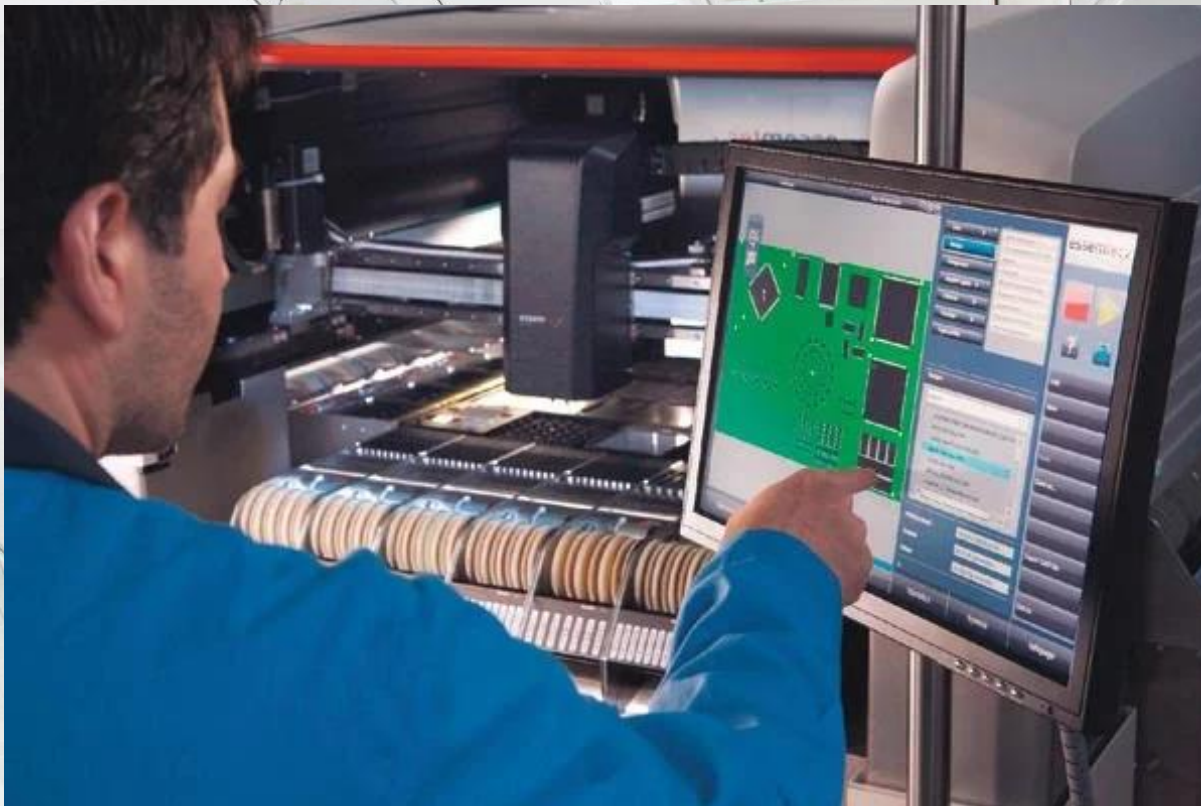


Komponentų surinkimo technologijos.

Defektai.

SMD placement processes. Defects



SMD vs Through-Hole



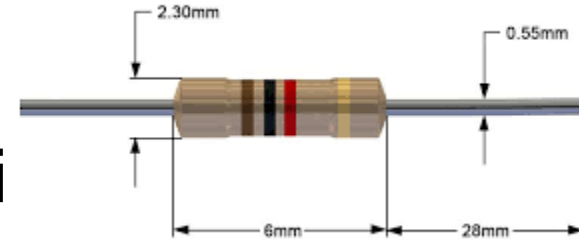
Surinkimo įrangos koncepcija

SMD Placement Machine Concepts

SMD vs Through-Hole



Through-Hole-Išvadiniai komponentai



Pros

Hand assembly of PTH components into a PCB is relatively simple, making them ideal for anyone prototyping a small circuit.

They can be used in a breadboard with no soldering required.

They are generally stronger than SMT components. This makes them ideal for connectors and rugged circuitry.

Cons

PTH components are more labor intensive to assemble. This makes them less ideal for production quantities.

They are generally larger than SMT components, making them less ideal for small circuitry.

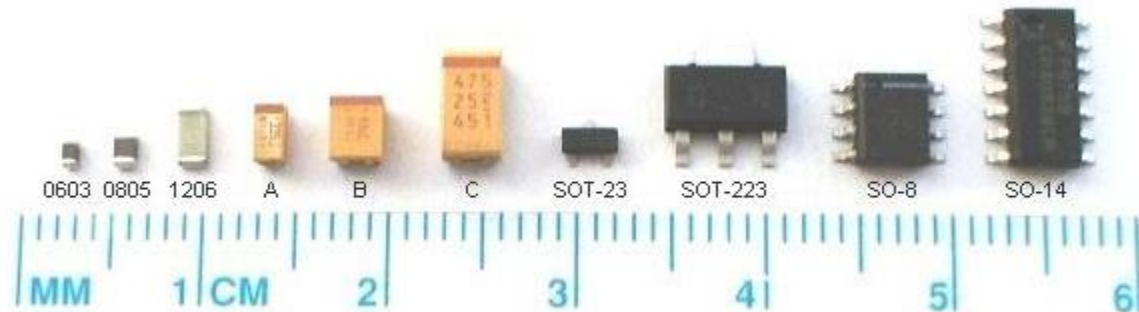
Due to decreasing popularity, many new chips are not offered in a PTH package.

Surinkimo įrangos koncepcija

SMD Placement Machine Concepts

SMD vs Through-Hole

SMD-Paviršiniai



Pros

- Generally smaller and cheaper than PTH components.
- Easier to assemble in high quantities with production equipment.
- More part options available due to increase in demand.

Cons

- Generally harder to hand assemble.
- Can be weaker for connections that need strength, such as connectors.
- Solder joints can crack and degrade due easier to their diminutive size.

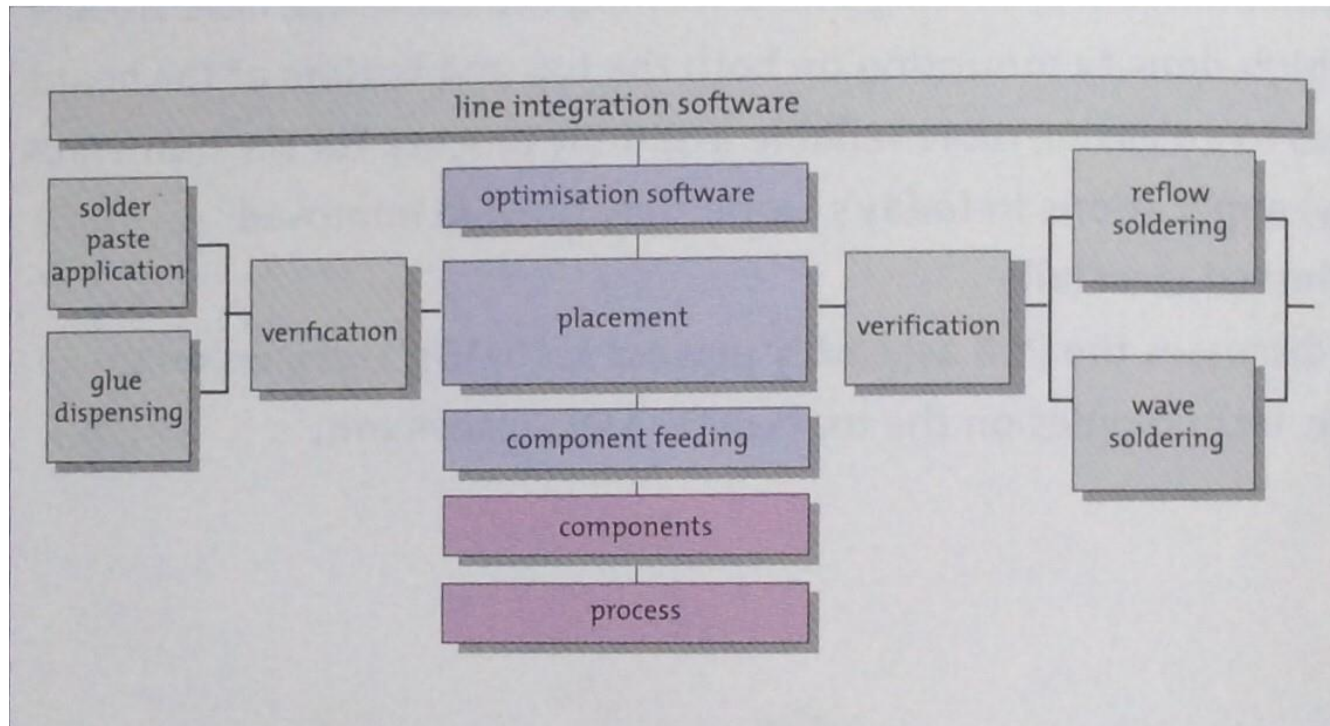
Surinkimo įrangos koncepcija

SMD Placement Machine Concepts

Small Outline	Dual Flat No Lead DFN	Quad Flat No Lead QFN	Plastic Shrink Small Outline SSOP	Plastic Small Outline SOIC
 Bumped Die (WLCSP) Die/Wafer (WLCSP) 3-lead SC70 (LB) 5-lead SC70 (LT) 3-lead SOT-23 (TT/CB) 5-lead SOT-23 (OT) 6-lead SOT-23 (OT/CH) 3-SOT-223 (DB) 4-lead SOT-143 (RC) 3-lead DDPAK (EB) 5-lead DDPAK (ET) 3-lead SOT-89 3-lead TO-92 (TO/ZB) 5-lead TO-220 (AT)	 8-lead DFN (MC) 2 × 3 × 0.9 mm 8-lead TDFN (MN) 2 × 3 × 0.75 mm 8-lead UDFN (MU) 2 × 3 × 0.5 mm 8-lead DFN (MF) 3 × 3 × 0.9 mm 8-lead DFN (MD) 4 × 4 × 0.9 mm 8-lead DFN (MF) 6 × 5 × 0.9 mm 36-lead VTLA (TL) 5 × 5 × 0.9 mm 44-lead VTLA (TL) 6 × 6 × 0.9 mm 124-lead VTLA (TL) 9 × 9 × 0.9 mm Very Thin Thermal Leadless Array VTLA	 16-lead QFN (MG) 3 × 3 × 0.9 mm 20-lead QFN (ML) 4 × 4 × 0.9 mm 20-lead QFN (MQ) 5 × 5 × 0.9 mm 28-lead UQFN (MV) 4 × 4 × 0.5 mm 28-lead QFN (MQ) 5 × 5 × 0.9 mm 28-lead QFN (MM & ML) 6 × 6 × 0.9 mm 40-lead UQFN (MV) 5 × 5 × 0.5 mm 44-lead QFN (ML) 8 × 8 × 0.9 mm 64-lead QFN (MR) 9 × 9 × 0.9 mm	 8-lead MSOP (MS) 10-lead MSOP (UN) 16-lead QSOP (QR) 20-lead SSOP (SS) 28-lead SSOP (SS) Plastic Thin Shrink Small Outline TSSOP 8-lead TSSOP (ST) 14-lead TSSOP (ST) 20-lead TSSOP (ST)	 8-lead SOIC (SN) 8-lead SOIC (SM) 14-lead SOIC (SL) 16-lead SOIC (SL) 18-lead SOIC (SO) 20-lead SOIC (SO) 28-lead SOIC (SO)

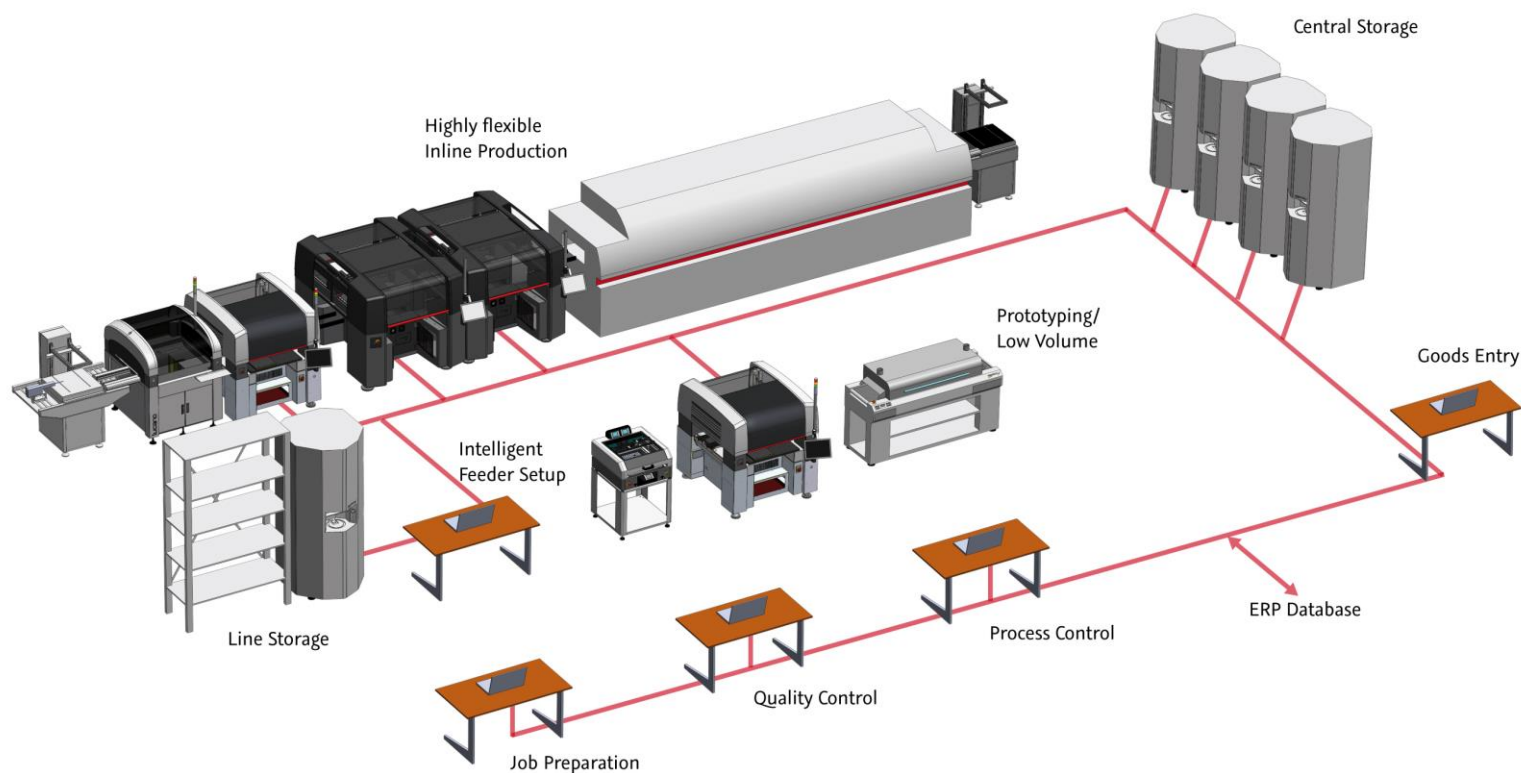
Surinkimo linijos koncepcijos

Production Line Concepts



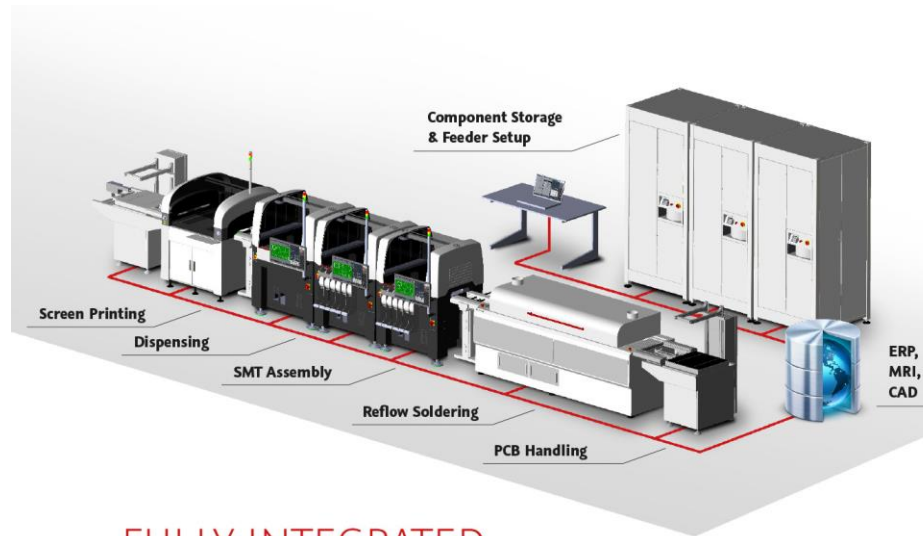
Surinkimo linijos koncepcijos

Production Line Concepts

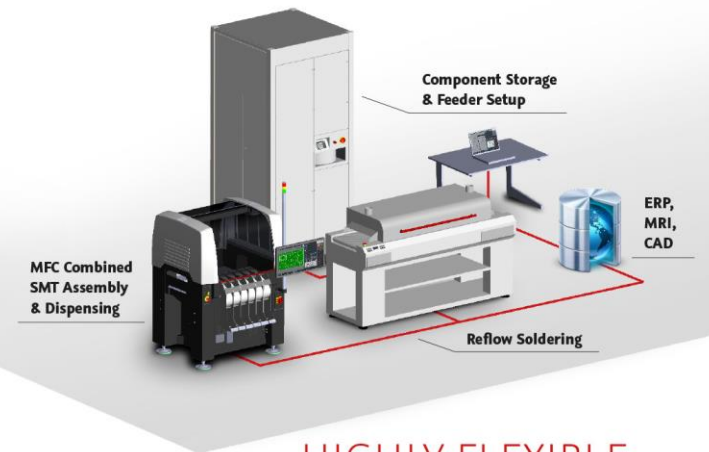


Surinkimo linijos koncepcijos

Production Line Concepts



FULLY INTEGRATED
LINE SOLUTIONS



HIGHLY FLEXIBLE
CELL SOLUTIONS

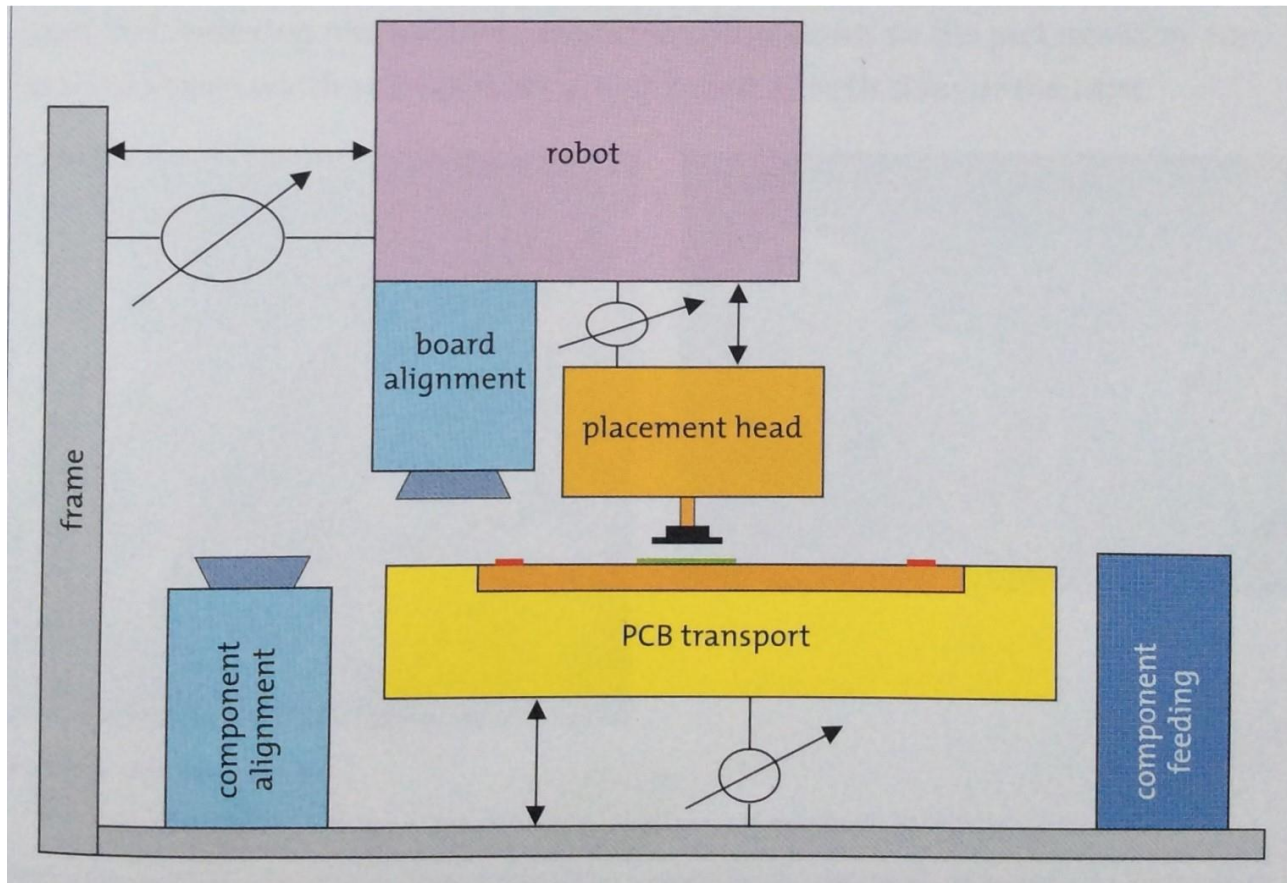
Surinkimo linijos koncepcijos

Production Line Concepts



Komponento pastatymo procesas

The SMD placement process



Komponento pastatymo procesas

The SMD placement process

Figure shows a generic pick-and-place machine in which the majority of modules are assigned a specific function in the placement cycle. The following modules can be distinguished:

- Frame, the skeleton of the machine, which positions the sub-modules in relation to each other and transfers forces;
- Component feeding unit;
- Component alignment sensor unit, part of the placement head or mounted on the base.

Komponentų talpyklos Component feeding

Tape, cut-tape feeders, trolley tape feeders

Bulk feeders

Tray feeders

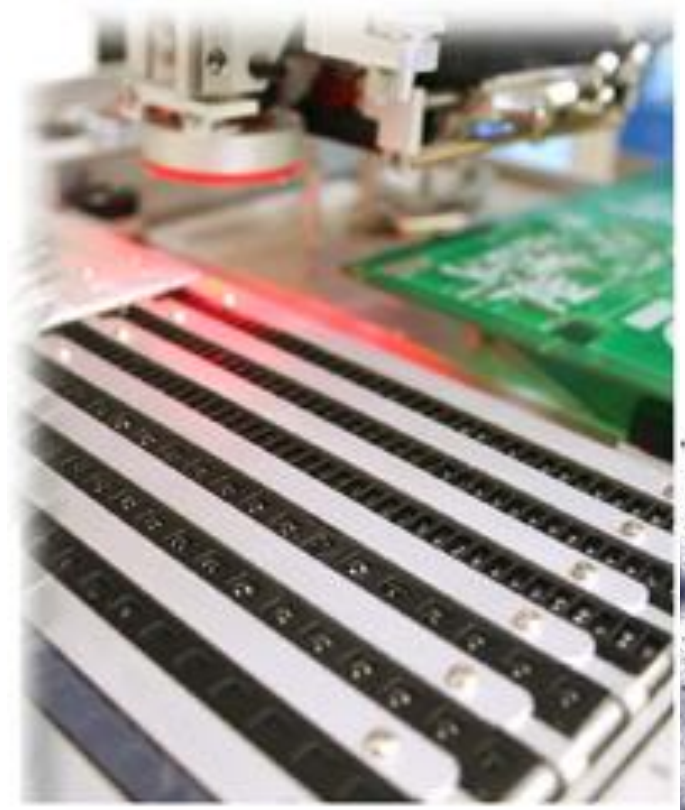
Waffle feeders

Stick\tube feeders



Juostinės talpyklos

Tape, cut-tape feeders

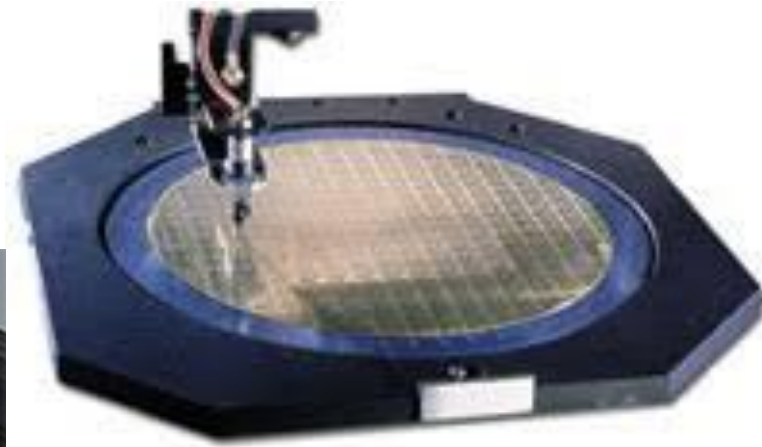


Supiltų komponentų talpyklos Bulk, tray feeders



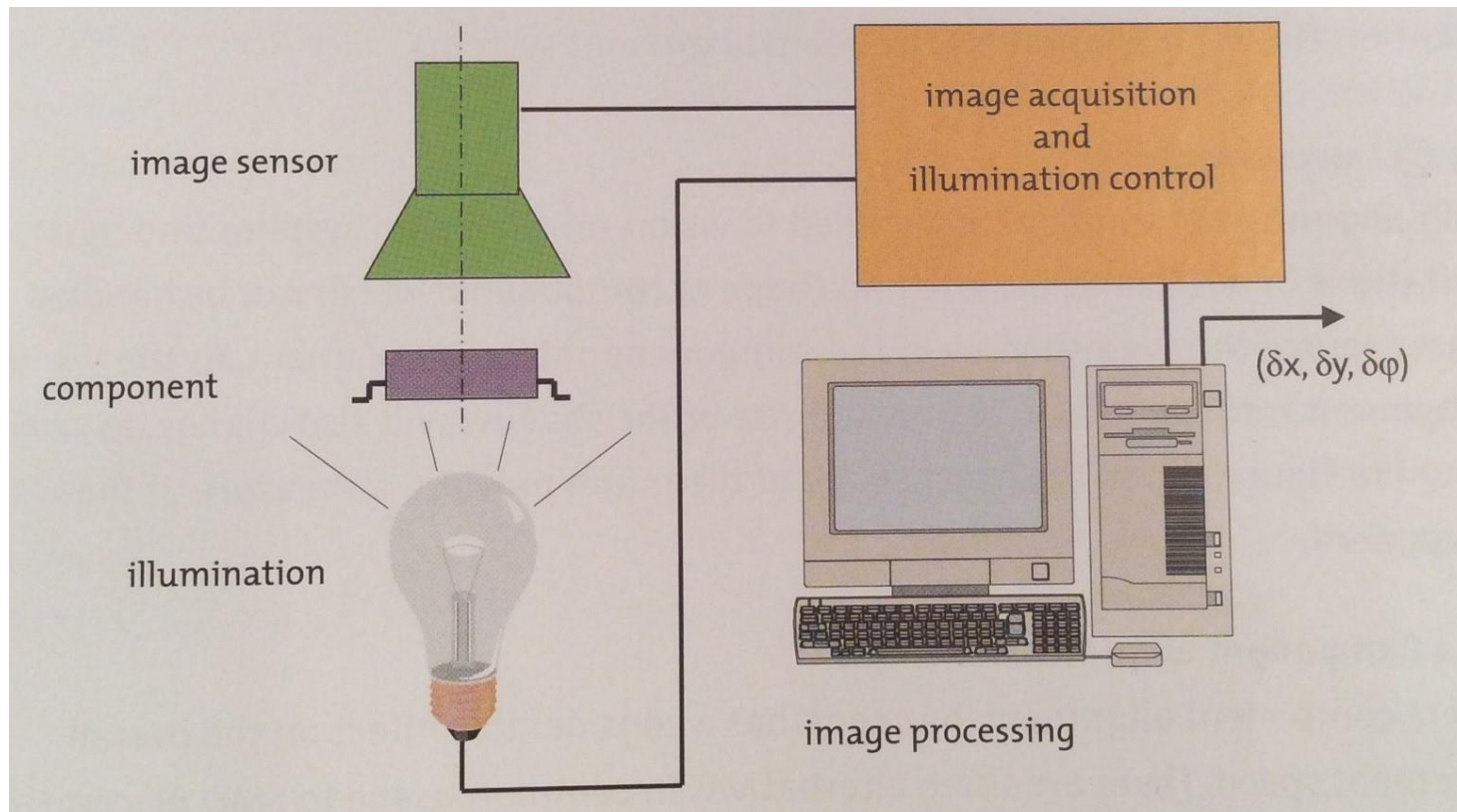
Lustų talpyklos

Waffle feeders, Wafer feeders



Komponento pozicionavimas

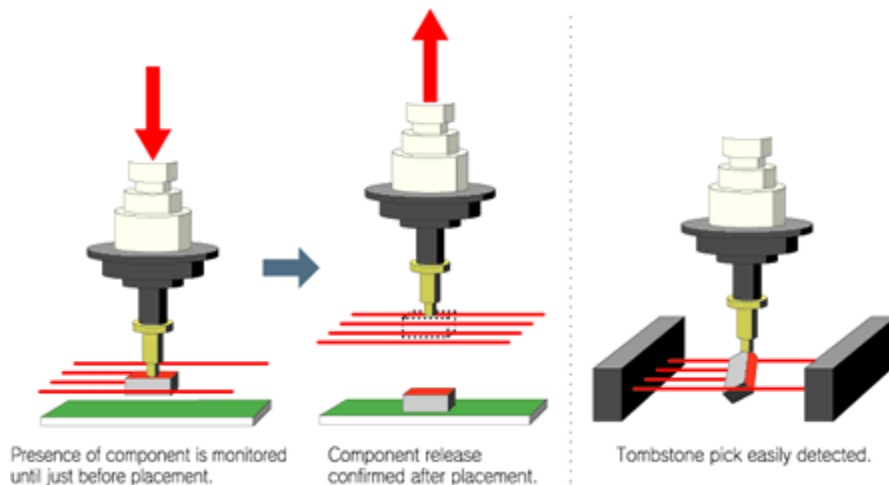
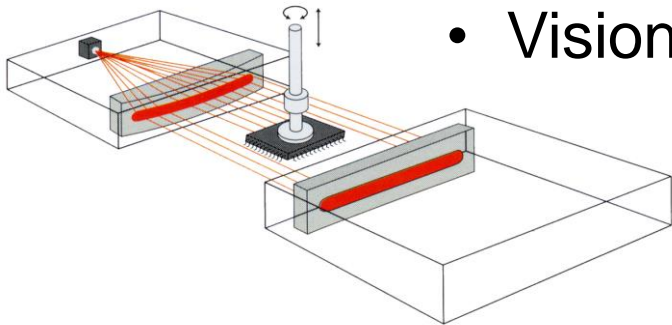
Component Positioning



Komponento pozicionavimas

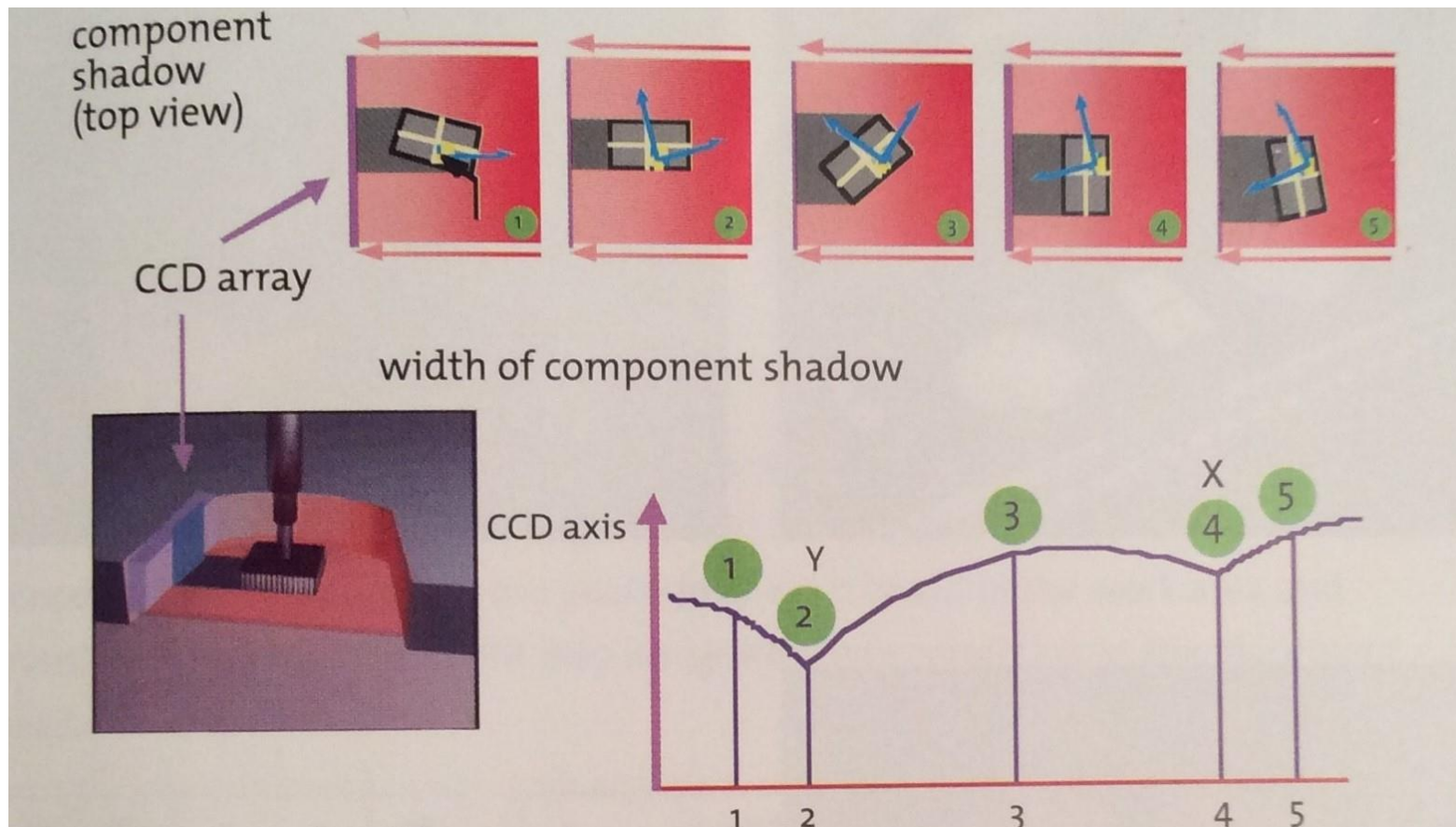
Component Positioning

- Stop and Go
- Vision on the Fly
- Vision on the Beam



Komponento pozicionavimas

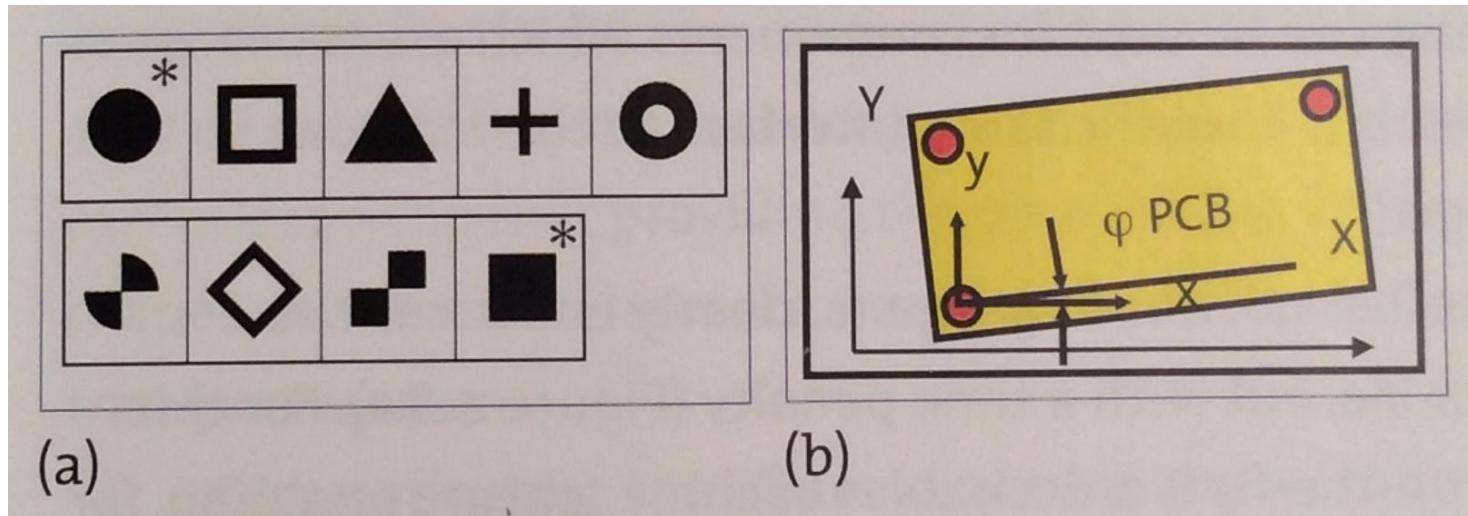
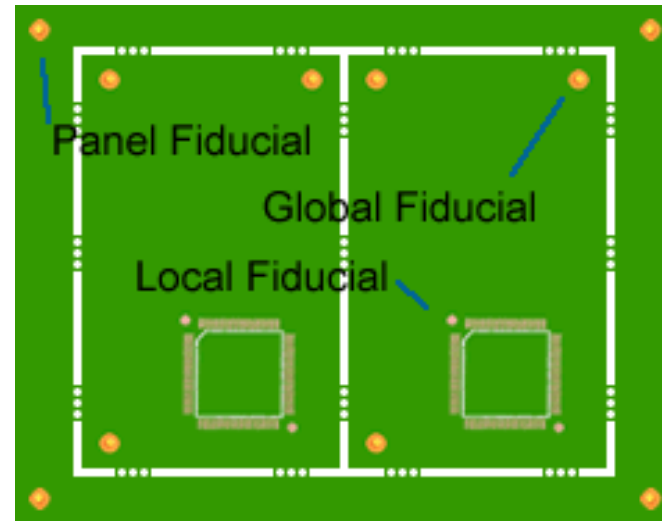
Component Positioning. Laser alignment



PCB pozicionavimas

PCB Alignment

- Global Fiducials
- Local Fiducials



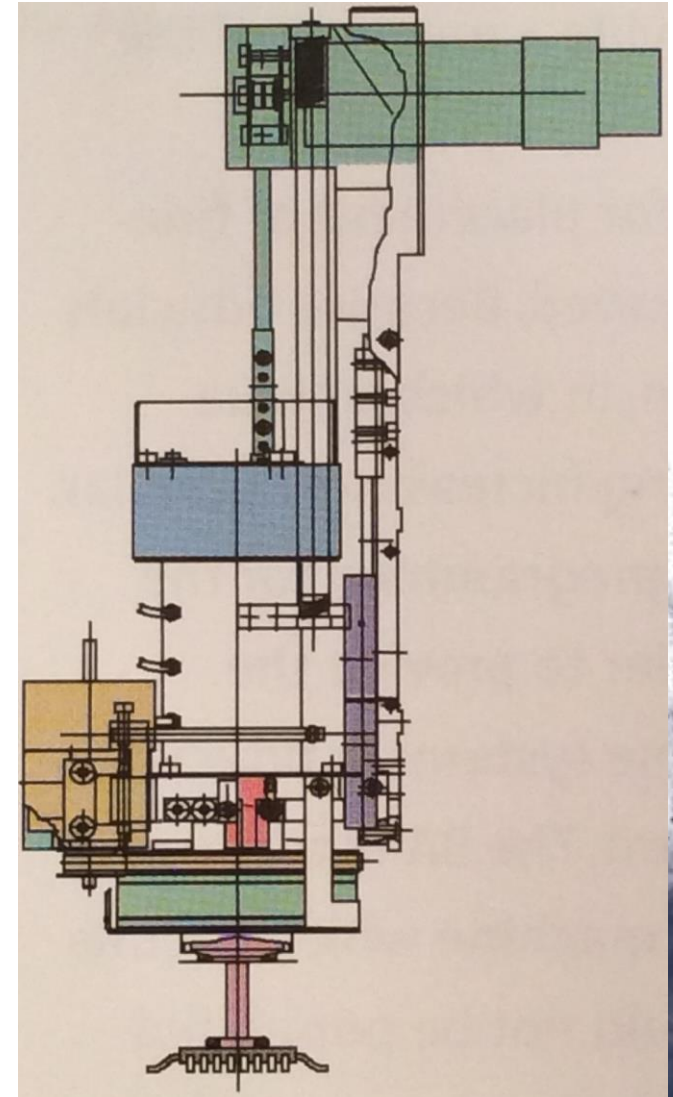
Pastatymo manipulatorius

The placement head

ktu

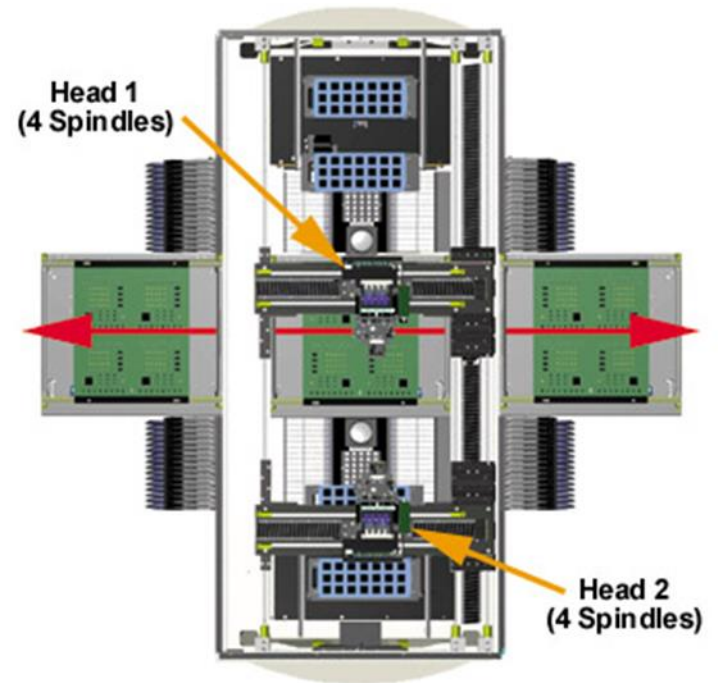
1922

- Vacuum nozzles
- Exchanging toolbits
- Telescopic nozzles
- Vacuum generators



Pastatymo manipulatorius

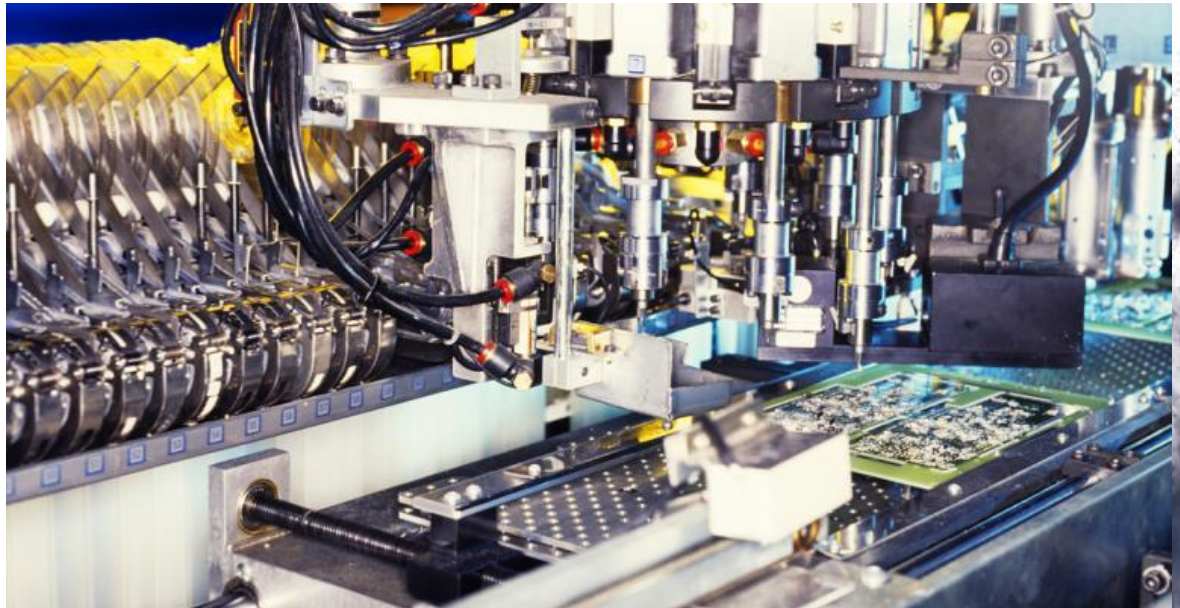
The placement head



SMT įrangos koncepcija

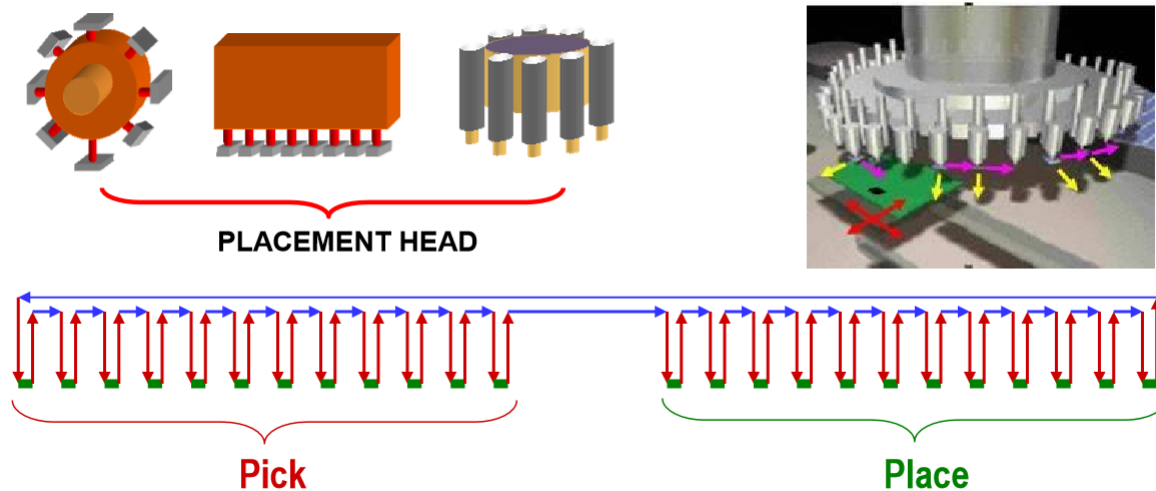
SMT Placer Concepts

- Accuracy and Flexibility
- Placement Cycle Time
- Cost per Placement CPP



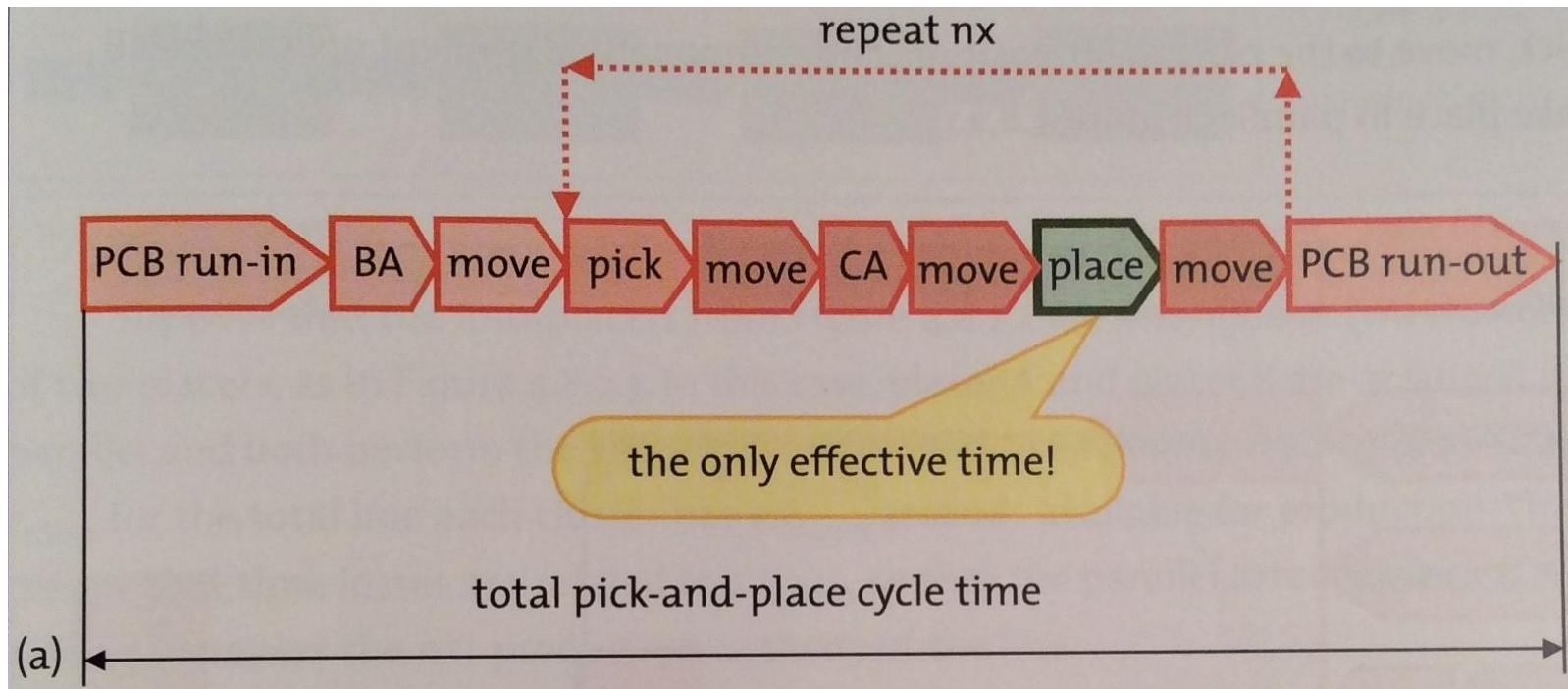
SMT nuoseklus surinkimo procesas

SMT Sequential placement process



SMT nuoseklus surinkimo procesas

SMT Sequential placement process



SMT nuoseklus surinkimo procesas

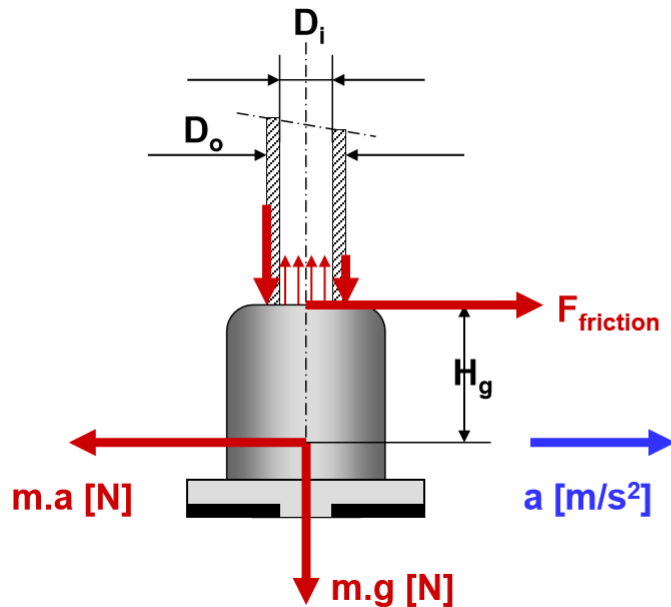
SMT Sequential placement process

- High accelerations / decelerations
- High forces acting on components risk of component shift or loss
- No component position monitoring between component alignment and placement position
- In most cases: no placement force control / no presence check

SMT nuoseklus surinkimo procesas

SMT Sequential placement process

Acceleration forces acting on pipettes



Risk of components shift:

- Acceleration force ($= m \cdot a$) > friction force

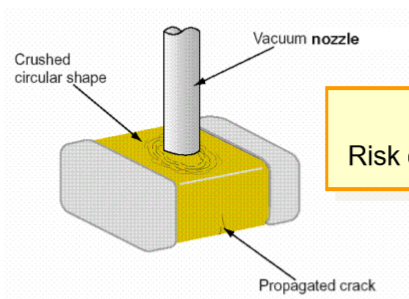
Risk of components break loose:

- $m \cdot a \cdot H_g > F_{\text{vacuum}} \cdot (D_o/2)$

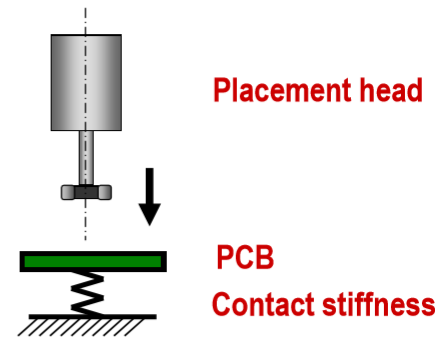
SMT nuoseklus surinkimo procesas

SMT Sequential placement process

Force control



No force control:
Risk of component cracking



Impact force is determined by :

- Velocity
 - High velocity → high impact force
- Contact stiffness
 - High stiffness → high impact force
- Impact mass
 - High mass → high impact force

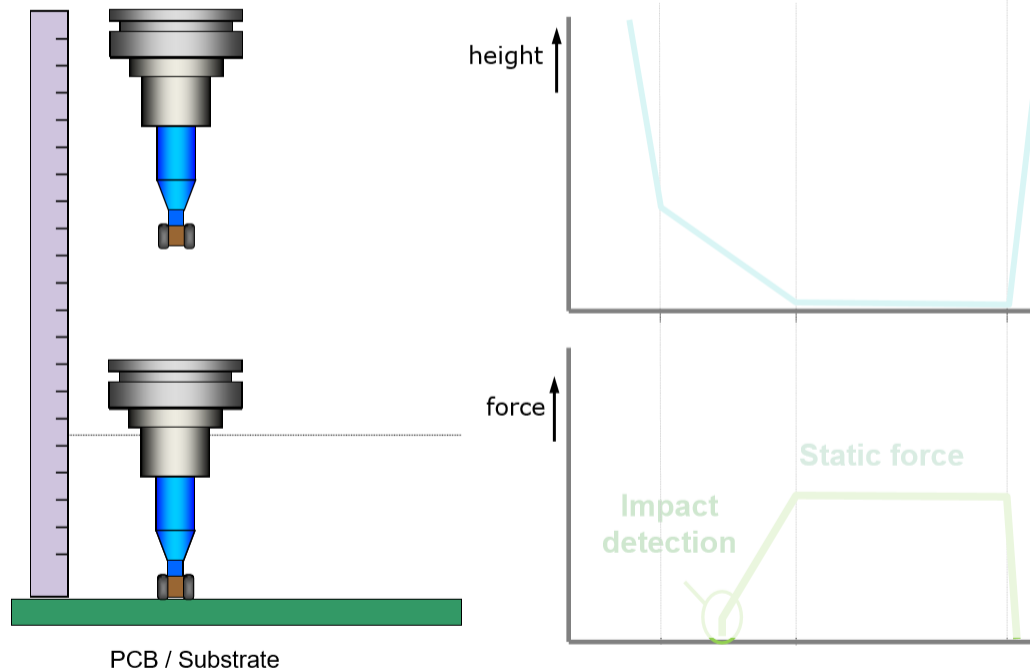
$$F_{placement} = F_{impact} + F_{static}$$

$$F_{impact} = v * \sqrt{m * k_{contact}}$$

SMT nuoseklus surinkimo procesas

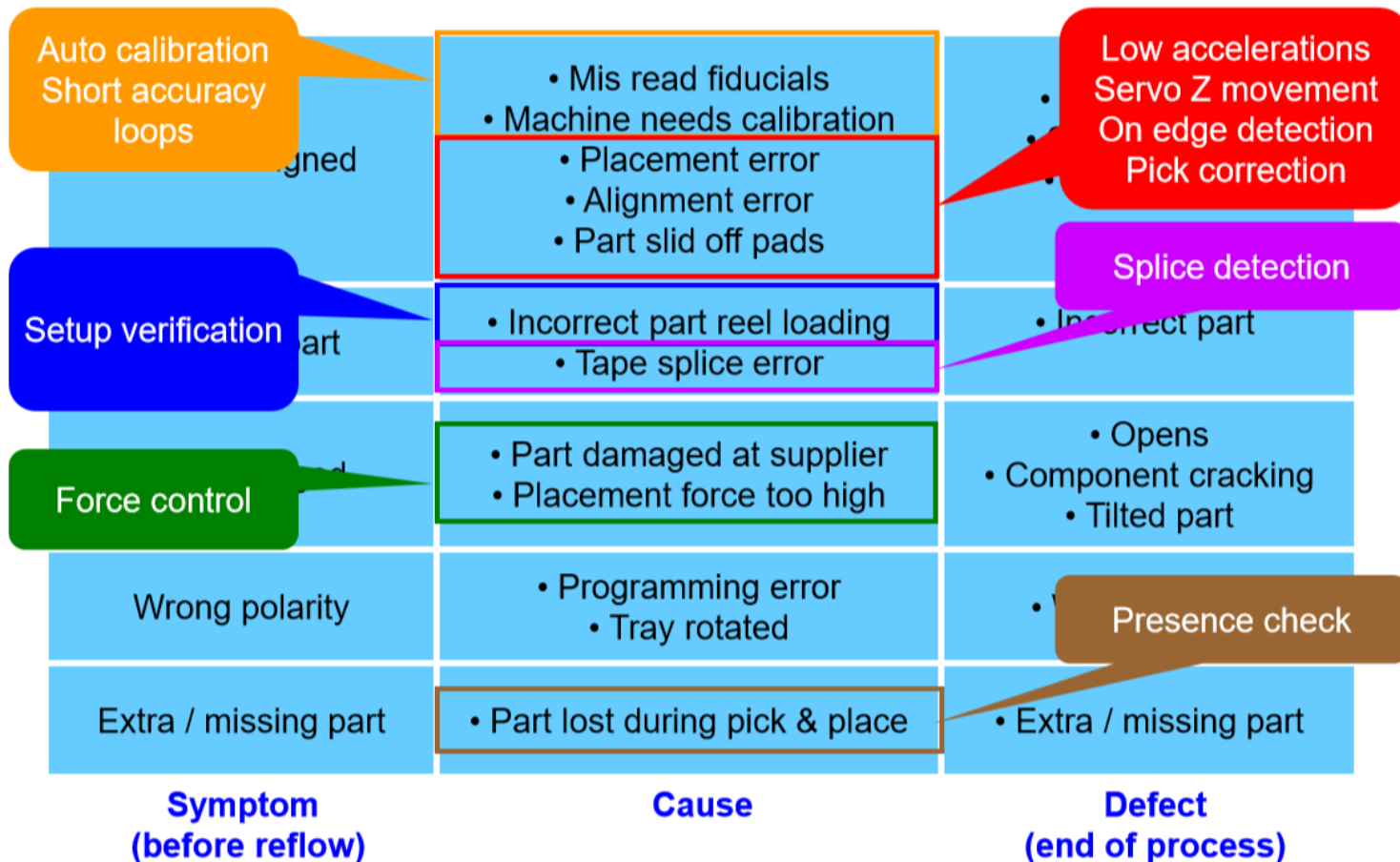
SMT Sequential placement process

Impact force control



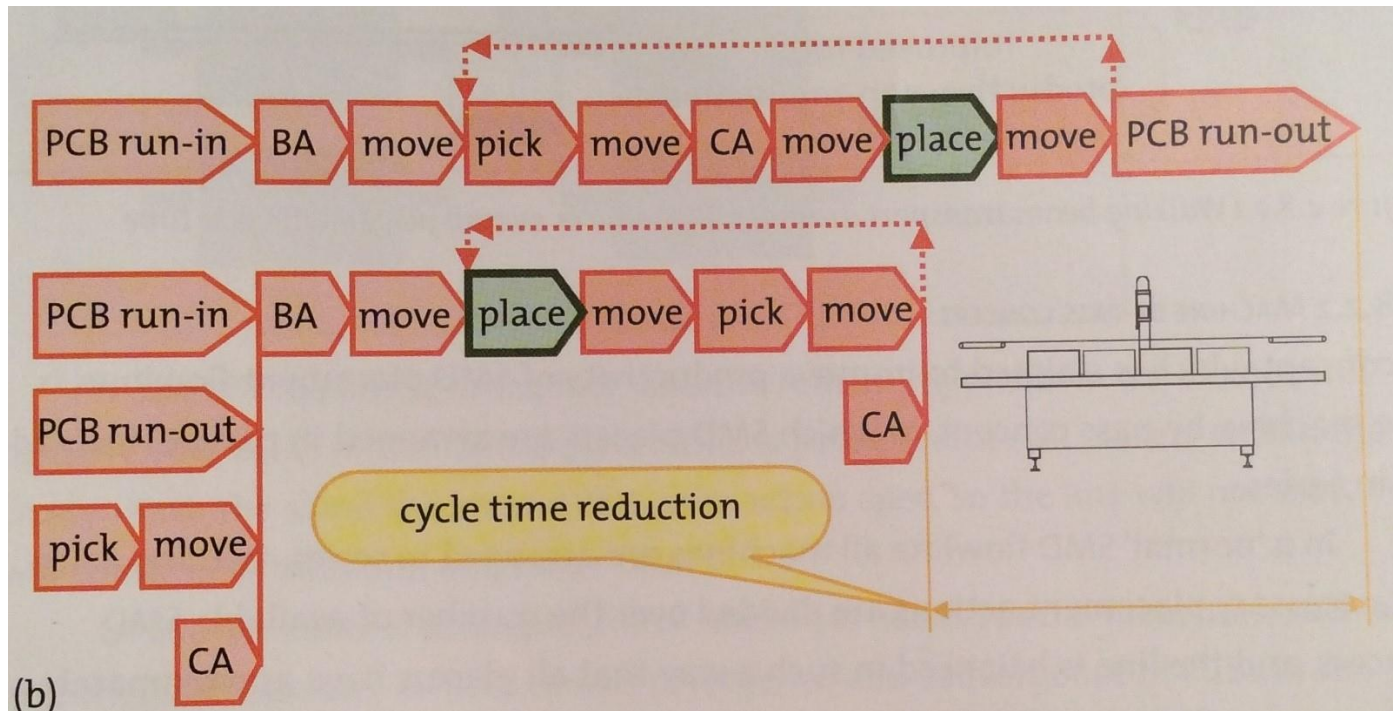
SMT nuoseklus surinkimo procesas

SMT Sequential placement process



SMT lygiagretus surinkimo procesas

SMT parallel placement process



SMT lygiagretus surinkimo procesas

SMT parallel placement process

Parallel pick & place principle

