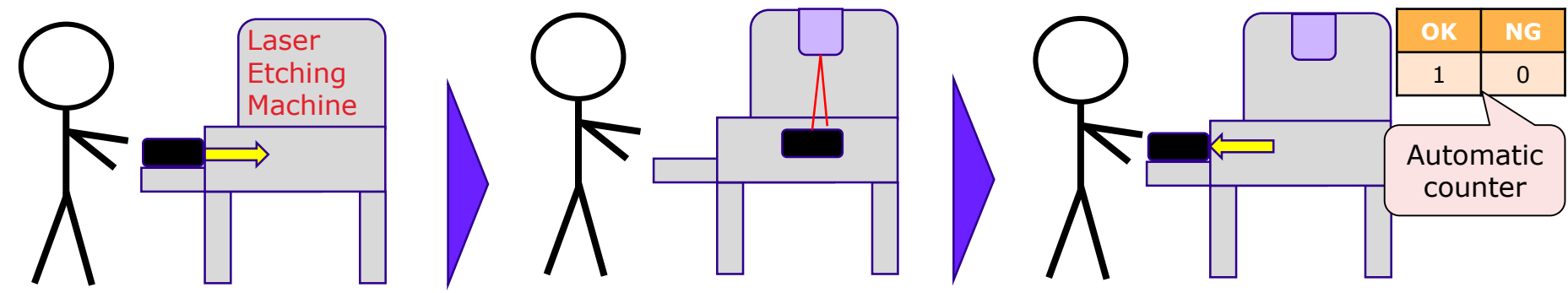


CEG-FORM-116 Laser Etching Check Sheet VISUAL AID

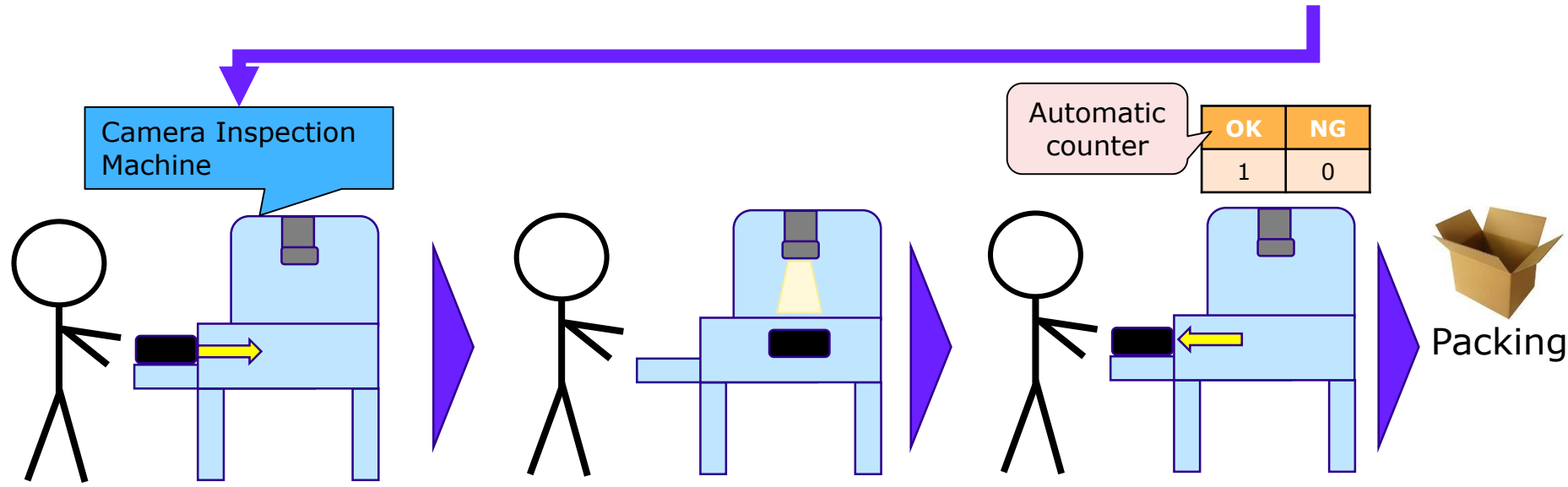
Sumitomo Electric Wiring Systems, Inc.
Wire Harness Production Management Business Unit
Quality Assurance Department
Component Evaluation Group
4/1/2024

**This document contains only essential
points. Not all checkpoints are included.**

1. Basic Process flow of Laser Etching



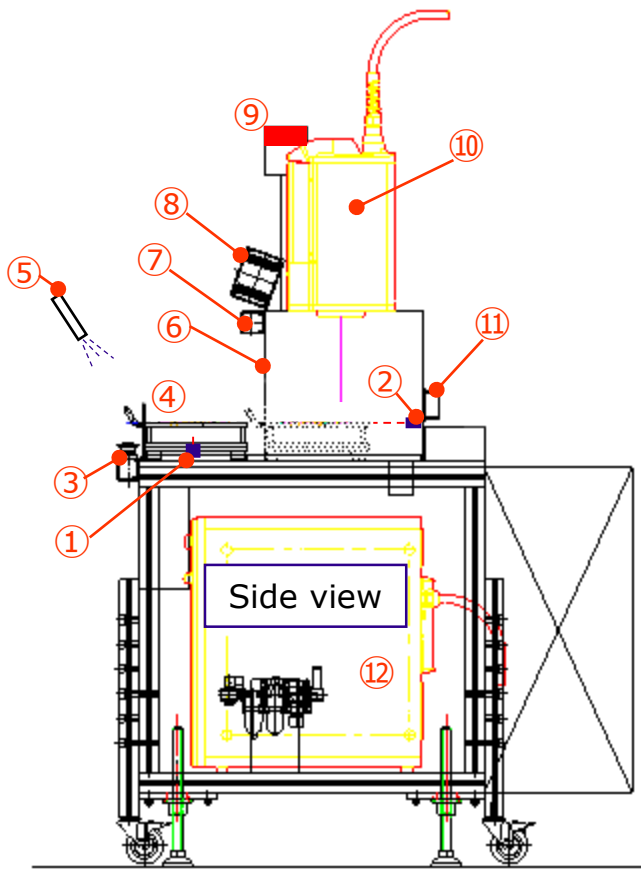
- 1. Set the component and press the start button
- 2. Etching by laser (Automatic)
- 3. Component come out and count OK or NG



- 4. Set the component and press the start button
- 5. Camera inspection for etching
- 6. Component come out and count OK or NG

2. Laser Etching Machine

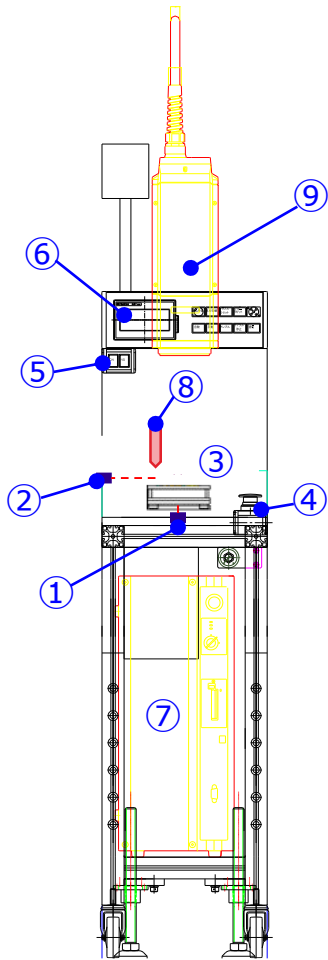
The laser etching machine shall have the following equipment or functions



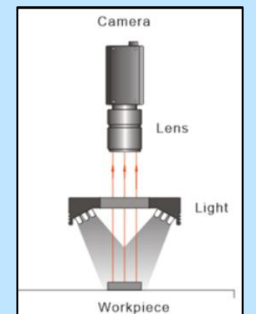
- | |
|--|
| ① Detection sensor for presence of component |
| ② Detection sensor for component floatation |
| ③ Start button <ul style="list-style-type: none"> • Cannot start unless components are set in the correct position • Cannot start without removing a product that has successfully completed a cycle |
| ④ Jig for fixing product (Prevent slanted etching) |
| ⑤ Air blow (foreign object removal before etching) |
| ⑥ Safety shutter <ul style="list-style-type: none"> • Prevents direct laser viewing • Open when successfully completed • NG or abnormalities, it will not open |
| ⑦ OK/NG lamp |
| ⑧ Counter of OK and NG (Process Skipping Prevention) |
| ⑨ Laser running lamp (For safety) |
| ⑩ Automatic shutdown in case of voltage drop <ul style="list-style-type: none"> • UPS installation is recommended • USP - Uninterruptible Power Supply |
| ⑪ Dust collector (Vacuum) <ul style="list-style-type: none"> • Control the dust collector so that it cannot operate unless it is turned on |
| ⑫ PLC Program (Detects failure of each sensor) |

3. Camera Inspection Machine

The camera inspection machine shall have the following equipment or functions



- ① Detection sensor for presence of component
- ② Detection sensor for component floatation
- ③ Jig for fixing products
- ④ Start button
 - Cannot start unless components are set in the correct position
 - Cannot start without removing a product that has successfully completed a cycle
- ⑤ OK/NG lamp
- ⑥ Counter of OK and NG (Process Skipping Prevention)
- ⑦ PLC Program (Detects failure of each sensor)
- ⑧ Pass Mark (Pin Mark)
- ⑨ Camera and lighting should return to the same position even if removed
 - As the angle of light changes, the visibility of the image changes
 - If the image visibility changes, the inspection results will change



4. Etching Process

Preparatory stage

- ✓ Registration of etching patterns should be done only by specific certified technicians.
- ✓ Conditions under which etching is clearly visible (speed, laser output) shall be verified.
- ✓ Verify the accuracy of the camera inspection machine for each part number.
 - See P7, 8 for verification methods

Before operation

- ✓ There is a checklist for equipment inspection, and it must be checked according to the rules. (Is each sensor working? Can the inspection machine judge NG samples as NG?)
- ✓ The QA shall check with a check sheet before operation begins that the set part number and etching are correct. A record shall be kept.

First Sample



Check Sheet

注意 NOTICE AVIS
УВЕДОМЛЕНИЕ

USE THE DESIGNATED FUSES ONLY.
UTILISEZ SEULEMENT LES FUSIBLES DESIGNES.
ИСПОЛЬЗУЙТЕ ТОЛЬКО ПРЕОХРАНИТЕЛИ
УКАЗАННОГО НОМИНАЛА.

ABS MTR NO. 2

ABS MTR NO. 1

IGCT

10A 5A 3A 10A 5A 3A 10A 5A 3A

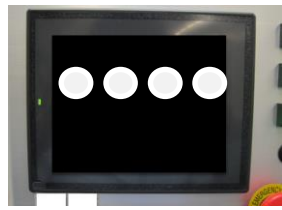
82662-48280
82662-0E120

CORRECT

In operation

- ✓ In the case of NG or some other abnormality, only the process manager is allowed to take action. A key switch or password is installed to cancel the error.

Password



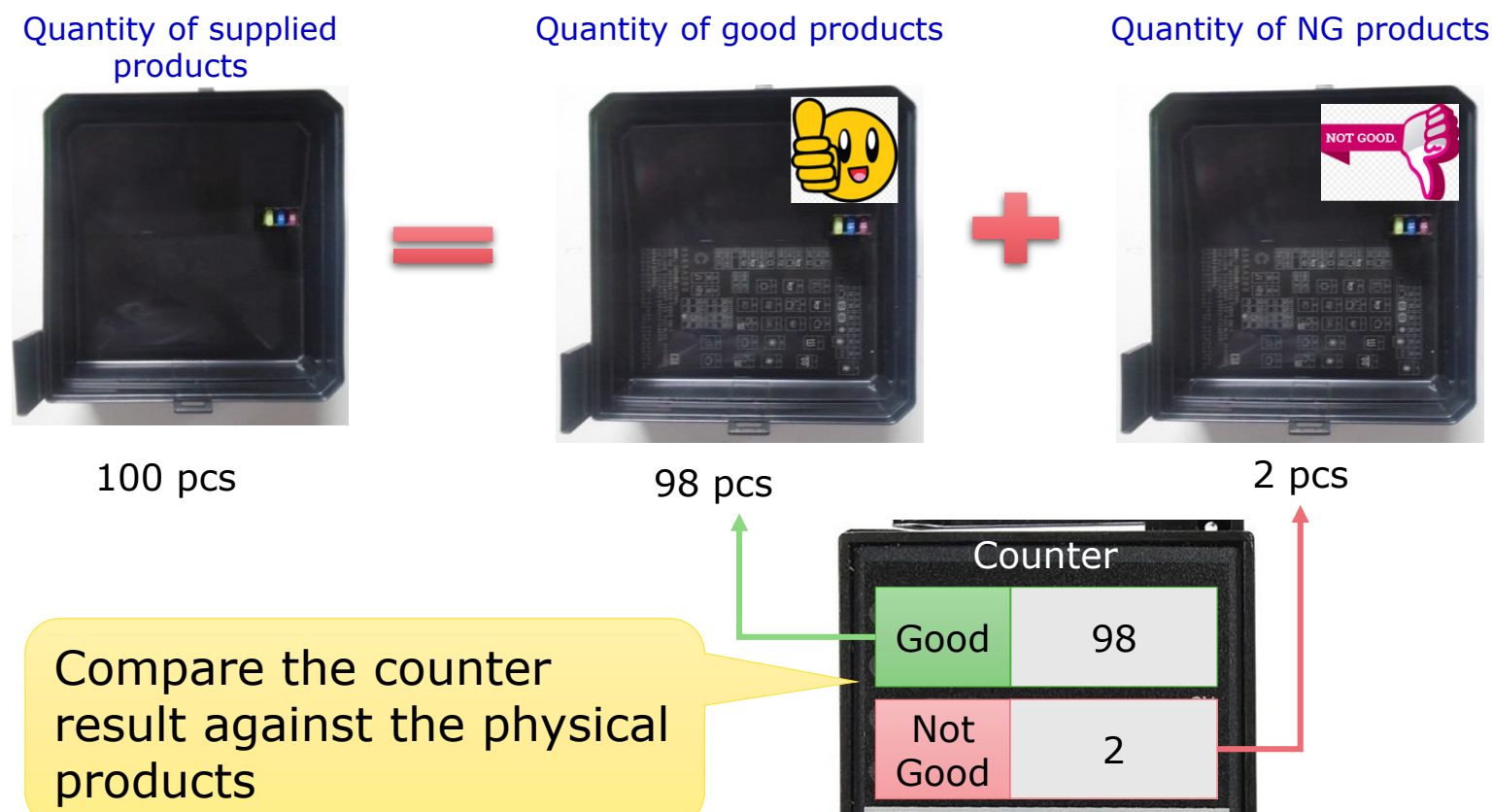
Key switch



4. Etching Process

After operation

- ✓ Ensure quantity checks are performed. Keep records.
Records should be checked not only by the operator but also by the leader or operation manager.



Other point

- ✓ There is a plan for inspection and replacement of consumables.
- ✓ There must be a rule to control change points for etching data changes.

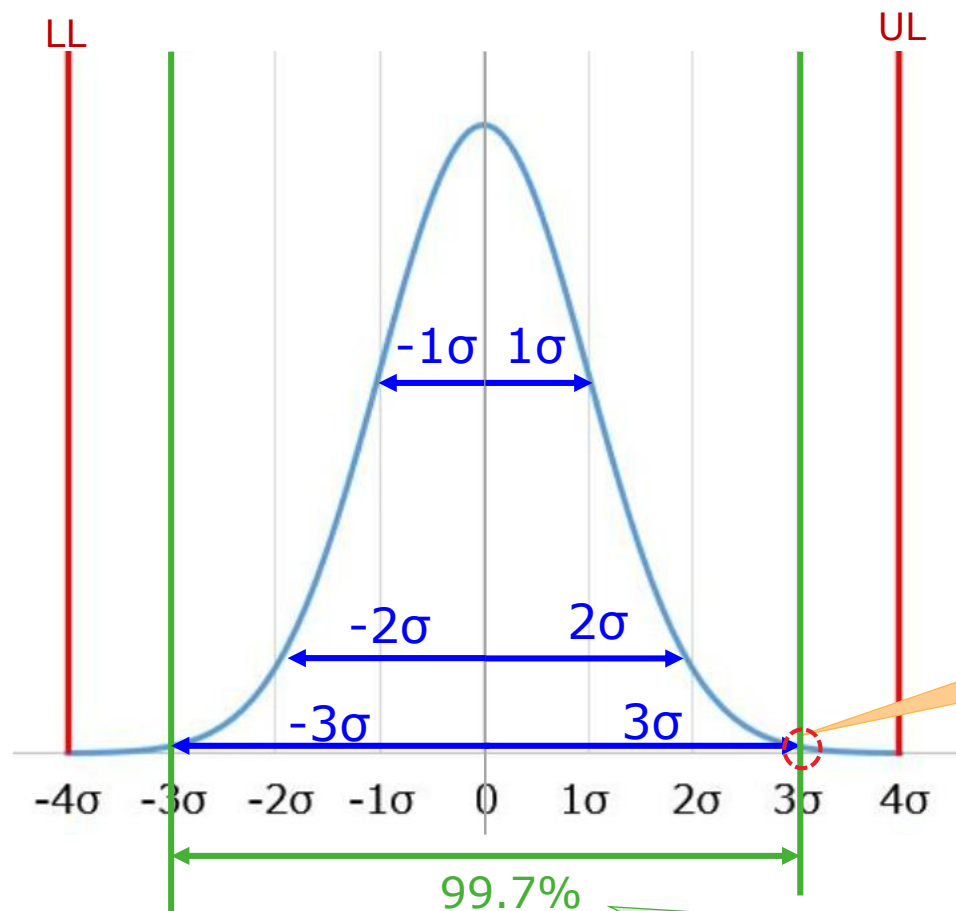
5. Inspection Machine Accuracy Verification Method

[Question]

How do you verify the accuracy of camera inspection machine?

[Answer]

Use a process capability study!



* σ indicates the range of variation in values.

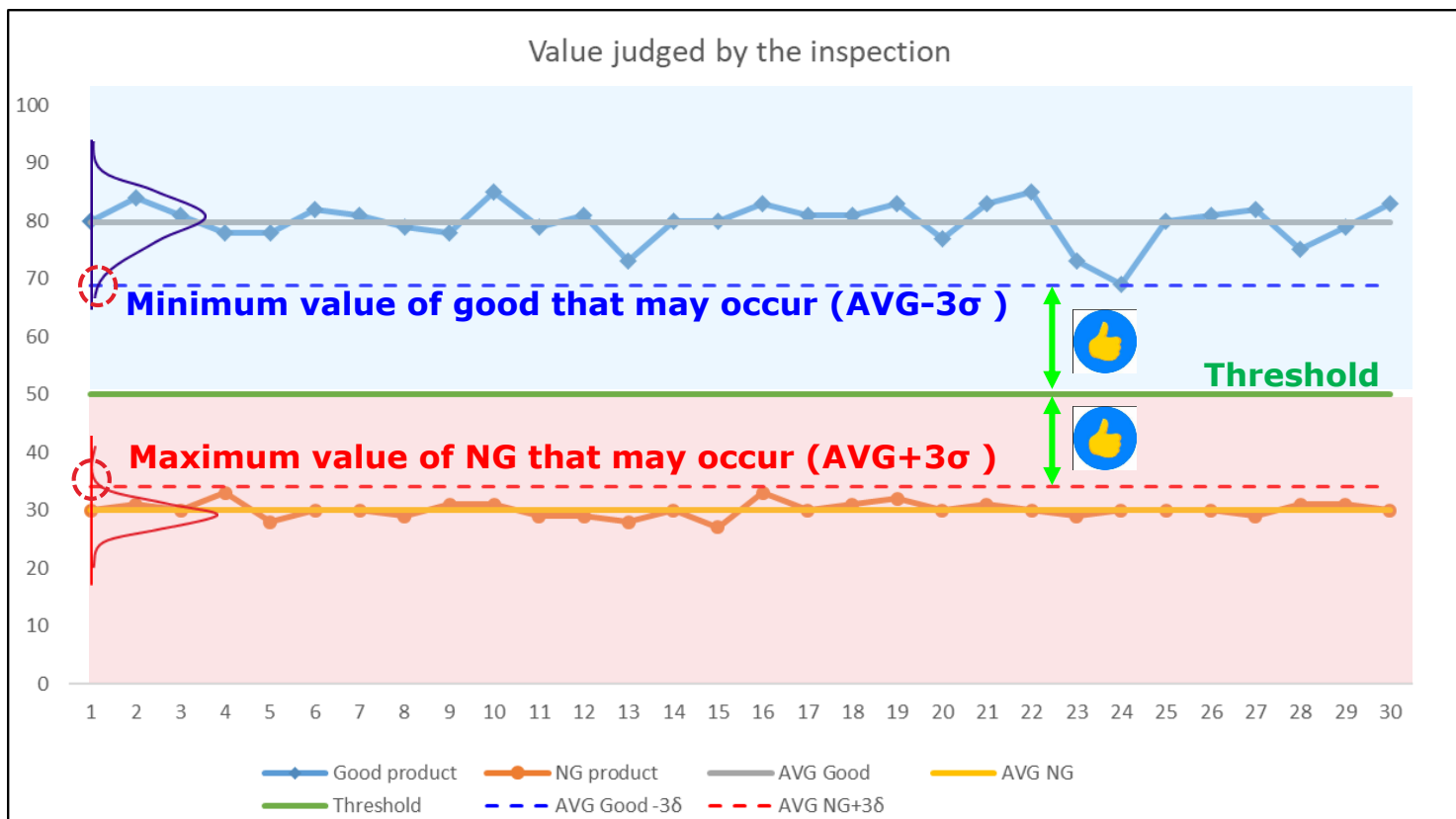
The value of edge can be calculated as "Median (average) + 3σ ".

The edge value is determined by adding three times the standard deviation to the median or average value.

If the CpK of the dimensional value or the value judged by camera inspection is 1.33 or higher, 99.7% of all values are within the $\pm 3\sigma$ range. In other words, this can be used to check the possibility of exceeding the threshold value in camera inspection machines.

5. Inspection Machine Accuracy Verification Method

The values judged by camera inspection of 30 good samples and 30 NG samples with 0.5 mm character omission are shown below.



SEWS mandates ensuring the minimum acceptable value of good samples and the maximum allowable value of NG samples.

It's crucial to confirm that both the minimum good sample count and the maximum NG sample count remain below the threshold.

If either value approaches or surpasses the threshold, it could lead to misjudging good products as NG and vice versa.



SWS WAY

Action principles for all of us in the Sumitomo harness business

PROFESSIONALISM

• *Customer satisfaction* • *Honesty & Integrity* • *Pride in what we do*

TEAMWORK

• *Mutual communication* • *Accountability & Cooperation* • *Diversity & Inclusion*

CHALLENGE

• *Forward thinking* • *Learning from experience* • *Ambition & Perseverance*