



Etteplan

Repeatability and flexibility in packaging

Who are we?

Engineering
services provider

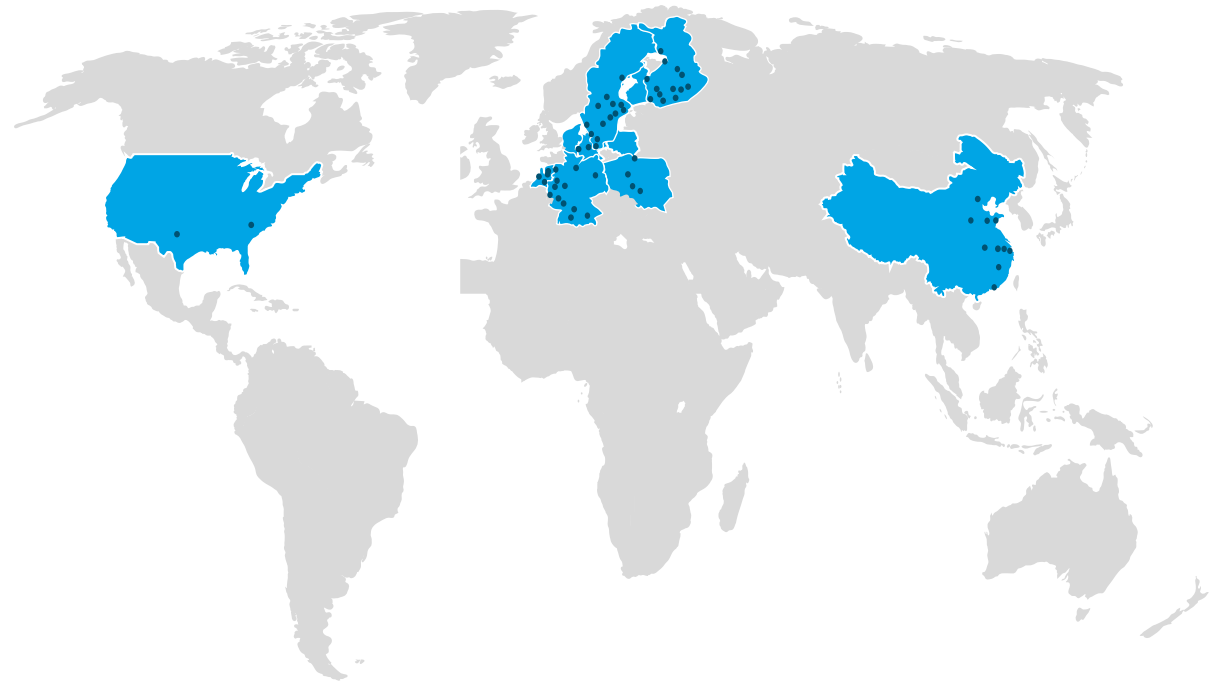
Offices in Finland,
Sweden, the
Netherlands,
Germany, Poland,
Denmark, USA and
China

350,2

REVENUE, EUR MILLION 2025

~ 4,000

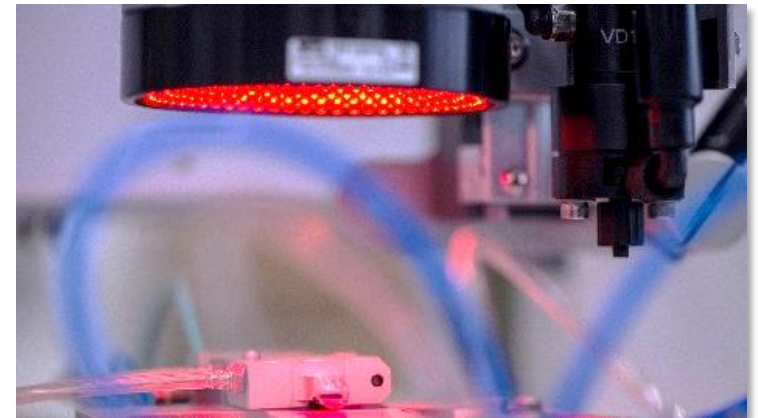
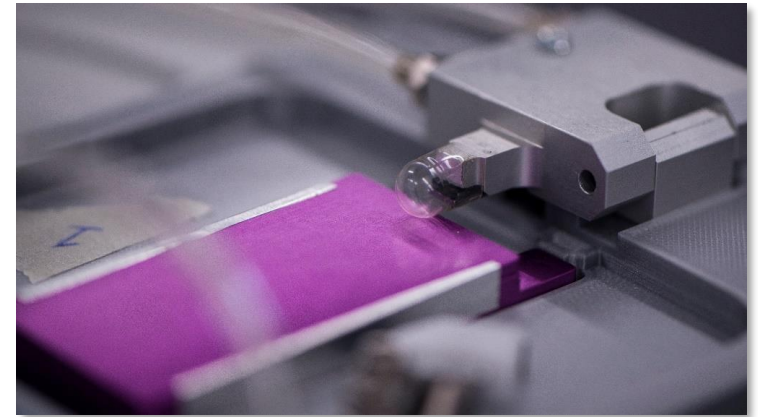
NUMBER OF PERSONNEL



What do we do?

Helping you to create lasting impact

High-tech system integrator for accurate assemblies and optimal production processes



Typical packaging examples for OEMs / R&D companies



R&D setup of non-integrated manual & actuated stages,

Typically, calibration/optimization is lengthy process; lost, altered, broken components etc.,

Impeding lead time & repeatability



Self-developed software interface(s)

Typically, 1-2 engineers developed the software, changes takes days/weeks & interferes with other work

Impeding lead time & repeatability



Samples are outsourced to manufacturers: 2+ months lead time

Impeding lead time

Typical example of contract manufacturer / packaging foundry in photonics



Machine / production line setup for specific type of application(s)/process(es)

Customer requests 10 samples, changes to machinery required

Impeding large cost / sample, lead time due to process optimization etc

Our solution

Etteplan

Modular Machine
Platform

WITH

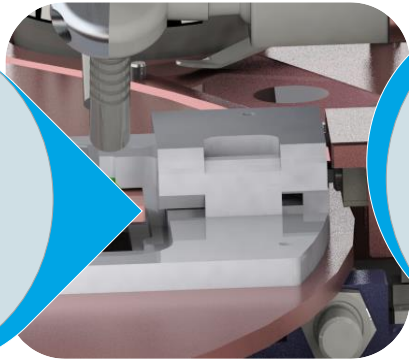
Flexible Production
Solution



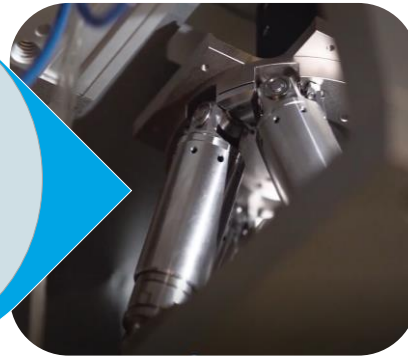
Powered by **PI**

Highlights photonic assembly functions and modules of our Indigo machine

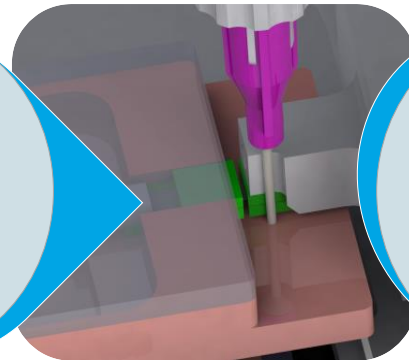
Mating of standard optical connector and gripper technology



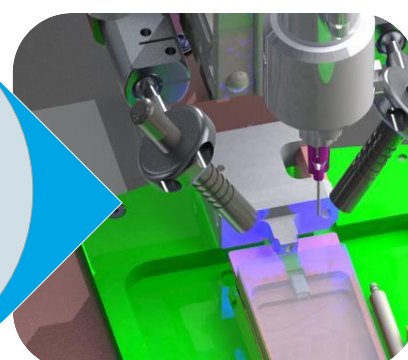
Active alignment



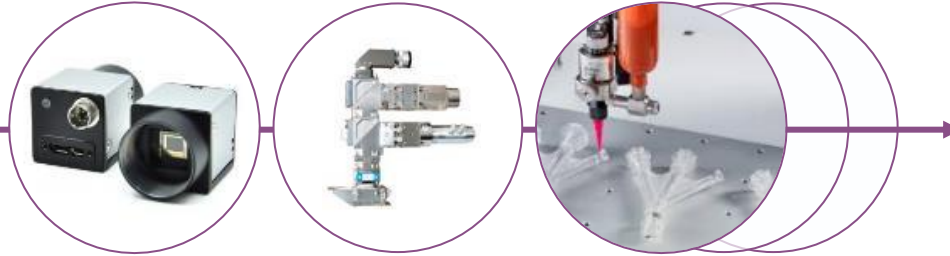
Automatic Dispensing



Automatic curing



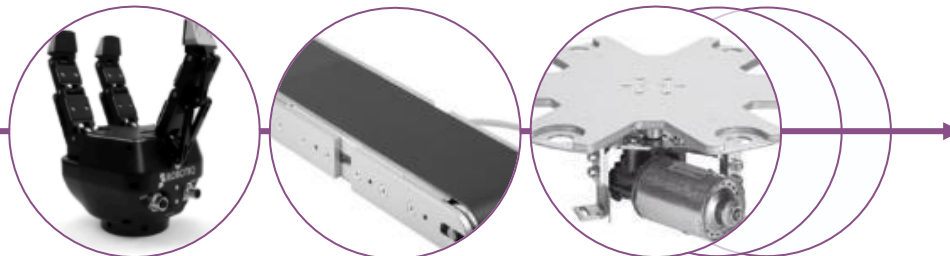
PROCESS MODULES



MOTION MODULES

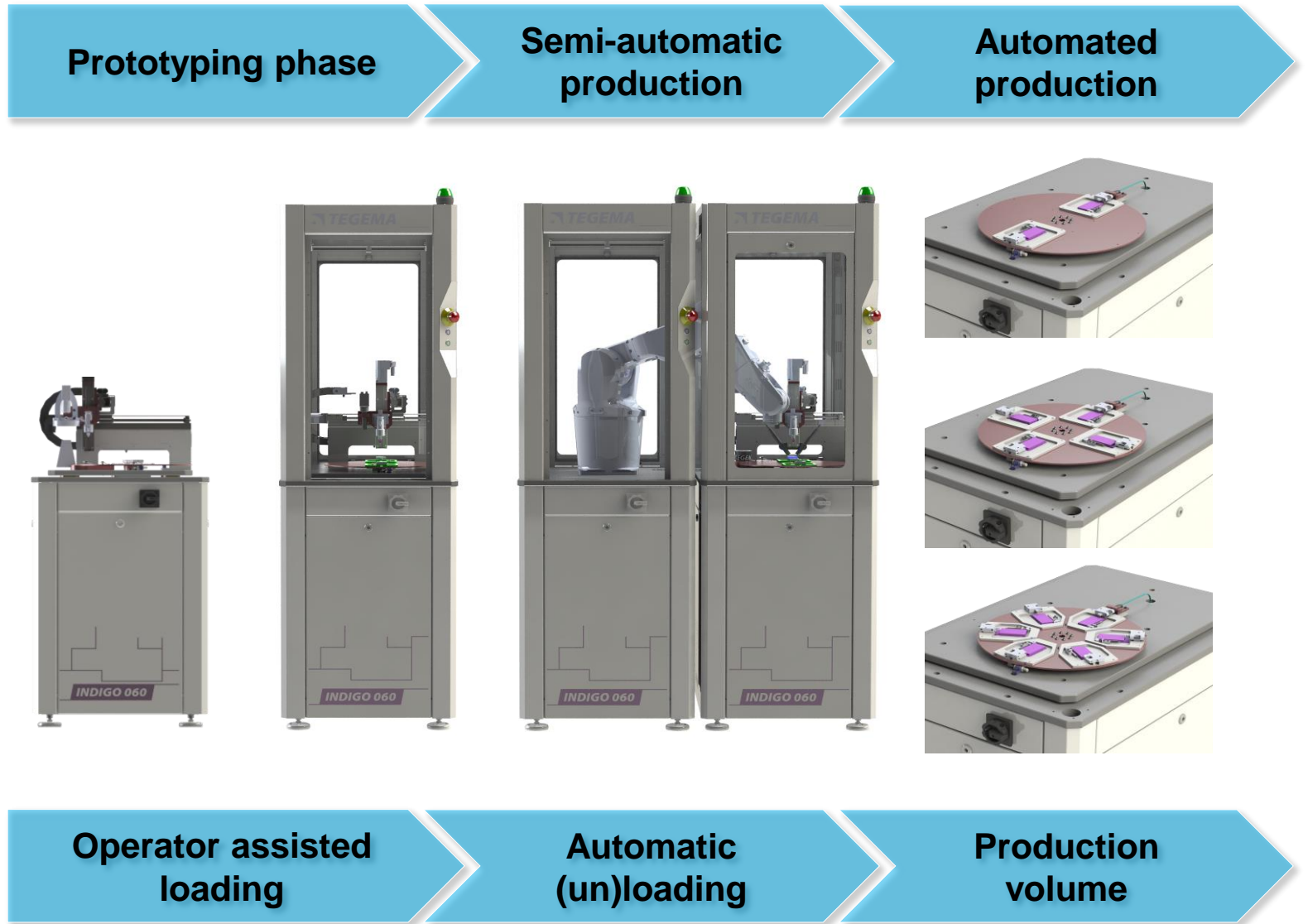


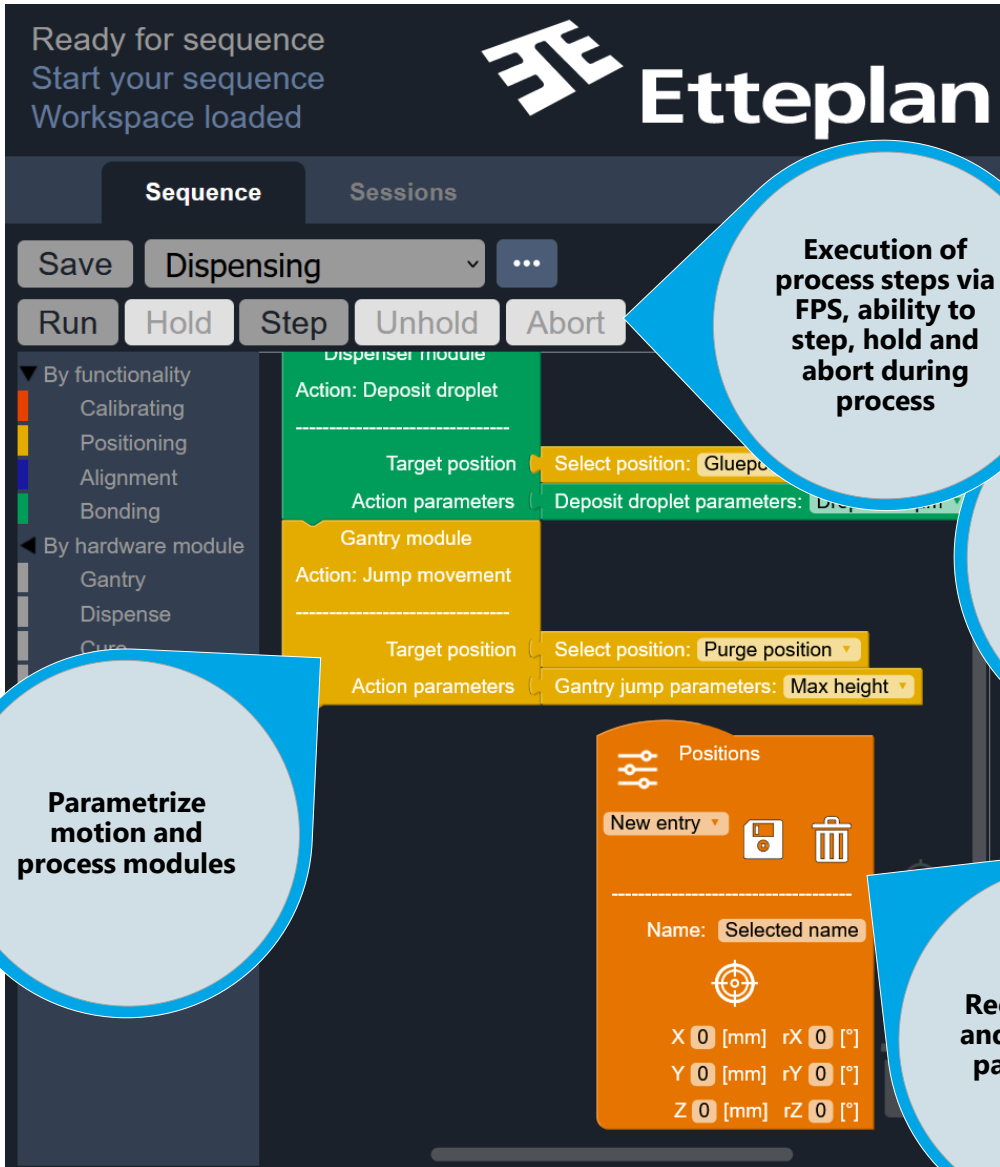
LOGISTICS MODULES



Modular system
grows with your
production
volume
requirements

From piece-by-piece
to mass
manufacturing



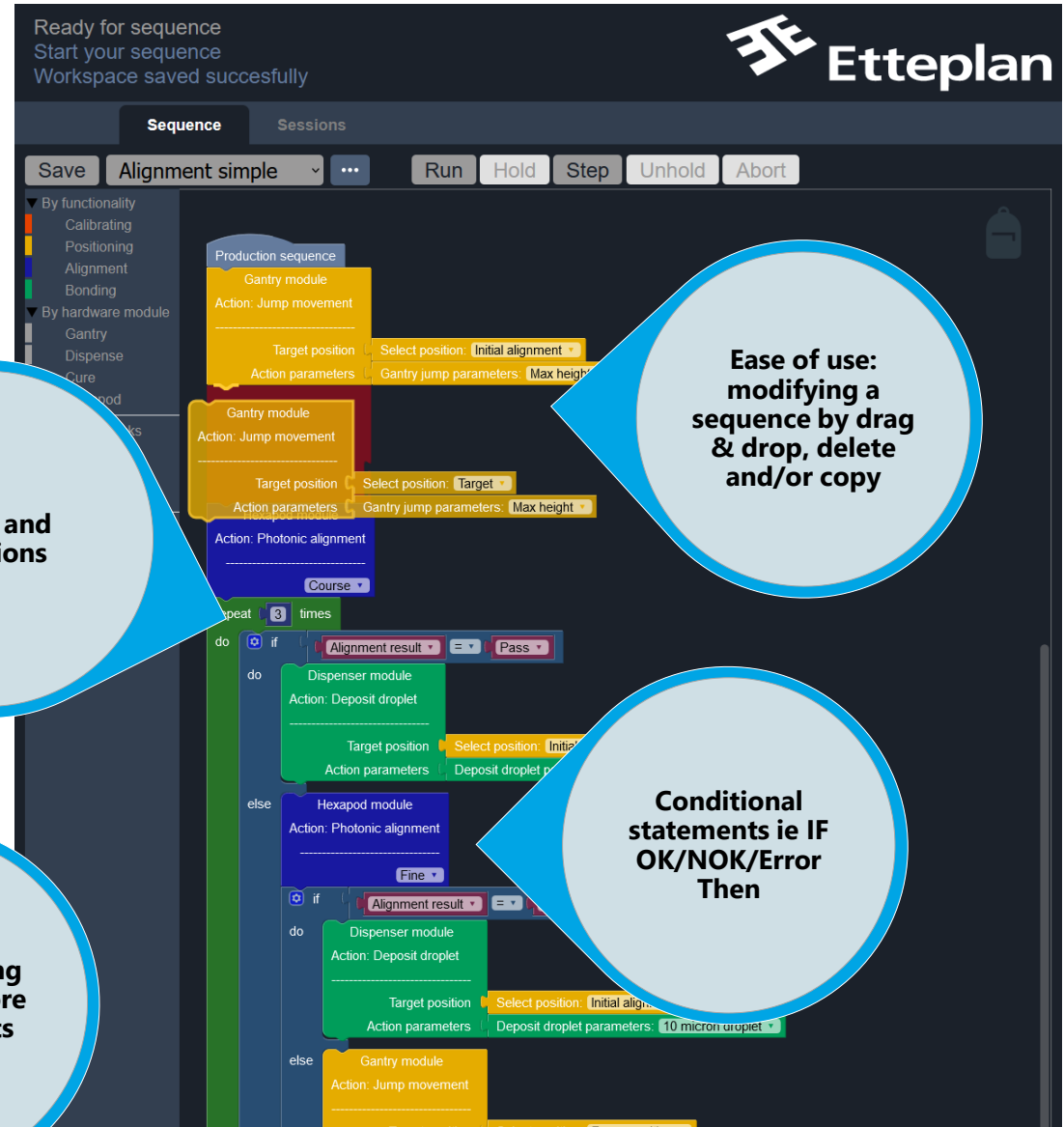


Parametrize motion and process modules

Execution of process steps via FPS, ability to step, hold and abort during process

Loops and iterations

Recipe handling and save/restore parameter sets



Ease of use: modifying a sequence by drag & drop, delete and/or copy

Conditional statements i.e IF OK/NOK/Error Then

Equipment capability test used with FAU and 10x SSC + 15x aligned with 1 SSC

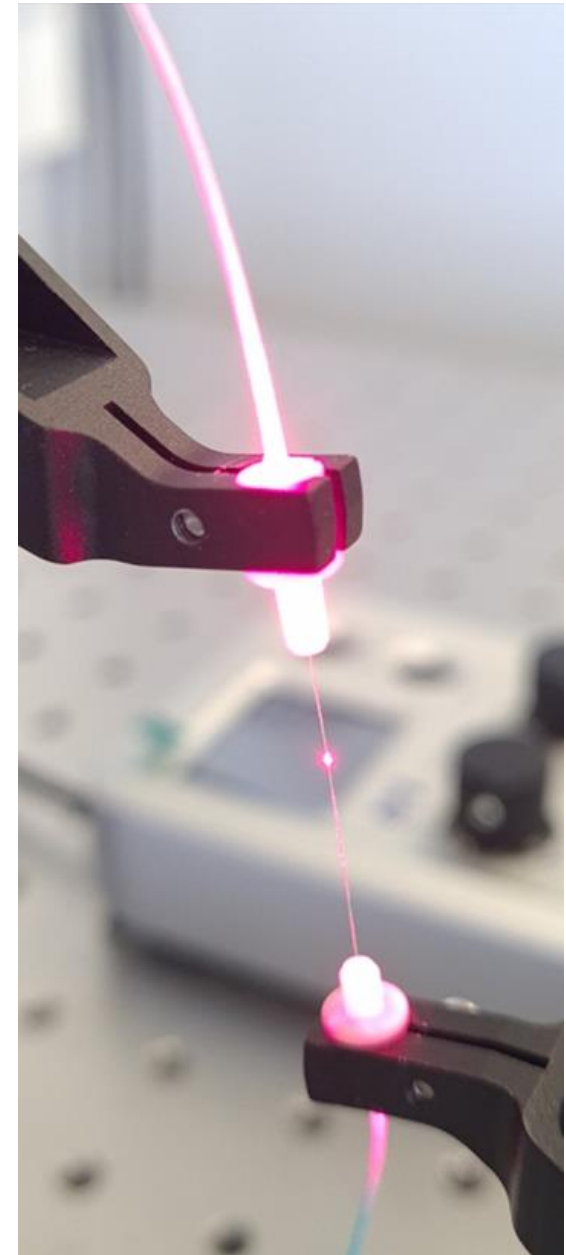
The equipment capability is determined by the following procedure:

Procedure

- 1x FAU is loaded in the machine and connected to the light source
- At least 10x different SSC are loaded in the machine (randomly selected)
- The FAU with SSC is 1x loaded in the machine and 15x aligned
- Channel loop A is selected as master, Channel loop B is slave

Data logging:

- After each alignment the optical coupling value [V] is noted

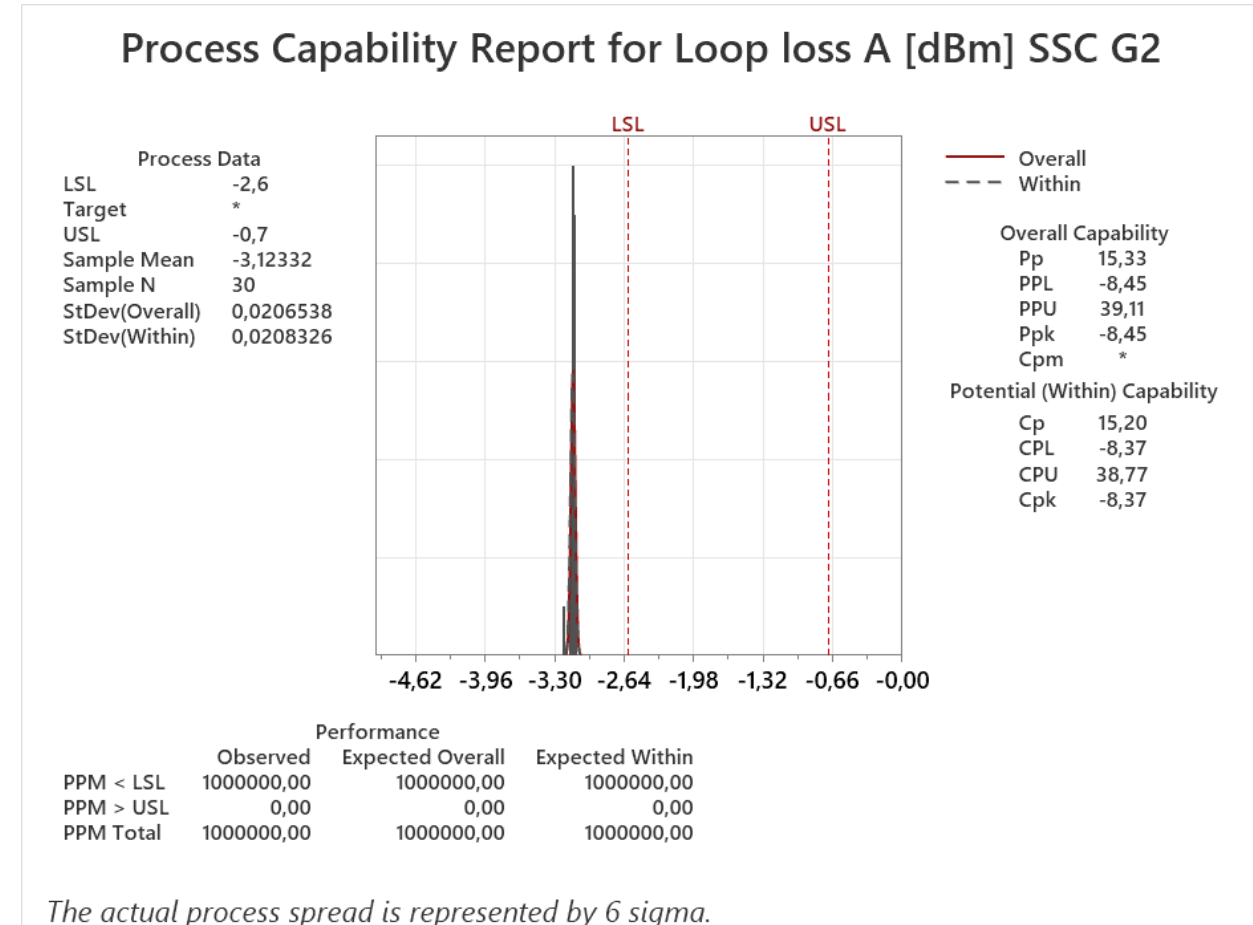


Machine capability for 1 SSC

Data observations

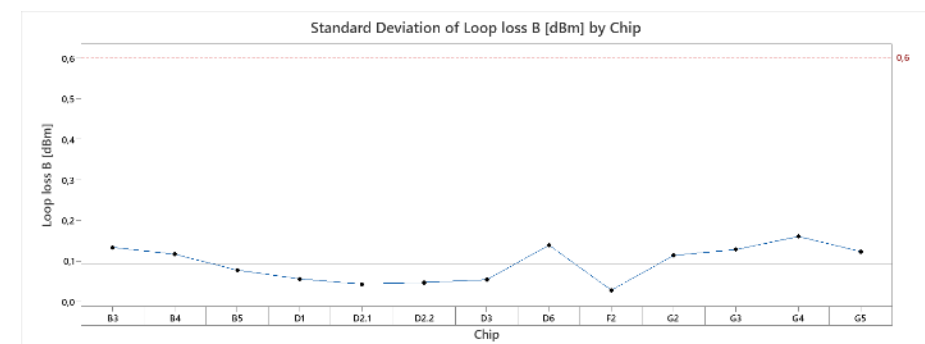
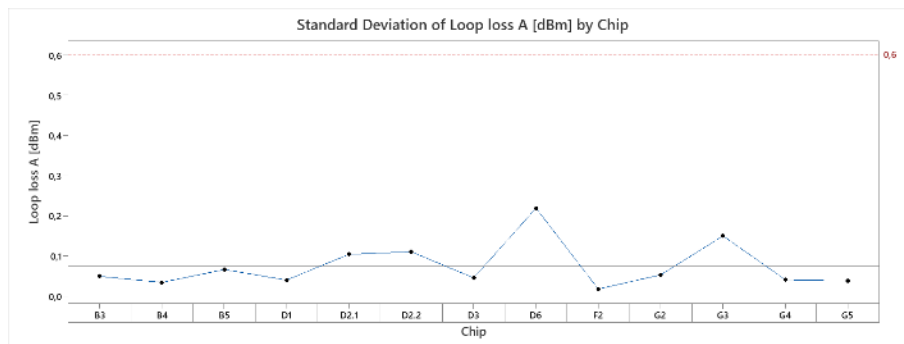
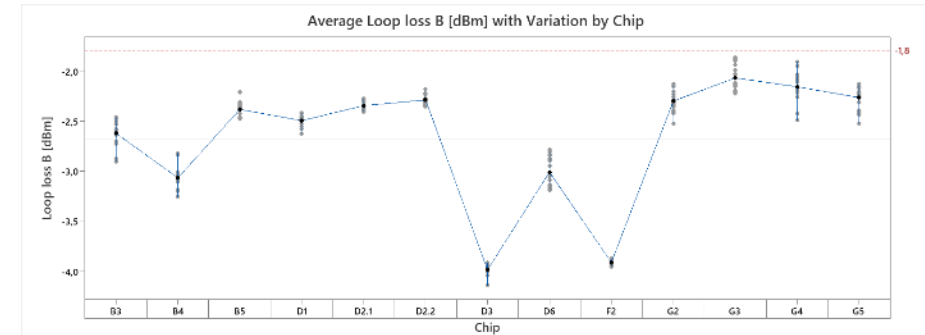
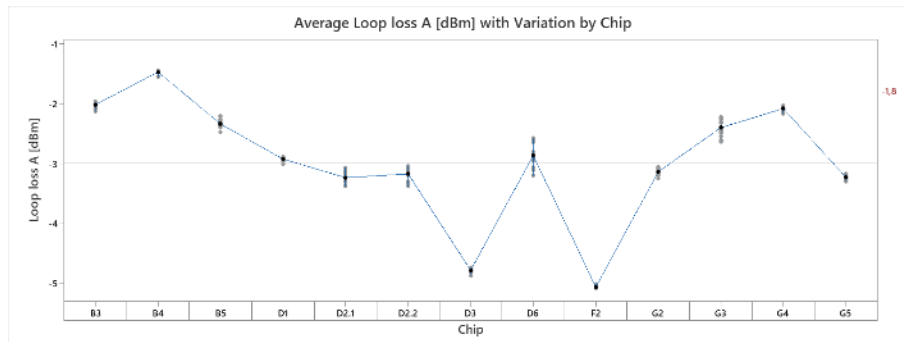
- Actual average of alignment is outside the specification limits
- Standard deviation of repeated alignment is about 0,02
- The potential equipment capability of alignment is well above Cpk 2*

*A Cpk figure well above 2 indicates a high reproducible alignment capability of the equipment



Alignment results mean and deviation by chip

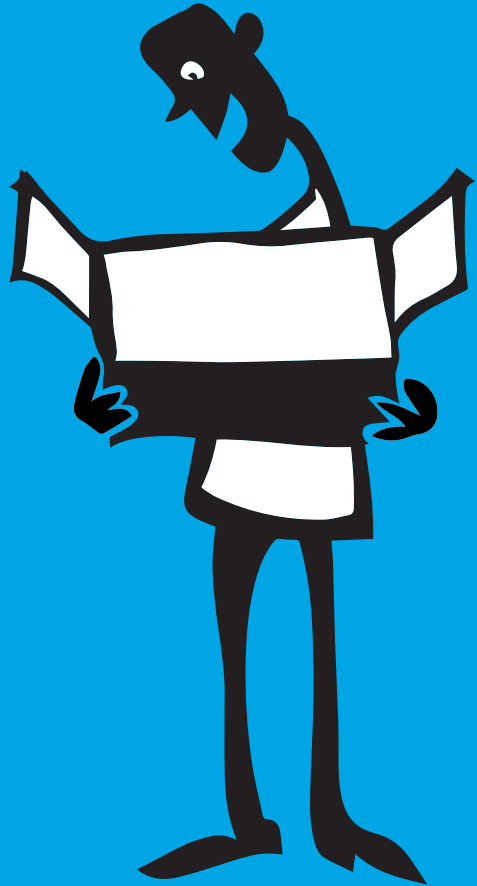
- Overall on average the coupling efficiency below the target average of -1,8 dBm
- Overall the standard deviation of repeated alignment is well below the target value 0,6



Observations and conclusions

- The standard deviation of alignment is low within a SSC, indicating high capability of equipment and tools
- Based on the low variation of coupling loss, the machine is capable to find and optimize the position of FAU to SSC that leads to the lowest coupling loss

In summary



Flexibility

- **Modules** can be interchanged, added
- Equipment **scalability**: start small manual system for proto to full auto production
- **Visual programming** to change production process quickly

Repeatability

- Industrial system, consisting of **proven technology** from known OEMs
- **High machine capability** as indicated
- **Software** to assist on reliable reruns of applications

Future applications & challenges

- Investigations and tests for **front-end assembly with active alignment**:
 - Flip-chip or pick-place components like photodetectors/laser diodes in a cavity, following active alignment and subsequently bonding (technology TBD)
 - **Looking for collaboration with other product OEMs or developers who see benefit in their (future) product / production process with such process technology**
- Expansion of bonding competences;
 - Currently, Etteplan is mainly focused on dispensing of epoxy
 - Looking for **partners** who can help in development of **laser (micro)welding** and
 - **Interested parties who seek for equipment manufacturer** with laser welding and can make use of benefits of our machine platform

Together we make light work



Etteplan