marked on a pack is a count, the count is the quantity. South Africa's Legal Metrology Regulations require prepackages to comply with SANS 289, take their tolerances from SANS 458, and say the NRCS may not permit the sale of prepackages deficient of the quantity marked (Legal Metrology Regulations 2018). A camera count before closing, or a checkweigher after it, is how a packer shows each pack holds what it says.

### SOURCES FOR THIS PAGE


1. NIST/SEMATECH e-Handbook of Statistical Methods, 7.2.4.1 Confidence intervals for a proportion (Wilson method) (https://www.itl.nist.gov/div898/handbook/prc/section2/prc241.htm) (NIST, read 2026-10-27)
2. HIKROBOT SC1000 vision sensor: existence, count and measurement tools (https://www.hikrobotics.com/en/machinevision/productdetail?id=7130) (vendor product page, checked 2026-10)
3. HIKROBOT SC2000E colour vision sensor: colour count, size and recognition tools (https://www.hikrobotics.com/en/machinevision/productdetail?id=6083) (vendor product page, checked 2026-10)
4. HIKROBOT SC3000X: learning-based count, multi-object count, deep-learning detection (https://www.hikrobotics.com/en/machinevision/productdetail?id=6921) (vendor product page, checked 2026-10)
5. HIKROBOT Light Source Catalogue 2025 Q3, p.80: UV fluorescence for UV glue (https://www.hikrobotics.com/en2/source/vision/video/2025/7/21/Light%20Source%20Catalog_ENG_2025Q3_v2.pdf#page=80) (vendor catalogue, checked 2026-10-02)
6. Legal Metrology Regulations, GN 877 of 2018 (regulations 20, 32 and 34) (https://www.gov.za/sites/default/files/gcis_document/201808/41854gon877.pdf) (Government Gazette 41854)


// BEFORE WE START

**Complete samples**
Complete packs or assemblies for each

**Incomplete samples**
Units with a missing, reversed, extra or partly

# What to prepare for the sample test

We check your packs or assemblies before proposing a station. We confirm quantities and shipping with you first.

Sample preparation guide

variant, as they reach the check point.

**Pack specification**
Bill of materials or pack list per SKU, with photos of a correct unit.

seated item, clearly marked.

**Line information**
Speed, spacing, trigger options, PLC make and model, and the reject you have or need.

// FAQ

## Presence and counting questions

### What is a vision sensor?

A vision sensor is a compact industrial camera with lighting and a small set of built-in tools, such as presence, pattern match and count, that gives a pass or fail. It is simpler to set up than a camera system with a controller, and suits one or a few checks on a stable product from one view.

### What sensor counts products on a conveyor?

For products that pass one at a time with a gap, a photoelectric sensor counts them. When products touch, overlap or vary in shape, a camera looking down from above counts them in the image. For small loose parts filled into bags, a dedicated parts counting machine is the usual tool.

## How can missing components be detected during assembly?

A camera images the assembly after the last part is fitted and checks each location for its part, using shape, edges or colour. The result goes to the PLC, which rejects the assembly or stops the machine. Parts hidden under others need a check at an earlier step or an extra view.

## What is a vision counting system?

A camera that counts the items in its view, such as products touching on a conveyor, items in an open pack, pockets in a tray or bar ends in a bundle, and compares the count with the expected number. A vision counting system is used where a photoelectric sensor cannot separate the items.

## How can items in a pack be counted automatically?

A camera above the open pack counts items when they sit side by side, or checks each pocket in a tray or blister. The count is compared with the SKU's count from the recipe or PLC. Stacked or heavily overlapping items cannot be counted reliably from one view.

## Can the station check a closed box?

No, if the pack is closed with cardboard, opaque film or other opaque material: a camera cannot see through it, so the check sits before the pack is closed. Clear film can work where glare and wrinkles allow the items to be seen; the sample test shows whether they do.

### Does the station confirm that a screw is tightened?

No. It can see that a screw is present and seated flush, but not its torque, which comes from the tightening tool.

RELATED: Choosing a HIKROBOT smart camera → · Metal components → · Plastics & packaging → · Food & beverage lines → · Label & print inspection → · Carton & pallet verification → · Vision sensor, smart camera or PC? → · PLC & reject integration → · Cost & budget guide →

LINE SOLUTIONS USING THIS: Returnable crates → · Multipacks → · Juice box straws → · Bread bag closures → · Staple food bags → · Cement bags → · Rebar bundles → · Assembly error-proofing → · Egg cartons and trays → · Machined hole and feature inspection → · Machined part mix-up inspection →

COMMON IN THESE INDUSTRIES: Food & beverage → · Building materials → · Metal components → · Machining →

TYPICALLY BUILT WITH: Vision sensor (HIKROBOT SC1000–SC3000) → · Area scan cameras with a vision controller → · 3D laser profiling →

// PRESENCE AND COUNTING

## Request an assessment for this application

Tell us what should be in each pack or assembly and send complete and incomplete samples. We will tell you what a station can check.

Start application assessment