

# Etteplan Indigo Photonic Assembly Platform

**A modular machine platform that enables a breakthrough  
in photonics assembly speed**

Integrated photonics technology is the future. It transports data faster, over longer distances and consumes significantly less electrical power. Despite all the developments in these optical applications, the growth of integrated photonics is hampered by the high investment cost of essential infrastructure for producing these applications.

- FAST
- ACCURATE
- MODULAR
- COST EFFECTIVE



## A breakthrough in cost and cycle time

We have developed a fast, accurate, modular machine platform for the assembly of microoptical elements, to fill in this missing link. The result is a production platform that is capable of aligning two small optical elements with sub-micron accuracy. It has a short cycle time - up to ten times shorter than current solutions - and is modular, in order to meet the requirements of the various optical applications. This will significantly reduce your packaging cost and thus the cost price of photonics devices. The modular building block design allows for usage in R&D (start-up) environments, enabling accurate assembly of optical elements at relative low investment cost. If the production volume increases, the system can be reconfigured by simply adding modules to become a fully automated assembly solution.

## Versatile assembly platform

Photonic assembly requires high precision alignment of two optical elements, optimized to its specific performance. The core of the machine platform is ultra-fast, accurate, active alignment by which the alignment of the optical components is optimized for perfect coupling efficiency. This capability combined with lexible micro gripper technology and accurate bonding technologies, yield to a versatile assembly platform suited for a wide range of optical assemblies.

## Process development included

We develop our production machines together with a solid assembly process, that fits your product requirements. During the project life cycle, the maturity of the product, process and machine increases. During these phases, information is shared between product, process and equipment to ensure that the interface between these key aspects are represented.

- **FAST:** < 30 sec record-breaking cycle time for photonic assembly
- **ACCURATE:** 17 urad typical 0.02 dB (application dependant)
- **MODULAR:** configurable to the application and production requirements
- **COST EFFECTIVE:** Good return on investment, low maintenance cost
- **FLEXIBLE:** easy to modify for running several applications
- **COMPLETE:** the machine comes with a developed process
- **SMALL FLOOR SPACE:** < 1,1 m<sup>2</sup>
- **CONTROL SOFTWARE:** HMI easy to use, to develop and teach applications

## Modular

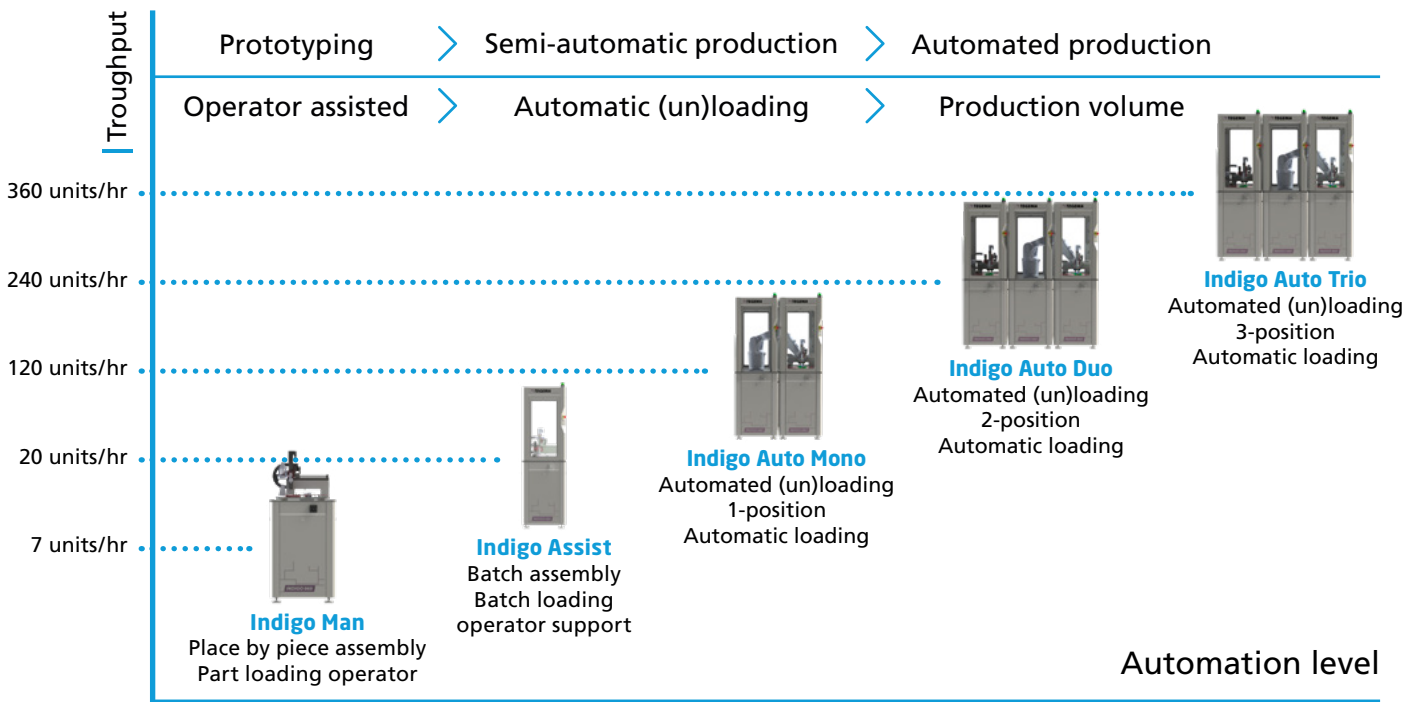
The platforms' unique modularity is a stepping stone approach for growing along with the production volume demand, from research phase to fully automatic production without having to invest in new equipment. The Indigo Man provides a solution for piece by piece assembly in an R&D environment. The Indigo Assist provides a solution for low volume production, where the operator loads the parts and the assembly is automated. When production volumes increases, the Indigo Assist can be upgraded to TEGauto by simply adding a loading and unloading unit from either tray loader or conveyor system.



# Photonic device assembly

Etteplan Indigo product line is an assembly solution for operator assisted, semi-automatic to fully automated production of photonic devices. A solution where two optical components needs be aligned and bonded within ultra-precision. The machine platform can be modular configured for applications for chip to chip alignment, lens to chip, optical fiber to chip, and many others.

'Growth of integrated photonics hampered by a missing link in the assembly chain.'

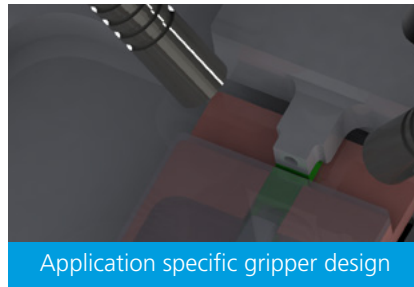


'Very compact, very well thought out and a lot faster. We look forward to installing the first system.'

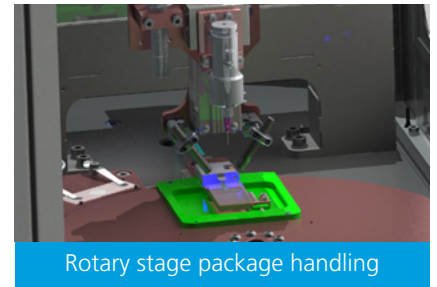
Pim Kat, CEO, Technobis

## Key features

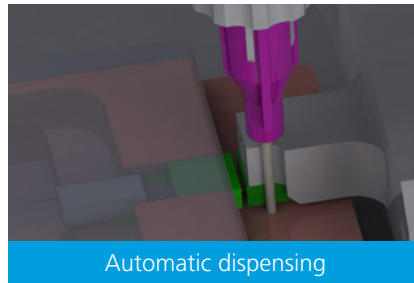
- Automatic photonic device assembly  
Sub micron accuracy (< 100 nm application specific)
- Excellent Price performance ratio
- Cycle time < 30 sec (fully automated)
- Small footprint 1,1 m2
- Flexibility (quick change over application specific tooling)
- Fully manual to semi-automated machine versions
- Configurable closed-loop active alignment
- Data/media logging and reporting function (SPC)
- Modular machine platform allows in filed retrofitting during service life
- Individual machine configurations with application specific process modules
- Bonding technologies, adhesive bonding (UV curing, Thermal curing), soldering, solder, reflow, laser welding, thermal compression



Application specific gripper design



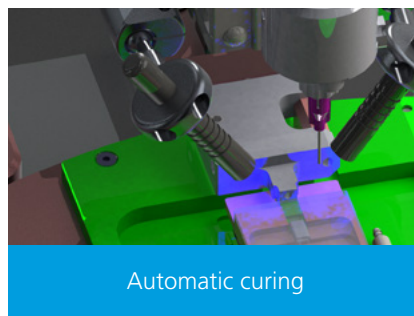
Rotary stage package handling



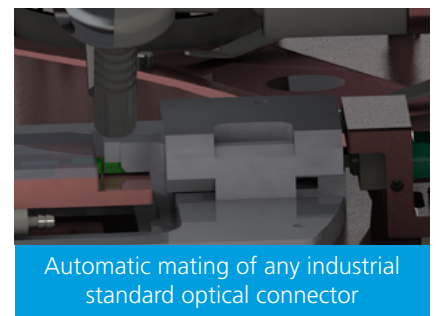
Automatic dispensing



Automatic part (un)loading



Automatic curing



Automatic mating of any industrial standard optical connector

## Field of use

- Fiber Optic module assembly
- Micro lens assembly
- Photonic device assembly
- Camera module assembly
- Optical interconnect assembly for fiber optics and waveguides
- LIDAR assembly

## Part feeding and handling

- Manual placement by operator
- Automatic robot handler (parts terminated package)
- Tray loader
- Transport belt
- Application specific toolplate
- Optical fiber gripper standard
- Optical fiber rotational gripper (polarization direction)

## Process modules

- Alignment module 6DOF / resolution 2 nm / range 25 mm (single or multiple)
- Adhesive dispenser
- UV curing source
- Thermal curing source
- Soldering process module
- Laser welding module
- Analogue power meter
- Polarization meter
- Optical interconnect to all optical interconnect standards (manual or automatic)
- Machine vision for coarse alignment, collision prevention
- Probe unit to activate PIC for alignment process



Prototyping phase > Semi-automatic production > Automated production



Operator assisted loading > Automatic (un)loading > Production volume

## Modular-configurable

- Operator assisted solution
- Full automatic configuration
- Easy to swap or add additional process modules
- Daisy chain multiple systems in line
- Scalable, parallelizable
- Can be integrated in existing production lines

'I am very excited about the modular structure of Etteplan system.'

Boudewijn Docter, President, Effect Photonics



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