

# FLEXIT

## The high volume production line for Integrated Photonics

Photonic integrated circuits (PICs) play an essential role in finding and developing solutions to many of the world's critical problems, such as reducing energy consumption, improving healthcare, fighting food waste and meeting our continuous hunger for information. However, a generic solution for the assembly and packaging of photonic chips does not currently exist. The FLEXIT project, which runs from January 2022 to December 2023, therefore sees an opportunity to unite high-tech companies in the Netherlands and push forward this highly promising domain.

The FLEXIT project will enable this through the further development of the FLEXIT method to process photonic chips at an industrial level. Through a design tool for product development and the mapping of the entire digital chain, the project will also optimise all production processes in the supply chain. Ultimately, two demo products will be selected to test the supply chain according to a new FLEXIT product standard for mass production, through which manufacturing yield will rise, costs will be reduced and delivery reliability can be maintained for the foreseeable future.



### EUROPEAN UNION

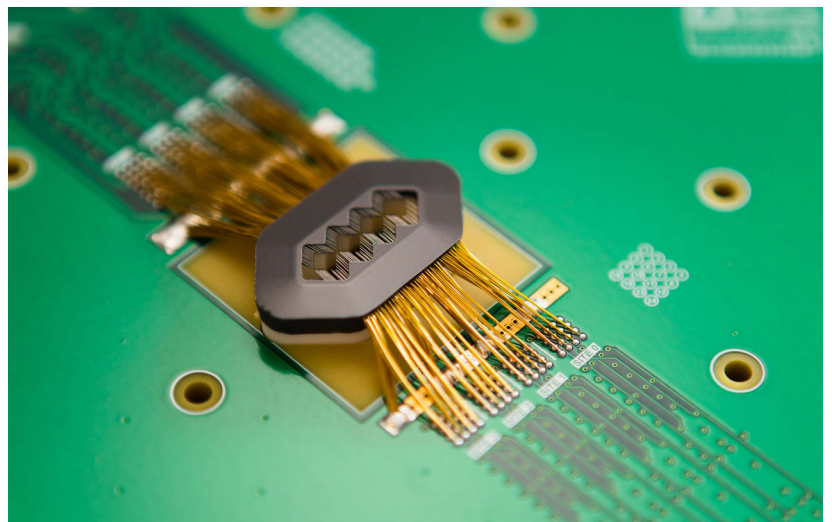
European Regional Development Fund.  
*Funded as part of the Union's response to the COVID-19 pandemic*



European Regional Development Fund

# Salland Engineering's test equipment development adds value to FLEXIT

As a partner in the FLEXIT project, Salland Engineering contributes 30 years of experience in test solutions for the semiconductor industry, including test applications, instruments to fill the gaps in test needs (such as radio frequency, digital cards, analogue instruments and power supplies) and, more recently, software tooling focused on test data analysis, test execution and configuration management. Their work is made for engineers by engineers, with a strong focus on decreasing test and processing times to enable volume testing and reduce the costs of testing.



## The test technology ecosystem

The organisation of a project like FLEXIT requires a great deal of coordination both externally and internally. Within Salland Engineering, participation is taking place from the Instrument and Software Tool Development group, headed by Erik Kloekke. Project leader Armando Bonilla Fernandez is coordinating the instrument and test setup development, which is being carried out by hardware, software and firmware engineers, while Johannes van Putten is leading the development of the software tools that are being created within FLEXIT.

As for wider collaboration with the other ten partners, the company can draw on prior experience working with research institutes, technical clusters and manufacturing and technology partners worldwide. Salland Engineering has a complete understanding of the test technology ecosystem that complements close cooperation with multiple stakeholders in this industry. This gives them the capability to offer functional solutions to test problems, focusing on engineering challenges similar to those confronted in the FLEXIT project. Salland engineers are fully able to read between the lines to fulfil expectations on increasing test capabilities with high parallel testing and quick and easy data analysis by adapting or designing software or instruments to match the needs of their customers and partners.

## Participation across the project

In concrete terms, FLEXIT sees Salland Engineering working with Chilas and VTEC to create an effective solution to validate their photonic parts. The first step is to focus on the test strategy and design of the testing on the demo devices, then to attempt to develop a test solution for diced chips, bars or wafers and evaluate them before assembly. Their participation also extends to:

- the selection and configuration of optical instruments to be part of the test rack for checking the demo products, which will be used within Salland Engineering's test runner (test sequencer).
- the development of electrical instruments that fill the gap for photonic integrated circuit (PIC) tests and are flexible enough to evaluate all other demo devices within the project.
- the creation of test plans and programmes for demo devices and software to administer them in the test runner.

As part of FLEXIT, Salland Engineering is also implementing DPlus, their in-house development data analysis tool that includes additional functionalities for data analysis and report creation and that can be stored in a manufacturing execution system (MES) like the FLEXIT-Factory tool by WorkFloor. This can be used to produce meaningful data representation for designers and the fabrication process. Version 1.3 of DPlus has now been released, allowing users to utilise comma-separated values (CSV) data files. This is more interactive and can create (semi-)automatic reports with charts and export statistical tables.

## The long-term value

Off the back of such efforts, several goals have already been achieved: optical instrumentation has been selected and is being configured to be used in the test programmes of the test runner, while a 16-channel PCI eXtension for Instrumentation Device Power Supply (PXI-DPS) is being developed. Based on the requirements of the project partners and a market analysis, this will evaluate the demo devices and future designs. Draft test plans have also been created and Salland Engineering is working with LioniX International on wafer-level measurements for electrical structures, such as lead zirconate titanate (PZT) actuators, to generate and analyse data before the evaluation of the end products.



As FLEXIT progresses, Salland Engineering is keen to further explore the principle of self-aligned fingers and facets alongside LioniX International and SMART Photonics, using this in an opto-electrical wafer prober concept to simplify wafer level testing for PICs. Alongside this, the company expects to build up knowledge on PICs measurement setups to offer Testing-as-a-Service (combining optical and electrical work) for photonic devices in the short term. Test solutions will be developed to evaluate the full speeds of devices that work at >100 Gbps per channel in opto-electrical configurations and DPlus will be used to process the test raw data generated. This will provide a better understanding of FLEXIT's coupling performance and help bring the added value of automated test equipment development to the other partners and to the project as a whole.

## FLEXIT project partners

### Chilas

Development and production of semiconductor lasers based on several materials with high power in combination with integrated technology.

### IMS

Development of production and assembly lines for hybrid microsystems with added value like lenses for smart phones, medical implants and microsystems.

### LioniX International

Develops and commercialises on silicium-nitride (SiN)-based waveguide technology (TriPlex) for a variety of applications and is leading the photonic sector.

### PHIX

World-leading packaging and assembly foundry for Photonic Integrated Circuits (PICs), building optoelectronic modules based on all major PIC technology platforms in scalable manufacturing volumes.

### Salland Engineering

World-leading in test technology and engineering, specialised in solutions and services to improve efficiency and quality testing at semiconductor manufacturers.

### SMART Photonics

The first "pure-play foundry" in the area of InP PIC production and on the verge of scale up.

### Synopsys

Supports the project with design software and tools for the development of photonic ICs.

### VTEC

Development and realisation of lasers and sensors for various photonic platforms. Assembly and packaging is taken care of including fibre connections.

### Workfloor

Supplier of factory data collection systems.

### High Tech NL

The national branch association for the Dutch high-tech industry. Its Semiconductors cluster is fully focused on the vast and strong semicon industry, operating as a 'single point of contact' in all steps of the value chain, driving and stimulating (international) cooperation, and initiating and facilitating (international) innovation and crossover projects.

### Berenschot

A consultancy company that supports High Tech NL with grant proposal writing and project management and facilitates cooperation between companies and the growth of ecosystems.