

The logo for SmartEEs features a stylized, multi-colored graphic resembling a wing or a signal waveform, transitioning from blue to red. The text "SmartEEs" is positioned to the left of this graphic, with "Smart" in red and "EEs" in blue.

SmartEEs

# Technical marketplace offering

A close-up photograph of a hand wearing a blue nitrile glove, holding a small, rectangular printed circuit board (PCB) with intricate circuit traces. The background is a dark, textured surface, possibly a person's arm in a dark shirt.

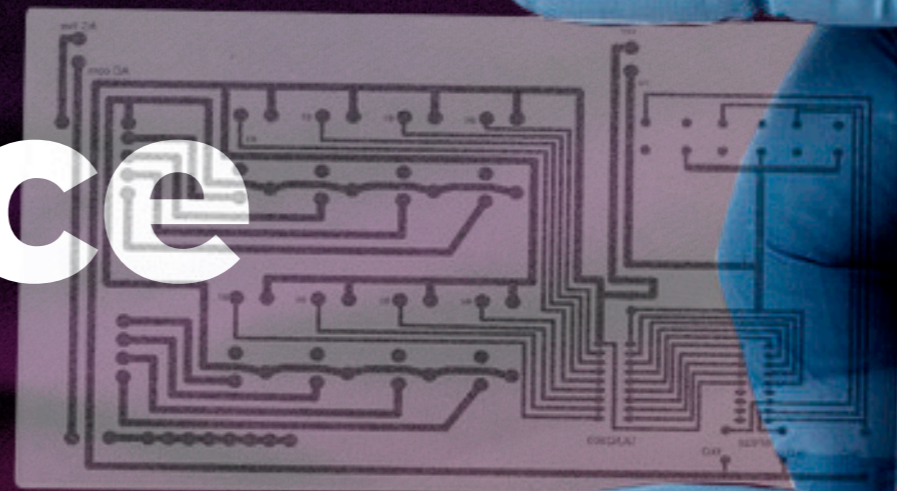
Flexible  
and Wearable  
Electronics  
(FWE) products,  
prototypes  
and services

The logo for SmartEES, featuring the word "SmartEES" in a sans-serif font. "Smart" is in red and "EES" is in blue. To the right of the text is a stylized graphic of a wing or a flame, composed of overlapping curved lines in shades of blue and red, all contained within a white rounded rectangle.

SmartEES

# Technical marketplace offering

Flexible and Wearable  
Electronics (FWE) products,  
prototypes and services





## Smartees2 at a glance

SmartEEs2 is a European acceleration program dedicated to **helping innovative companies digitise their businesses** thanks to **flexible and wearable electronics (FWE) testing, experimentation and manufacturing support.**

SmartEEs2 is one of Europe's **Digital Innovation Hubs (DIHs)**, which are ecosystems that consist of SMEs, large industries, start-ups, researchers, accelerators and investors. DIHs aim at creating the best conditions for long-term business success for all parties involved. They help ensuring that every company, small or large, high-tech or not, can grasp the digital opportunities.

As a Digital Innovation Hub (DIH), the project is **aligned with the Smart Anything Everywhere (SAE) initiative**, supporting product and service innovation through digital technologies.

# Objectives

1

## Easy Access to Digital Innovation

Easy access to the latest FWE-driven digital innovations and experimentation facilities provided to early adopters and new non-digitalised users in order to support them in gaining competitive advantage through early technology adoption.

2

## High-Value Services to Innovative Companies

High-value affordable services to help EU companies in digitalising their business thanks to FWE technologies testing, experimentation and manufacturing support.

3

## PAN – EU Collaboration Network For Flexible And Wearable Electronics

High-value affordable services to help EU companies in digitalising their business thanks to FWE technologies testing, experimentation and manufacturing support.

# Technical Marketplace

Smartees2 has built a **marketplace with different typologies of innovative technological solutions** in the field of printed electronics, organic photovoltaic, flexible displays and electroluminescent lighting for applications in multiple sectors.

The marketplace offers **150 services**, which can be classified into **23 products**, **44 prototypes** or **88 technical services**.



## Products

Components or systems commercialised. They are available for ordering multiple pieces and liability is assumed by the provider/seller. Necessary certification of the product was obtained (e.g. CE certification).

Among them it could be highlighted innovative products like OreTech's gold electrodes or the antimicrobial lighting surfaces, provided by LUMENASAFE, all of them useful for a wide range of industrial applications: lighting, health, textile, etc.



## Prototypes

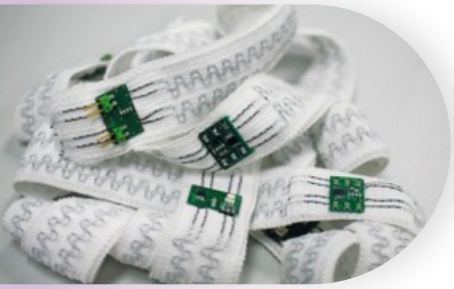
Components or systems, which have been successfully tested under real or real-like conditions. The prototypes listed in this catalogue are not commercialised, as the main purpose is to use them for demonstration and experimentation, including user and market acceptance. Prototypes offered in Smartees2 marketplace are applicable in over ten different industries, being consumer electronics the market with a larger number of applications, closely followed by transport, health and textile.



## Technical services

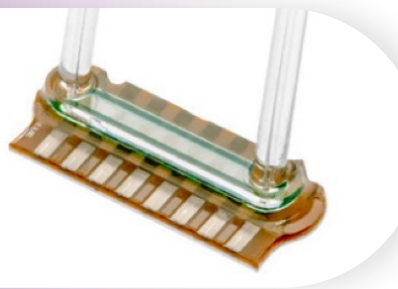
Tools and processes and their combination, which are necessary to prepare and test prototypes or products. Technologies offered cover electronics & components, flexible displays, integrated smart systems, OLED lighting and organic photovoltaics.

# Products



## AMOTAPE®Fast-E-Tex

Fast-E-Tex tapes integrating non-elastic zones in conductive elastic tapes. These non-elastic zones are perfect to contact electronic components without stress on the contact points.



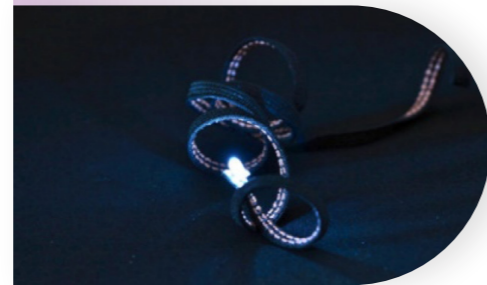
## Biosensors

Continuous biosensors, microfluidic systems such as static micromixers, complete monitoring solutions comprising of sensor arrays, microfluidics, electronics, and software.



## Biosignals Platform

Advanced biosignals monitoring platforms that integrate wearable body sensors. combined with wireless connectivity, algorithms, and software applications. BITalino. Beautifully designed hardware and apps, that are redefining biomedical education, introductory research, and prototyping.



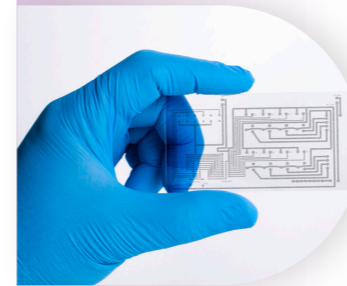
## Cond-elastic Textile Tape

An elastic, conductive tape was developed that maintains constant resistance even when stretched. Due to the high flexibility, elasticity, and assembly in connection with electrical properties, applications in the field of smart textiles are almost unlimited. They can be used e.g. as supply cables for the power supply or as a line for data transmission.



## Customized Controlpanel

keys, possible proximity sensor functionality, central control board with power supply, integration of additional components.



## Film for conductive inks

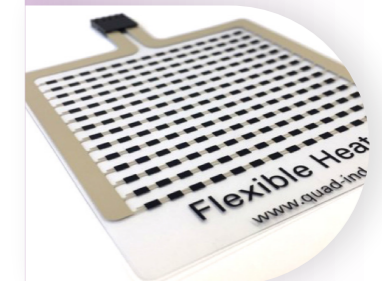
Wide range of transparent Atmospheric Pressure Plasma Nanocoated PET films dedicated to Printed Electronics which push forward performances of screen printing with both conductive and dielectric inks. Nanocoatings afford surface energies varying from 20-60 dyne/cm that can be fine-tuned to meet specific inks' surface tension. Matching PET film surface energy with ink surface tension leads to perfect wetting which ensures reliable, reproducible and pinhole-free coverage.



## Flexible printed battery

Flexible printed paper battery solution to applications such as wearable devices, healthcare and cosmetics, IoT devices, intelligent packaging etc.

Printed batteries are a new type of batteries manufactured by screen printing as thin as paper and known as "paper battery" with the trade name SoftBattery®. It can be customised upon customer requirements.



## Flexible PTC Heater

Custom flexible PTC heaters which provide a compact and cost-efficient alternative to wire-based solutions.





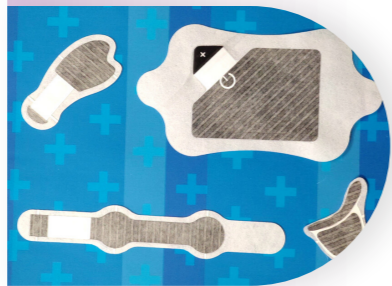
## Gold electrodes

OTech Aurum gold ink has superior conductivity, and the device performance can be achieved by using up to 60% less material at the fraction of the production price. The ink is compatible with aerosol and inkjet printing processes and can be used in many different applications ranging from gold-coated body electrodes for EEG/ECG monitoring to lab-on-a-chip to roll-to-roll printed electrodes for skin patches.



## iHandU

iHandU is first real time objective rigidity evaluation solution, providing an assessment of motor rigidity in Parkinson's disease patients. It is a non-invasive wearable hand device, that is ergonomically suited in the patient's hand to classify wrist rigidity. Our machine learning algorithms process data related to rigidity and dynamic tremor in-situ providing real-time information.



## Iontophoresis patches

Cosmetic or medical patches integrated with a flexible printed battery. The battery enables the iontophoresis process. Iontophoresis is defined as the introduction, by means of direct electrical current, of ions of soluble salts into the tissues of the body for therapeutic purposes (Singh and Maibach, 1994). It is a technique to enhance the transport of drug ions across tissue barriers, such as the skin.



## IOTSU® Flexi

IOTSU® Flexi brings a new industry standard for scalable tracking. IOTSU® Flexi is a flexible, plaster-like node that enables remote monitoring of assets and measurement of various parameters for a wide range of applications. Its capability to measure acceleration, orientation, position and temperature levels makes it perfect for applications ranging from small asset tracking and other logistics to premium parcel services and cold-chain management. Most benefits of flexible IoT approach include the form factor, ease of use, the ability to install even on small objects and uneven surfaces, multi-sensing, long range coverage and cost-efficient manufacturing in large volumes.



## LUMENASAFE antimicrobial

Design and manufacturing LUMENASAFE antimicrobial lighting surfaces for improving food safety and quality. LUMENASAFE structure can be applied also other application areas and use cases based on Flexbright Customised Solutions offering with tailor-made flexible electronics design and unique Roll-to-Roll flexible electronics manufacturing services for system integrators.



## Membrane keyboards

Membrane keyboards with metal domes and very high embossing for good haptics using gloves.



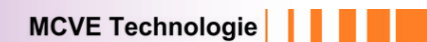
## Nanopaint

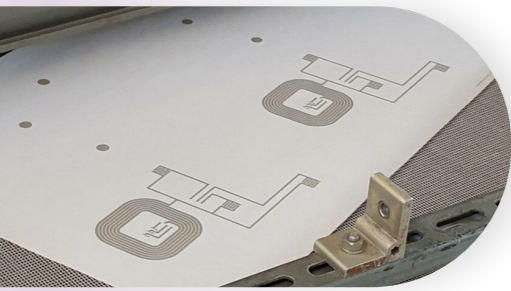
Nanopaint piezoresistive ink shows a strong variation of the electrical resistance upon mechanical deformation, allowing the implementation of force, pressure, and stretchable sensors on different substrates.



## PLASTRONIC

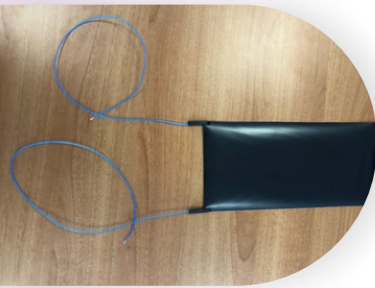
A fully additive process: deposit of the seeding layer to initiate the metallization steps: Cu electroless plus Sn bath or Au/Ni deposit. This ideal conductive material is low cost, nontoxic, and widely available. Its viscosity and curing conditions are compatible with the deposition system used. The conductive film produced has sufficient conductivity, high uniformity, and good surface adhesion on plastic and composite substrate.





## Printed NFC antennas

Various NFC Antenna printed on film, paper or glass available using different materials. Integration of NFC IC using adhesive technology. Often the chip is placed on an interposer.



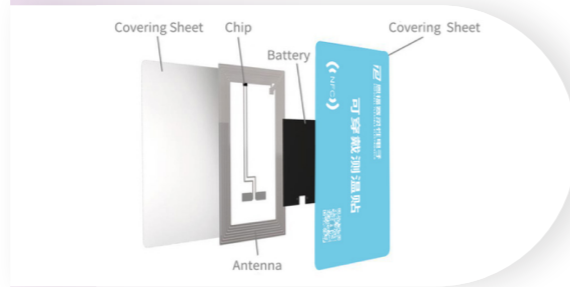
## Printed flexible heater

On demand printed heating substrate that can be integrated in different materials for heating. Power output could be optimized by the circuit design in accordance with specification.



## Smart printed OLED labels

Light printing onto every surface possible to create electronic labels and packaging for a game changing consumer marketing technology. Often the chip is placed on an interposer.



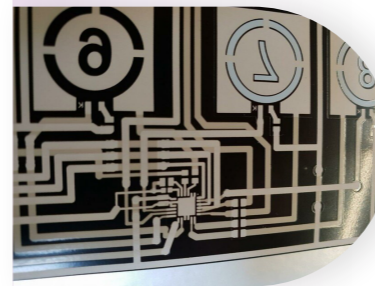
## Smart Temperature TAG

Enfucell smart temperature tag is based on combined technology of NFC, intelligent temperature sensor, and printed batteries. Tags can measure and record temperature in real-time. Data can be read with an NFC-enabled mobile device and uploaded to cloud platform for monitoring and analysis.



## Stretch sensors

Ultra-thin, elastomer sensors for strain feedback of textile, skin and other stretchable and deformable substrates. Ideal for motion capture and critical component predictive maintenance and performance feedback. Sensors can be adapted to measure force, pressure, shear, angle and much more. Stretch sensors can be customised to almost any shape and size, making them highly versatile and adaptable.



## Touch sensors

Printed touch sensors using transparent or opaque conductive inks on films and glass.

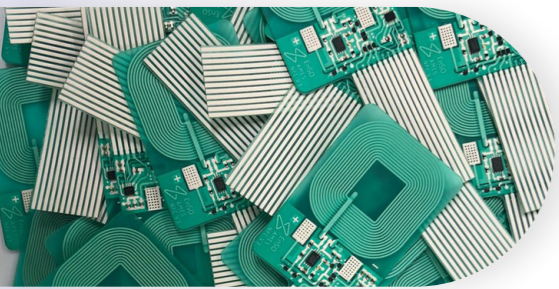


## Transparent conductive inks

Conductive inks for printing transparent conductive electrodes for many applications such as OLEDs, solar cells, touchscreen, displays and more. A unique silver layer with superior parameters and ease of deposition is an alternative for ITO.



# Prototypes



## AMES

Autonomous Micro Energy Source (AMES). Energy module integrated on a flexible substrate with energy storage component (thin lithium battery), printed antenna for NFC recharge, power management (possibility to connect several Energy Harvesting Technologies).



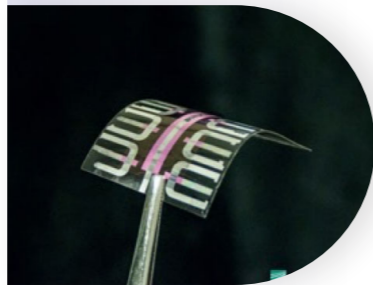
## Animated OLED lighting

Development of processes and technologies for efficient and cost-effective fabrication of innovative segmented and animated OLED lighting solutions. Typical jobs involve client-specific layout and fabrication of OLED demonstration samples for investigating new fields of application, as well as the integration in different products.



## Bike shirt for body posture monitoring

Textile with integrated stretchable electronics, movement sensors, Bluetooth and battery.



## Biodegradable electronics

Development of flexible (organic) electronics and barrier layers needed. Manufacturing of biodegradable conductive traces on biodegradable substrates using vacuum technologies. At Fraunhofer FEP, for example, we are developing biodegradable organic thin-film transistors based on these technologies.



## BioFuelCell Iontophoretics for cosmetics application

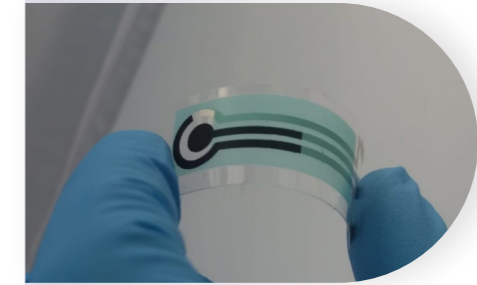
Health patches for cosmetics by utilising iontophoretic methods.

- Roll-to-Roll manufacturing
- Battery Principle: Enzyme-catalysed fuel cells are power sources capable of transforming the chemical energy of the fuel directly into electrical energy via electrochemical reactions.



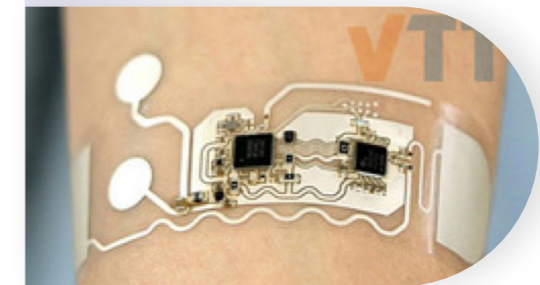
## Biosourced Substrates

Screen printing (DEK Horizon O3i): fully automated press with 15 micrometers resolution. Inkjet (DIMATIX): printing nozzle 40 micrometres.



## Biosensors

Eurecat has capabilities regarding print different kind of biosensors as well as ion-selective electrodes. From design to print, characterize and validate different kind of sensors, especially used in healthcare devices as well in points of care.

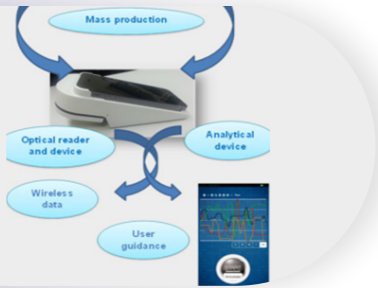


## Elastic Wearables

Elastic wearable ECG skin patch for health monitoring and diagnostics applications. It features direct integration of electronic components on elastic materials, and it is manufactured using high throughput roll-to-roll processes.







## Disposable rapid diagnostics

Personal health solutions for home use (TRL5). It measures from body fluids (serum, sweat, saliva) samples by disposable Lab-on-chip, which is roll-to-roll manufactured mobile phone or read-out unit for measurement, connectivity and user interface. It collects data to cloud service for an optical measurement and analysis.



## Elastomer integrated Bluetooth sensor node

Wireless overmoulded sensor for buildings, wearable, environmental applications. Current TRL level: TRL5



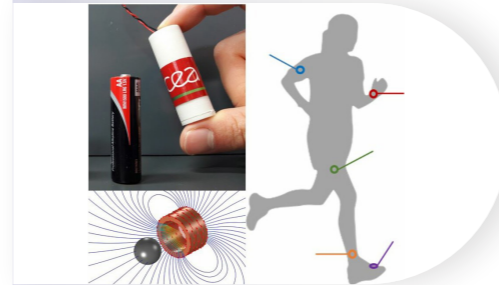
## Electroluminescence

Printed flexible light that convert inert surfaces into smart lighting objects. Industrial fabrics, home textiles, wearables, technical films or even glass can be supplied with additional lighting functionality integrated in an ergonomic way.



## Electroluminescent devices by printing technologies

Printed lighting systems that can be integrated in different materials for decorative or informational lighting. The devices structure and construction process allow a high degree of versatility, before and/or after device finalisation.



## Energy harvesting design

Energy Harvesting development for smart wearables. The service consists of the development of low-frequency vibration energy harvesters to improve the autonomy of smart wearables. The developments may concern human or animal movements. The energy harvester will be designed and optimised from acceleration data. A TRL4 proof of concept will be provided at the end of the service.



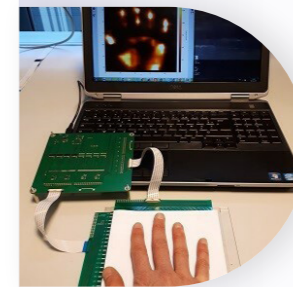
## Flexible blood bag holder

Flexible bag holder for the correct traceability of blood bags, to ensure conservation the cold chain of the blood during the whole process.



## Flexible OLED lighting

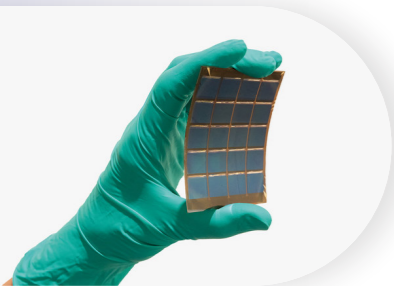
Processes and technologies for efficient and cost-effective fabrication of innovative OLED lighting solutions in Sheet-to-Sheet (S2S) and Roll-to-Roll (R2R). Typical jobs involve client-specific layout and fabrication of OLED demonstration samples for investigating new fields of application, stacked-layer development and efficiency increases for OLEDs, as well as the integration in different applications.



## Flexible sensitive surface

Interactive pressure sensing matrix for Smart Wearables applications. It enables the visualization of the pressure 2D-distribution, multitouch detection and quantification and automatic tracking of spatial and time-variant pressure points.





## Flexible Solar Cell

Flexible and fast development of new innovative demonstrators and related processes for fabrication and integration into textiles.

- Thin conformable solar cell module (3 x 3 in<sup>2</sup>)
- Substrates: 50 µm ultra-thin glass substrate
- Materials: polymer & perovskite based
- Specs: for perovskite module - efficiency 10%, 4,7 V, 12,8 mW/cm<sup>2</sup> (under 1 Sun)
- Features: area 56 cm<sup>2</sup>, thinness 100 µm including encapsulation



## Glass integrated full colour LED display

Glass integrated full colour LED display (TRL6).

### Features

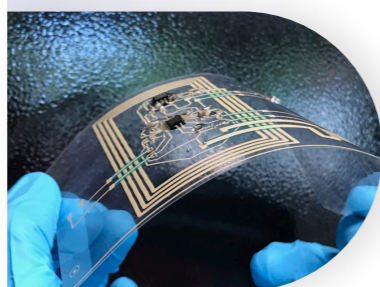
- The control IC is integrated in each LED
- Full colour and intensity control of 200 LEDs
- Setting each LED as you wish to scroll text messages, other images.

### Backplane foil

- Screen printed Ag conductive traces on PET.
- Graphical printing on both substrate sides on PET.
- 200 LED chip (5mm x 5mm) bonded using ICA.

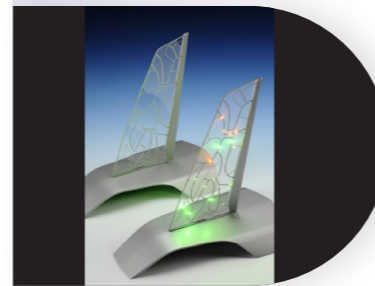
### Glass integration process

- Assembled LED foils are placed between glass plates and bonded together using vacuum, heat and pressure.
- Design freedom for both graphical and electronic layout.



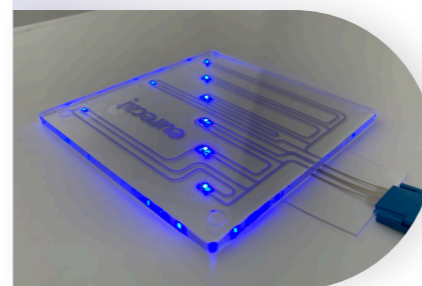
## Hybrid printed electronics

Combination of printed and placed electric components for smart packaging, building, automotive and medical. Hybridisation and printing of electronic circuits and devices complete service.



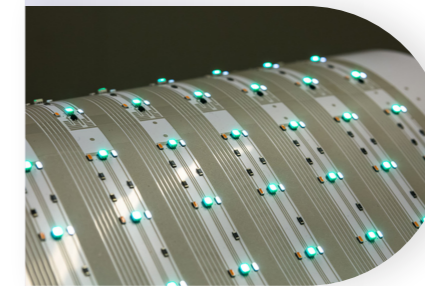
## Indoor air quality sensing luminaire

Ambient environment sensing in home, office, or school class. Measures from body fluids (serum, sweat, saliva) sample by disposable Lab-on-chip, which is Roll-to-Roll manufactured. Mobile phone or Read-out unit for measurement, connectivity, and user interface. Optical measurement and analysis.



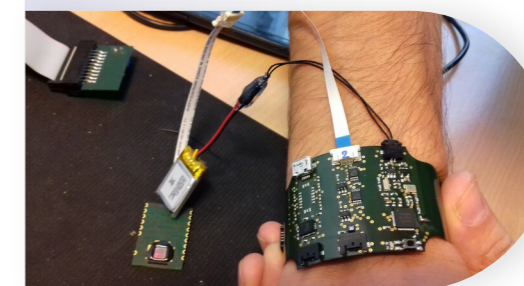
## In-mould Electronics

Printed & hybrid electronics embedded in plastic. Eurecat has a new Plastronics Lab that consists of two cleanrooms that enable an orderly combination of different manufacturing processes. One is dedicated to printing and electronics, while the other one is dedicated to processes involving plastics injection, thermoforming and over-moulding.



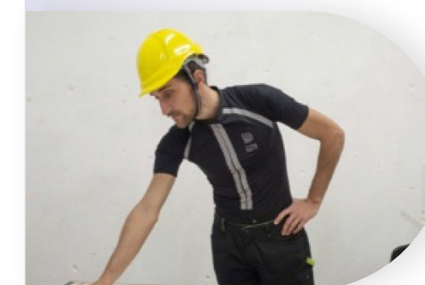
## LED foils

LED foils on large area and integrating into products through moulding, lamination and encapsulation. Assembly and printing on R2R apparatus.



## Low power design

The service consists of the development of low-power communicating platforms dedicated to the test of different kinds of flexible, conformable sensors (such as gas, pH, activity, T°, humidity). The flexible platform will be designed and optimized following the used case specifications. A TRL4 proof of concept will be provided at the end of the service.



## MADESIGN

Smart garment for spinal diagnosis.





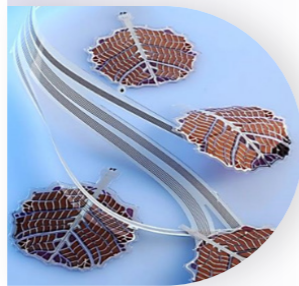
## Near Field Communication (NFC) for Wireless Data A

Customized NFC powered NFC Tag for sensing and data collection applications. Feasibility studies, application demonstrators.



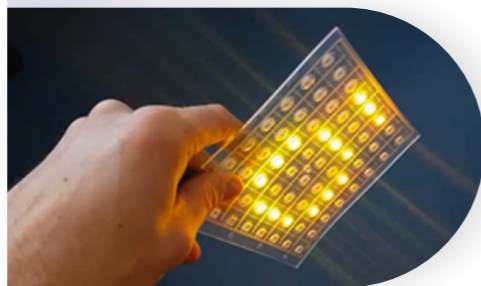
## Optical sensors

Organic Electronics multimodal NIR low-cost sensing solution for material classification and quantification in mass markets.



## Organic Solar Cells

Customised organic solar cells modules for indoor and outdoor energy harvesting. Design freedom of A4 size elements or continuous 300mm wide solar foil. Current TRL level 5.



## Overmoulded full colour LED matrix

Customised fully controllable LED matrix display, signage and lighting module. The flexible elements can be connected to create large area systems. Current TRL level: TRL6



## Paper Biofuel Cells

Paper biofuel cells, a sustainable & eco-friendly energy solution for low-power electronics. Metal-free & plastic-free technology, using enzymes to convert glucose and oxygen into electricity.



## Piezoelectric loudspeaker

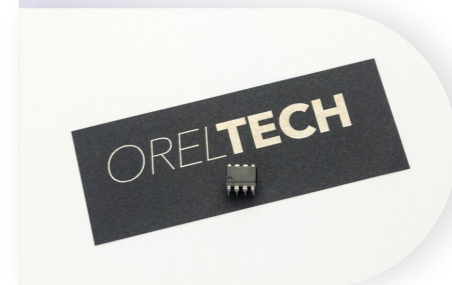
Paper based piezoelectric loudspeakers for small and large area devices. Electronic surfaces are hidden and can be printed in colour.



## Printed heating system in roll-to-roll process

Printed heating systems that can be integrated in different materials for heating. The power can be controlled by tailoring the properties of the materials and the circuit design to suit various applications.

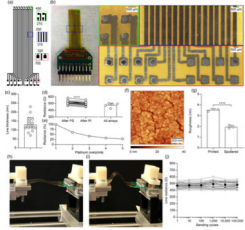
- Tailorable power density and maximum temperature can be printed directly into different types of substrates or laminated on them. Can also be stretchable and thermoformable.
- Seamless integration of printed heating devices in different kinds of substrates for uniform heating.



## Printed metal surfaces

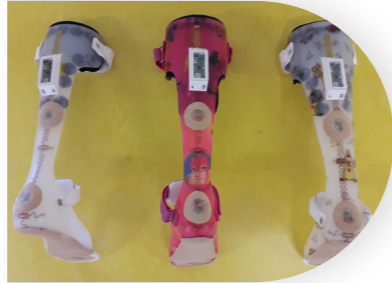
Prototypes of electrodes or functional metal layers on a variety of substrates. A lot of control over many metal layer parameters, such as conductivity, transparency, flexibility, adhesion, roughness and others.





## Printed Pt-Electrodes

All-printed electrocorticography arrays by inkjet printing of platinum electrodes and screen printing of polyimide as a passivation layer.



## Smart ankle foot orthosis

Ankle foot orthosis with integrated movement sensors; Combination of stretchable electronics and thermoforming process; Gait monitoring of people; Wireless data capturing

### Future options:

Other sensors; Longer lifetime; Other medical thermoformed devices proof of concept will be provided at the end of the service.



## Stretch sensors

Ultra-thin, elastomer sensors for strain feedback of textile, skin and other stretchable and deformable substrates. Ideal for motion capture and critical component predictive maintenance and performance feedback. Sensors can be adapted to measure force, pressure, shear, angle and much more. Stretch sensors can be customised to almost any shape and size, making them highly versatile and adaptable.



## Ultra-compact stick-on wireless sensor

Ultra-compact multi-usage stick-on sensor

- Wireless communication - BT Smart
- Accelerometer, temperature
- Indicator LED
- Encapsulated structure



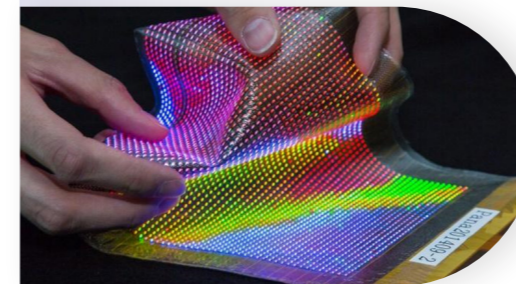
## Prisma ID

Printed smart identification tag to secure documents, cards, packaging and labels. prisma ID allows to verify the documents authenticity on the touchscreen of a smartphone, independently from special reading devices, anywhere, anytime. prisma ID combines digital security with consumer accessibility thereby offering an alternative to QR codes and NFC. Prisma is licensing this interactive technology to solution providers and manufacturers.



## Smart hologram

Prismade upgrades regular holograms with an easy to access, electronic verification feature: no more reliance on the end-user's knowledge of the hologram features. Just by touch, our smart hologram can be securely verified on any smartphone. Unlike camera-based systems, this new approach is more secure and easier to access.



## Stretchable RGB Display

Elastic electronics

### Product Features:

Stretchable; 80 x 45 RGB led display; 3 mm pitch

### Future Options:

Smaller pitch; Tiling; Integrated driving



## Wearable diagnostic patch

The CSEM's wearable diagnostic patch platform consists of a mobile, flexible, easy to handle well-being monitoring sensor/platform for in- and out-usage. For instance, the oxi-PAD (Peripheral Artery Disease (PAD) monitoring oxygenation sensor) is allowing early detection of PAD, assessment of early interventions (like drug treatment), real-time assessment of surgical interventions, monitoring after surgical interventions and possibly home-care monitoring.fabrics through smart textiles, ergonomics and aesthetics.





## Wearable movement tracker

Knitted customized garments capable to attach wearable electronics such as movement trackers or other sensors. We also offer the electronics hardware and the development of the wearable movement sensors (IMU). Possibility to obtain CE mark if the customer requires it.



## Wearable OLED

Processes and technologies for efficient and cost-effective fabrication of innovative OLED lighting solutions for textile integration. Typical jobs involve client-specific layout and fabrication of OLED demonstration samples for investigating new fields of application, as well as the integration in different textile materials.



## Wearables

Soft-electronics. Design and integration of technology into textile fabrics for interactive and functional properties for applications within health, sport and "fashion". Conceptual design for prototyping solutions and functional fabrics through smart textiles, ergonomics and aesthetics.



## Wrist-based phototherapy device

Elastic electronics.

### Product Features:

phototherapy, using light for relieve of pain, fully integrated (LEDs, passives, etc.) on foil, highly conformable to the hand by using stretchable electronics technology, embedded in silicone for wear comfort and washability.

### Future options:

other LED types, more functionality (control) integrated.



## Technical services offering



## 3D Printer

3D printer for rapid prototyping (black or white materials, rigid and rubbery materials, and transparent material). All materials can be combined with each other and so their properties by printing two materials at once.



## 3D visualization

3D Modeling whole process: design, conversion of 2D plans or images to a 3D geometry, texturing, physics, environment. The field of applications is very broad, including health and biotech, material sciences, photonics, smart systems, energy generation and energy efficiency.



## Absorption Spectroscopy

Absorption spectroscopy equipment.

- **Model:** Perkin Elmer LAS GmbH - Lambda 35
- **Materials:** solution, solid layer (1 in<sup>2</sup>)
- **Limits:** wavelength range 190 - 1100 nm and so their properties by printing two materials at once.



## AFM

Atomic Force Microscopy of surfaces (AFM) equipment.

- **Model:** A) AIST-NT Inc.-SmartSPM; B) Asylum Research-MFP 3D





## Airbrush

Airbrush on rigid and flexible substrates. Design, materials, and substrates can be provided by us or by the customer. ZOEK also owns the appropriate equipment for substrate treatment, ink formulation, and for quality check of deposited films or structures.



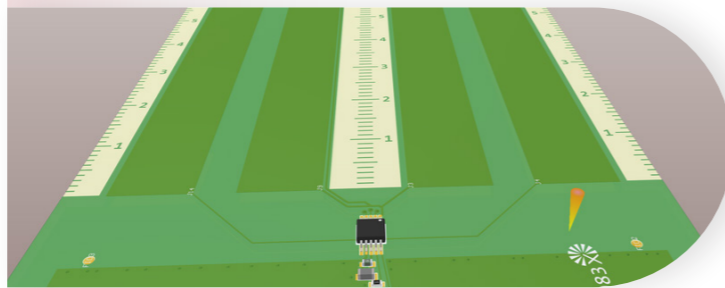
## Assembly of electrical components

Printed electronics require Pick & Place (P&P) machines to assemble electrical components that cannot be printed. Such components include SMD components, Packaged Chips, and, in some cases, bare dies. We have capabilities to do assembly in a high-mix mode and a low-mix mode but with a highspeed throughput. R2R assembly processes are focussed on maturity level and throughput. Therefore, these technologies increase the capacity of assembly equipment in the pilot line (Low-MIX at TNO, VTT) and (High Mix at CPI).



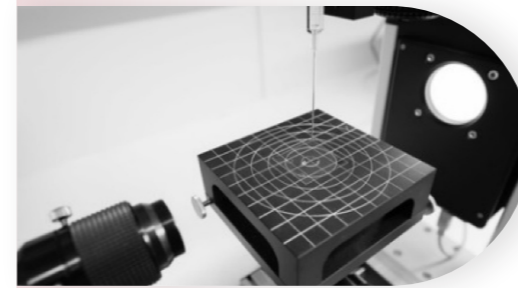
## Biosensor

Electrochemical biosensors and prototype manufacturing. Electrochemical cells are printed on flexible substrate using S2S Screen printing. Standard 3-electrode sensor has carbon working and counter electrodes, silver chloride reference electrode. Laser cutted tape channels are used for sample microfluidics.



## Capacity measurement

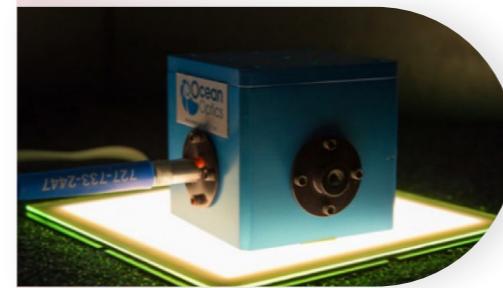
Using capacitive measurement technology, the deflection of a button made of ultra-thin glass can be measured. By using this technology, force sensing can be used to implement the look and feel of a membrane keypad with the advantages of mineral glass



## Contact Angle

Contact angle measurements.

- **Model:** DataPhysics Instruments GmbH - OCA 15Pro



## Device characterisation

Electrical and optical characterization of organic transistors, organic LEDs and organic solar cells.



## E-Broidery

Advanced embroidery allows to integrate sensors, LED, etc in textiles using conductive yarns. It also allows to create textile circuits and heating textiles.



## e-Textiles

Bike shirt for body posture monitoring

- Textile with integrated stretchable electronics
- Integrated movement sensors, Bluetooth and battery
- **Future options:** washable, other sensor types

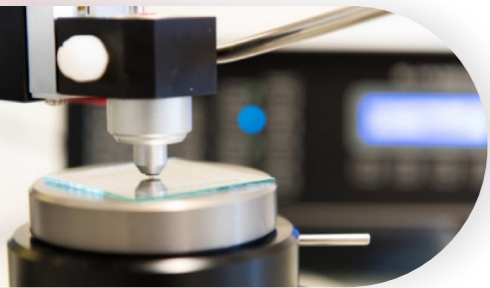


## Elastic electronics

Wrist-based phototherapy device

- Phototherapy: using light for relieve of pain
- Fully integrated (LEDs, passives) on foil
- Highly conformable to the hand by using stretchable electronics technology
- Embedded in silicone for wear comfort and washability
- Future options: other LED types, more functionality (control) integrated

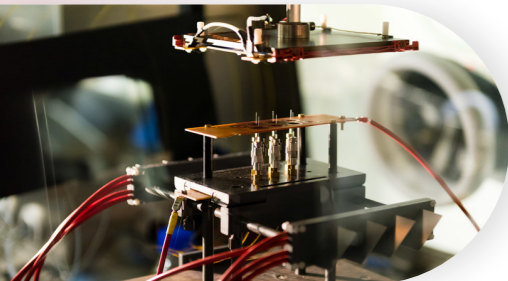




## Electrical conductivity

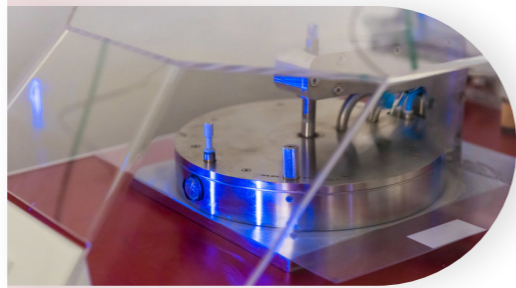
Electrical conductivity measurements.

- **Model:** EURIS GmbH - Jandel Resistivity Test Unit RM3000



## Electro-Spray Deposition (ESD)

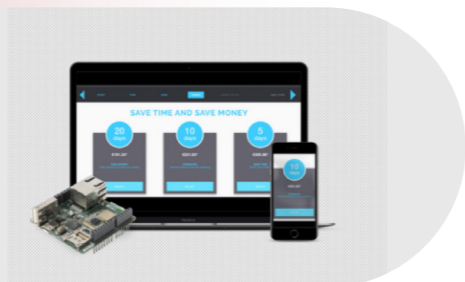
ESD on rigid and flexible substrates. Design, materials, and substrates can be provided by us or by the customer. Owning the appropriate equipment for substrate treatment, ink formulation, and for quality check of deposited films or structures.



## Encapsulation quality WVTR

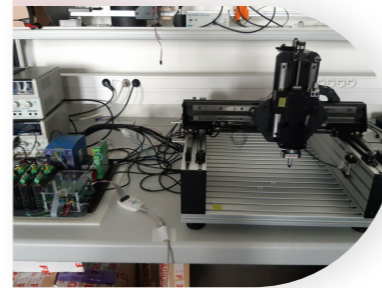
Measurement of water vapor transmission rates (WVTR) for thin films. This characterisation is important for barrier or encapsulation materials.

- **Model:** SEMPA Systems GmbH - HBS 18-1
- **Limits:** IR spectroscopic determination of WVTR, sample size min. 19 cm in diameter



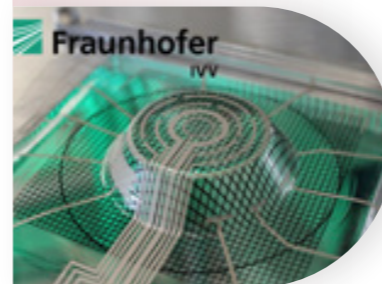
## Fast PCBA Prototype

Fast PCBA assembly: a fast-prototyping department that is able to supply assembled printed circuits in a very short time and competitive cost. AOI and in-circuit tests are available as optional QC services, together with Engineering and Manufacturing process.



## Flexible sensors testing

Mechanical characterisation of flexible force, pressure and deformation sensors. 3D quantification and localisation of several pressure points on a scalable and flexible area.



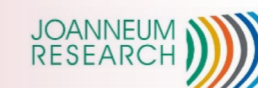
## Forming of 3D-geometry

Processes and technologies for the production of three-dimensional components. Through the application-oriented use of heating and forming technologies, we are able to influence the forming process in a controlled manner and thus minimize the strain on the component, which is necessary when using ductile pastes or attached components. This enables new geometries and functionalisation.



## Functional Printing

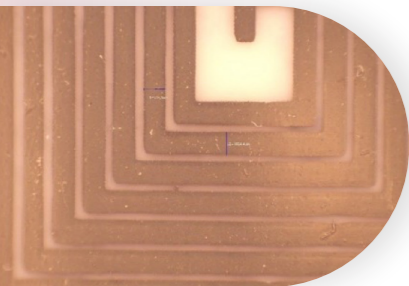
One-stop-shop for the development of scalable printing processes. JR-Materials covers the complete value chain ranging from ink development, surface modification, printing strategy, post processing, to characterisation. Printing on low temperature substrates is one of our key specialities. Our interdisciplinary team of highly skilled experts works to customer requirements often utilising a combination of different printing technologies.



## Gravure printing

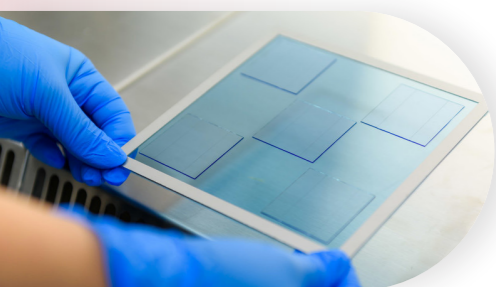
Gravure printing on rigid and flexible substrates. Design, materials, and substrates can be provided by us or by the customer. Owning the appropriate equipment for substrate treatment, ink formulation, and for quality check of printed films or structures.





## Green inks

Functional and environmentally friendly printed inks already available in LEITAT for innovative flexible and smart wearable electronics applications such as: electrodes for printed batteries, printed solar cells (OPV, PSC), RFID/NFC antennas, electrochromic and/or electrowetting devices to be integrated in textile, paper, packaging, automotive, building, and/or energy industrial processes.



## Handling - Ultrathin Glass

Support in handling of ultra-thin glass. Our processes include transport, cleaning, deposition and coating.



## Heating Textiles

Advanced embroidery (smart embroidery) for developing of heating textiles using conductive yarns.



## High-precision cutting

Reproducible cutting of your substrates. We also deliver cut substrates on customers demand.

- **Materials:** glass, ITO-glass, ultra-thin glass, silicon wafer
- **Limits:** substrate size up to 300 x 300 mm<sup>2</sup>, accuracy of repeatability 10µm



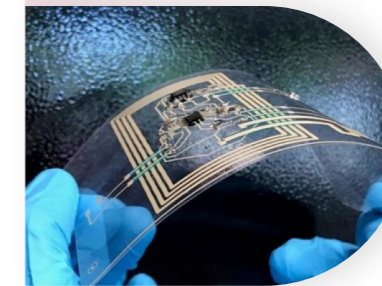
## Home-care platform

A composite system managing both continuous monitoring of physical and cognitive status, and provision of customized physical rehabilitation through proprietary as well as off-the-shelf wearable devices. The service is provided through a platform consisting of a mobile application and a web-based dashboard. Through data processing algorithms features are extracted to analyze users' behaviors.



## Hybrid electronics

Integrated silicon-based electronics and printed electronics for production of user centred products.



## Hybridization Technology

Specific hybridisation technology, validating materials to be used for electromechanical soldering at low temperature, and a process to Pick & Place SMD components at large scale on flexible foils. We can deliver hybridized foils to be thermoformed and overmoulded.



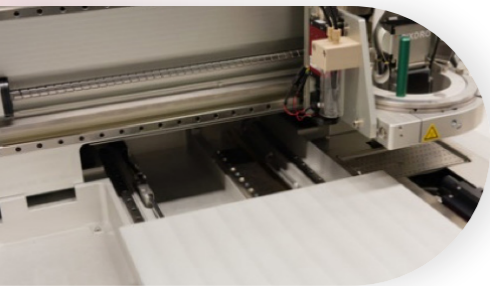
## Ink formulation

Ink formulation for various wet deposition methods.

- **Methods:** inkjet, slot die, screen printing, airbrush, electro-spray
- **Analytics:** viscosity, contact angle







## Inkjet printing

Inkjet printing on rigid and flexible substrates. Design, materials, and substrates can be provided by us or by the customer. ZOEK also has the appropriate equipment for substrate treatment, ink formulation, and for quality check of printed films or structures.



## ITO Coating

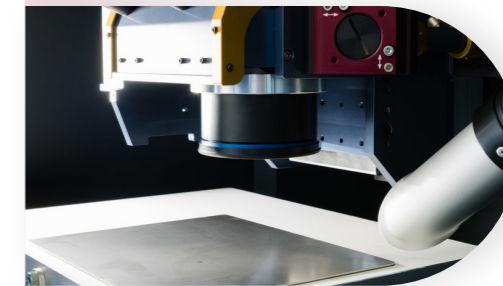
Coating of ITO on rigid and flexible glass substrates.

- **Method:** RF Sputtering + Heat treatment
- **Limits:** 17 W/sq, 87% T, no heated sample holder, sample size up to 15 x 15 cm<sup>2</sup>



## LaborMAN

R2R printing machines for various printing and drying (UV, infrared) processes.



## Laser cutting

Reproducible laser cutting of rigid and flexible substrates.

- **Materials:** copper foil, glass, ultra-thin glass
- **Limits:** feature size around 10 mm



## Inkjet printing

Inkjet printing service on flexible and rigid substrates for customers who want to conduct trials with their/our designs or their/our inks and need the Eurecat's knowledge and the equipment to print functional and printed electronics. Eurecat also has the necessary curing & characterisation equipment needed.



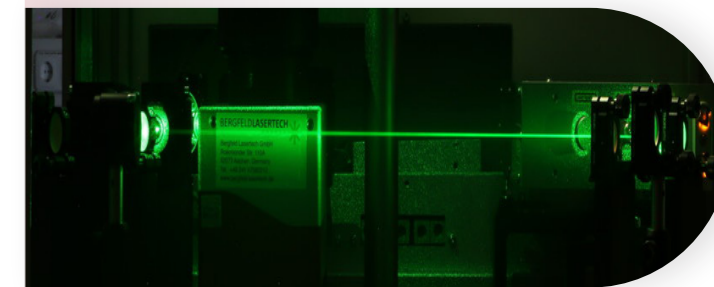
## LAB-2-FAB Services

InnovationLab (iL) has an extensive range of capabilities, including initial research, product development, prototyping and pilot production. External companies can partner with iL at any stage of the product development process, ranging from a first idea to a fully functional printed prototype. iL closely collaborates with Heidelberg Druckmaschinen AG, who have recently invested in a R2R printing machine for printed electronics, thus offering extensive manufacturing capabilities.



## Laser ablation

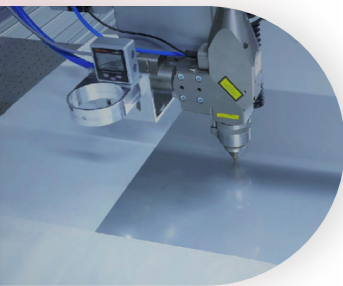
Reproducible laser ablation. Owning also the appropriate equipment for quality check of ablated films or structures.



## Laser process development

Laser process development and prototyping. Development of optical systems and assemblies. Expertise on laser safety. Support in planning of production systems.





## Laser Processing

High accuracy laser processing of printed electronic substrates.

- **Sheet size** 600 mm x 400 mm (CO2)
- **Sheet size** 2000 mm x 1500 mm (Fiber laser)



## Led design

Looking for manufactures to build led prototypes.

- Small size LED
- Different glass colours.



## Liquid Phase Deposition

Versatile process equipment is available in two clean rooms (ISO 4): a screen-printing tool, a slot-die coater as well as various spin coaters in ambient air and inert Nitrogen atmosphere. Among standard processes are the production of grid anode structures, passivation layers, as well as of hole-injection and hole-transport layers for use in organic semiconductor devices.

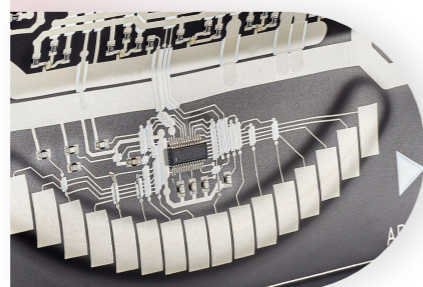


## Make substrate functional

Development of new functional materials using our know-how on printed electronics, printed sensors (temperature, strength and pressure, chemical, moisture, gauge...), surface mounted devices (encapsulated LEDs...). Development of flexible devices, as well as structural electronics for all industries, including but not exclusively textile or plastronics.



Fabricant d'Interfaces Homme Machine



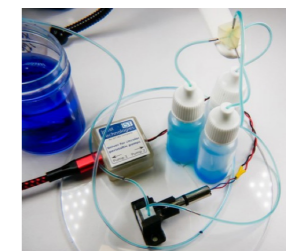
## Manufacturing IME parts

CLAYENS NP offers the full manufacturing chain for IME (In Mould-Electronics) from design of assembled parts: screen printing, components dispensing, overmolding, thermoforming, controls. We can produce up to small series = 100 parts/month.



## Material purification

Contract Purification at CreaPhys Core competence at CreaPhys is an in-house contract manufacturing and process qualification. Our team of highly skilled researchers and technicians works with customers to develop a purification process (based on gas-phase transitions, e.g. sublimation) that can be easily scaled up to meet production demands while offering cost-effective solutions for the production of highly pure material.



## Microfluidics

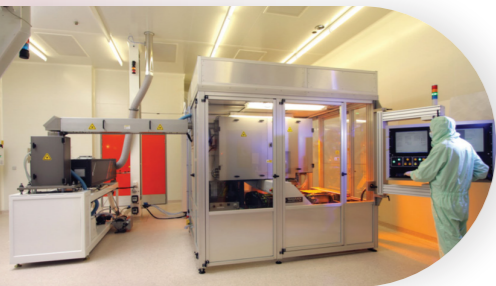
Prospects for numerous microfluidic services are the company's growing product portfolio around a reliable micro-pump, which enables miniaturized devices for the life sciences and analyzing devices, like small lightweight body attached autonomous analyzers and other instrumentation. Additionally, laminating, milling and 3D printing of multi layered microfluidic structures enables even the most complex prototypes for your application.



## Motion and physiological

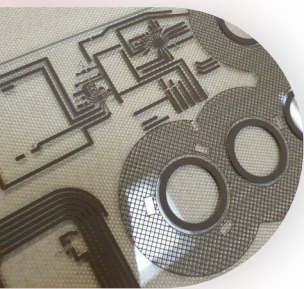
Motion & physiological characterisation of wearables and smart textiles. Characterisation results for motion and physio sensors like wrist, watch, smart textiles for human (driving / wellness / working equipment) cost-effective solutions for the production of highly pure material.





## Optimisation for micromachining and drilling

Laser tools dedicated for H-TOLAE available in InSCOPE include two different types. The first one is optimised for micromachining and drilling and subtractive patterning. It relies on nano or picopulse UV Lasers. The second, based CO2 Laser, is devoted to device singulation from mother plastic foil. These Laser are available either in roll-to-roll or sheet-to-sheet modes.



## Printed Electronics on flexible glass

Glass is a durable and scratch-resistant substrate and a perfect gas barrier. As ultra-thin glass, it can be even bendable. Printed electronics on ultra-thin glass combine the benefits of flexible foil with the durability of glass.

Printing electronics and decorative inks on the glass. Directly printed sensors and assembled electronic systems on glass including. Sheet size up to 500x700mm possible.



## Printed Electronics Manufacturing

Oamk PrinLab is versatile and well-equipped printed intelligence development environment which supports the implementation of development projects and manufacturing of printed intelligence-based applications. Laboratory introduces and tests different printing techniques and develop, manufacture and test printed electronics components and applications.



## Printed Electronics scaling up

Scaling up of printed electronics products: from idea to prototype and to industrial manufacturing. We work in an industrial environment with our partner EMBEGA, that is specialised in flexible printed electronics and polymers/silicone screen printing. Our aim is helping our customer introducing new PE products in market, by developing manufacturing processes and integrating new functionalities in the final product. size up to 500x700mm possible.



## Photoluminescence

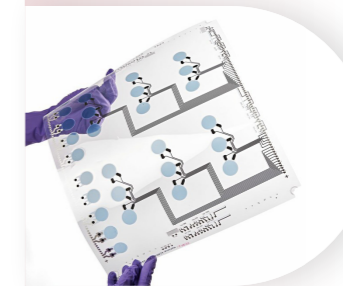
Photoluminescence spectroscopy.

- **Model:** Agilent Technologies - Cary Eclipse Fluorescence Spectrophotometer
- **Limits:** fluorescence, phosphorescence, wavelength 200 - 900 nm (excitation & emission), scan speed 400 nm/s, solid layer samples size 1 x 1 - 7 x 8 cm<sup>2</sup>



## Photonic soldering service

Photonic soldering service for customers who want to solder by this new way. Interesting for printed electronics mad on substrates with low heat resistance.



## Piezoelectric transducers

Piezoelectric sensors and actuators based on electroactive printable materials.

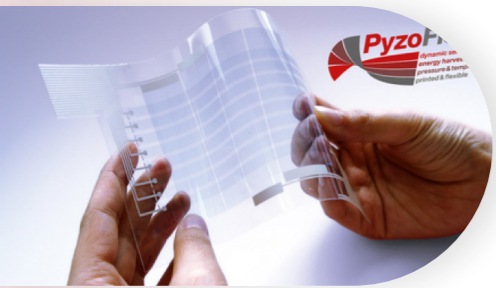
- Typical substrates available: PEN, PC, Polyimide (Kapton), TPU, Paper
- Typical stack thickness (substrate excluded): <50µm



## Post processing lamination

Lamination is a common method to protect the electronics against e.g. moisture, heat and oxidation. On top of that, lamination can provide graphics and aesthetics. Typical usage can be found in the packaging and building markets. Materials which can be laminated include, but are not limited to common plastic substrates, such as PET, PEN, PC and PI. In advanced stages, TPU and even paper can be used.





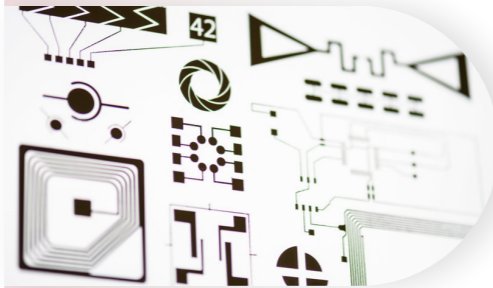
## Piezoelectric: PyzoFlex

Printing of customized transducers (incl. protection layer) of specific shape and size on a variety of substrates Poling (target value poling) of the transducers as well as singularization of the transducers Basic evaluation electronic board.



## Printed capacitive sensors for integration in flexible substrates

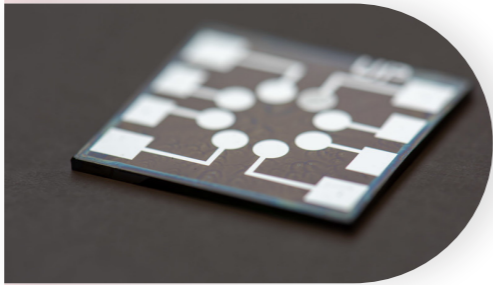
Development and optimisation of capacitive sensors printed into flexible substrates. The sensors can be printed using sheet-to-sheet or roll-to-roll screen printing equipment in different types of substrates. The sensors can be used to detect the proximity of a finger, hand or objects.



## Printed circuits

Printed circuits on various substrates. Design and materials can be provided by us or by the customer.

- **Substrates:** glass, PEN-foil, PET-foil, parylene
- **Materials:** silver, PEDOT, transparent insulato



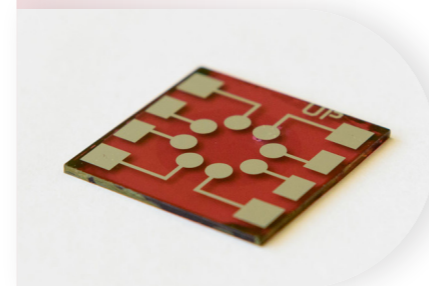
## Printed Haptic Feedback

Printed haptic feedback on various substrates. Design and materials can be provided by us or by the customer.



## Printed integrated circuit

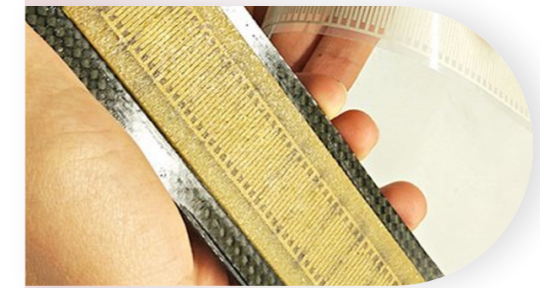
Design and development of printed integrated systems that rely on a proprietary fully-printed integrated circuits core. FLEETech gives intelligence to plastic through our PrintIC technology, adding complex logic and analogue circuits for sensor readout and actuator driving, such as OLED or EC displays. Our systems can be applied to almost any surface and our ICs are highly flexible and recyclable as plastic.



## Printed sensors

Printed sensors on various substrates. Design and materials can be provided by us or by the customer.

- **Sensor types:** light sensor, motion sensor, (force) touch sensor, temperature sensor
- **Substrates:** glass, PEN-foil, PET-foil
- **Limits:** unique shapes possible, thin and flexible



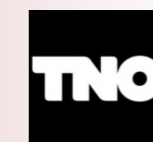
## Printed sensors for integration into composite materials

Development of smart composite materials with sensing capabilities applicable for instance in automotive and aeronautics. Printed sensors can be integrated into composite materials with the introduction of new functionalities such as health monitoring, impact detection, or measurement of the presence of ice or liquids on the composite's surface. It allows the replacement of conventional sensing and measuring methods that are bulkier and not fully integrated in the structure.



## Printing

Traditional electronic circuit manufacturing using lithography requires resource-intensive subtractive processes—like etching and cleaning— that must be carried out in a cleanroom environment, whereas printed electronics manufacturing simply entails adding material to a substrate. A few printing techniques are available. The most suitable technique is chosen according to the target physical properties, resolution, ink costs, number of samples to be produced and TRL.





## Printing and assembly

Printing as a service of conductive and non-conductive inks using screen or inkjet printing. Several sheet-fed screen-printing units and drying are available. Printing of conductive materials (Silver, Copper, Carbon) and non-conductive using thermal or UV drying technology including all post-processing steps such as lamination, die-cutting, laser cutting, and assembly.



## Printing and testing

Printing process development (mostly for screen and inkjet printing) and simulation assisted quality inspection instrumentation and reliability testing.



## R&D services

Printing process development (mostly for screen and inkjet printing) and simulation assisted quality inspection instrumentation and reliability testing.



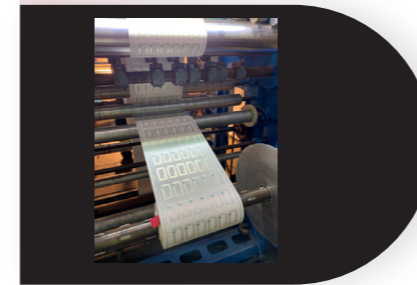
## R2R Inspection System

Development of processes and technologies for efficient and cost-effective fabrication of innovative organic electronic solutions in Roll-to-Roll (R2R). The inspection system consists of a winding unit with a CCD camera bank for pixel resolution down to 14µm (100% web inspection) and a modular, moveable optical microscope with a point resolution down to 1µm.



## R2R Lamination and Coating

Development of processes and technologies for efficient and cost-effective fabrication of innovative organic electronic solutions in Roll-to-Roll (R2R). The coating and lamination unit is suited for functionalizing the substrate surface by coating processes and encapsulation of organic devices with e.g. a barrier film. The coating and lamination unit is encased in an inertbox to process under protective atmosphere.



## R2R Printing

Functional printing on paper and plastic substrates. Thanks to its R2R 4 heads industrial flexo line Guarro can help you bringing to the market innovative products using printed electronics technology. With a deep knowledge of printed components such as RFID antenna, sensors, electrochromic displays or printed batteries we will help you to upscale your prototype from lab to pilot scale.



## R2R vacuum deposition

Development of processes and technologies for efficient and cost-effective fabrication of innovative organic electronic solutions in Roll-to-Roll (R2R). In addition to the production of OLEDs, our highly innovative processes and equipment also enable the manufacture of a wide range of other components and layers.



## S2S vacuum deposition

Development of processes and technologies for efficient and cost-effective fabrication of innovative organic electronic solutions in Sheet-to-Sheet (S2S). In addition to the production of OLEDs, our highly innovative processes and equipment also enable the manufacture of a wide range of other components and layers.





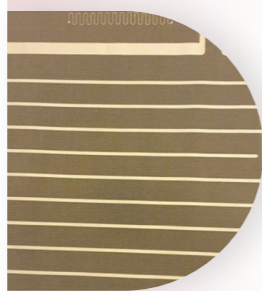
## Screen printing service

Discontinuous screen printer sheet to sheet maximum print area 50cmX40cm. Continuous screen printer sheet to sheet din-A3. Maximum print area 50cmX70cm



## Slot-die coating

Slot-die coating on rigid and flexible substrates. Design, materials, and substrates can be provided by us or by the customer. ZOEK also owns the appropriate equipment for substrate treatment, ink formulation, and for quality check of printed films or structures.



## Smart Fabrics

Printing on Textiles is a widely used process; at Freudenberg, we have experience on printing conductive materials on textiles using S2S processes. We have developed a special process in order to integrated printed electronics on fabrics and textiles at low costs from low to high volumes.



## Smart textiles

Integration of smart materials and electronic components into textile structures by lamination and printing technologies.

Smart Textiles are a new concept of textiles that are sensitive to external stimuli such as pressure, touch, temperature, humidity, atmosphere composition, vibration, stretching forces and are able to respond and interact, lighting up, changing colour, heating, communicating, harvesting and storing energy, etc. The common feature is a successful combination of mature technologies from textile industry such as weaving, knitting, embroidering and coating techniques with new materials such as electrical conductive yarns, piezoelectric polymers, optical fibres and functional coatings.



## Spin coating

Spin coating on rigid and flexible substrates. Design, materials, and substrates can be provided by us or by the customer. Owning also the appropriate equipment for substrate treatment, ink formulation, and for quality check of printed films or structures.



## Stretchable conductive tracks directly printed in different types of surfaces

Flexible and stretchable conductive tracks, printable in different types of surfaces. The printed stretchable conductive tracks are bendable and stretchable, suitable to be integrated into substrates that require a constant modification of shape and dimensions. It can be used to connect different types of sensors and electronic components, and can also be used as capacitive sensors, by changing the design and integration with electronic control.



## Stretchable electronics

Stretchable devices (sensors, actuators and interconnections) developed using three main deposition strategies: - Printing of stretchable inks - Printing or vacuum deposition on pre-loaded substrates - Transfer of stretchable devices from a sacrificial substrate to the stretchable substrate.



## Structural electronics

Smart ankle foot orthosis.

- Ankle foot orthosis with integrated movement sensors
- Combination of stretchable electronics and thermoforming process
- Gait monitoring of people
- Wireless data capturing
- Future options: other sensors, longer lifetime, other medical thermoformed devices





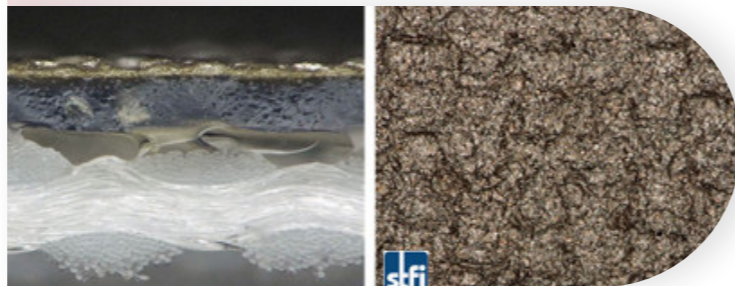
## Synthesis and up scaling

COC offers cooperation in synthesis, tailoring and up scaling of materials for functional applications (electronics, photoactive processes) including application form. Synthetic, purification and characterisation procedure of investigated compounds developed on laboratory scale is verified in glass pilot plant and regular pilot plant. Technologies is possible to transfer into regular production units of industrial partners or to use for production in our pilot plant.



## Textile electrodes

Development of textile electrodes for measurement of physiological parameters liker heart rate, respiration rate, EMG, ECG, EEG and EMS. Also, development of electronics for measuring these parameters.



## Textile functionalisation

- Formulating and compounding hotmelts, waterbased inks and pastes, 100% systems (Silicone, PVC, ...) UV-curable pastes
- Material characterisation impregnation (padding) -
- Printing (flatbed screen, microvalve, inkjet, 3D-printing)
- Coating knife (direct, indirect), reverse roll, slot die (hotmelt and waterbased dispersions)
- laser treatment (UV, IR)
- Lamination (hotmelt and dispersion adhesive)
- Drying and UV-LED curing (365 nm, 395 nm, N2-inertisation) - R2R up to 0.5 m



## Textile Sensors

Printing technology of textile sensors for the determination of pressure, strain, bending or flow rate.



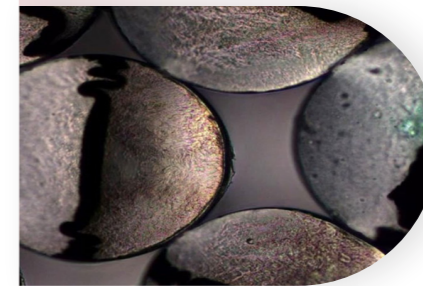
## Thin film deposition

CreaPhys offers process consulting in device stack design, material optimisation, and prototyping. A fully integrated in-house R&D line gives you the chance to work with our expert team to find the right process for your needs and work with our equipment to test materials before making the purchasing decision. This service is offered as a standard for projects at both R&D and industrial scales.



## Transfer to industry

CTP promotes innovations and developments in the paper and printing industries. Thus, it participates in the integration of new technologies, as Printed Electronics, into its partners' businesses. CTP has the aim of opening the printed electronics world to traditional printers by upgrading their competencies while keeping their high-volume processes. It consists of adapting printed electronics elements as electroluminescence, RFID, NFC, flexible printed circuit... to various players e.g. packaging.



## Tricomponent fibres for energy generation and sensing

Conventional textiles with integrated sensing and energy generation features.

Using different materials for the production of melt-spun fibres, it is possible to create fibres that can, for instance, generate energy, measure the impact force or the deformation of the structure in which they are integrated.

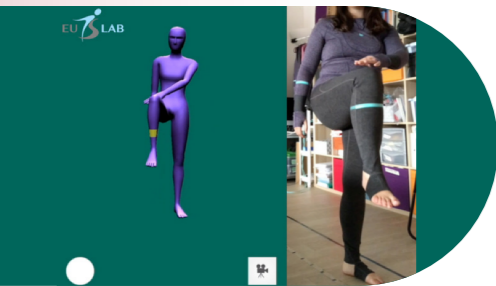


## Viscosity

Viscosity measurements of liquids (pure materials solutions, inks etc.).

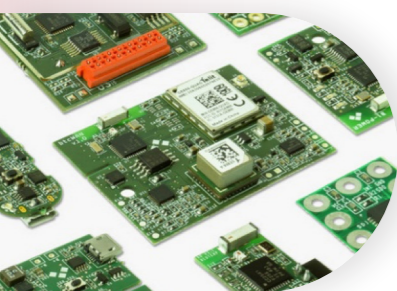
- **Model:** Collotec-Meßtechnik GmbH / RheoSense - m-VROC





## Wearable MOCAP

Custom design and integration of human motion analysis/motion capture (MOCAP) solutions: from single inertial measurement units to integrated full-body washable suit.



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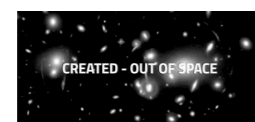
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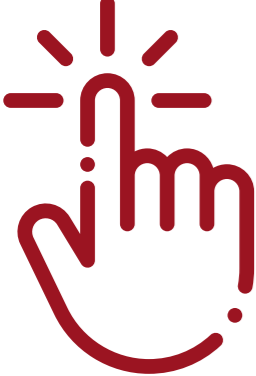


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