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Tendencias e Innovación en Printed Electronics para sector Ferroviario

Functional Printing & Embedded Devices Unit

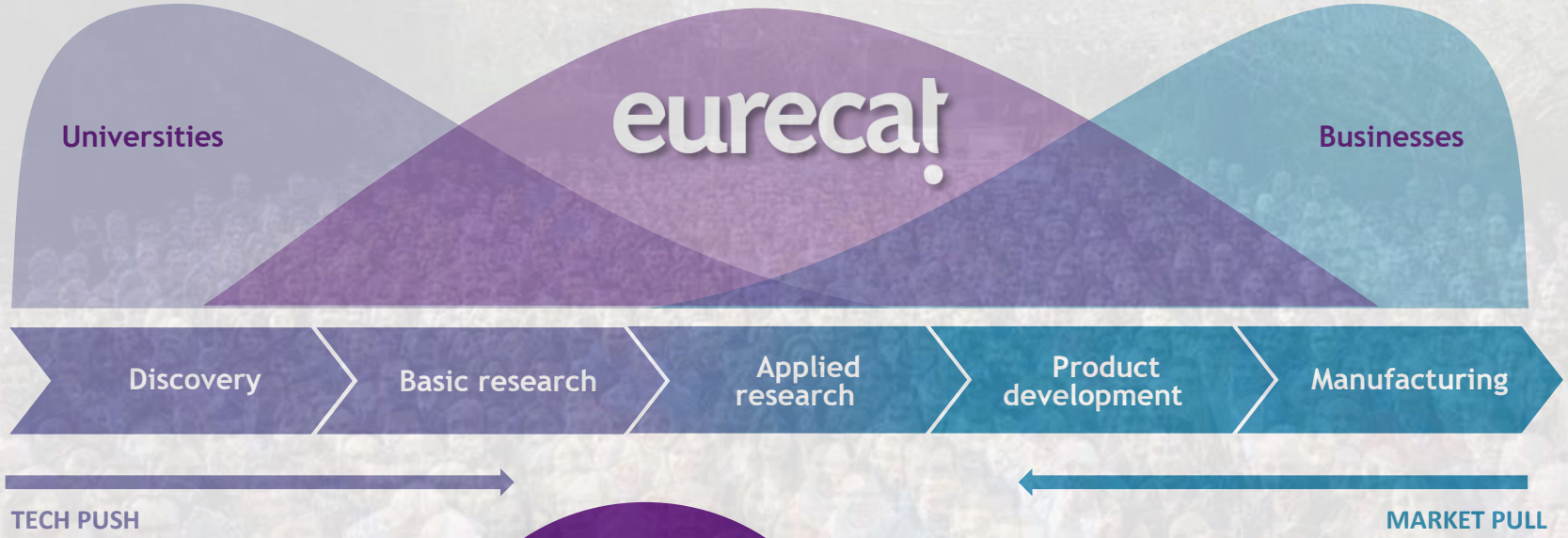
"innovating for business"

Eurecat in a nutshell

BRIDGE FROM BASIC RESEARCH TO MARKET

"innovating for business"

Quite a challenge …which opens up great opportunities



+1700 private customers, of which

63% are SME

670 staff

2nd Spanish technology centre in H2020 funding

125 H2020 projects underway (2014-2021)

+ 33 H2020 projects led (2014-2021)

+ 200 Large R&D&I consortium projects

153 patents

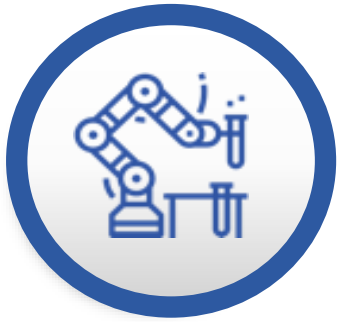
Eurecat's Corporate video

Eurecat's Strategic Areas

TECHNOLOGICAL OFFERING

"innovating for business"

Our interdisciplinary capabilities enable us to address complex challenges.



Industrial **Area**

1. Advanced materials and new manufacturing processes
2. **Functional Printing & Embedded Devices**
3. Collaborative and cognitive robotics
4. Functional textiles
5. Chemicals
6. Modelling and simulation
7. Product development

Digital **Area**

1. Sensor systems and IoT
2. Data science and analytics
3. Artificial intelligence
4. Cybersecurity
5. Multimedia technologies
6. Digital Health

Biotechnology **Area**

1. Nutrition and health
2. Omic sciences
3. Biotechnology

Sustainability Area

1. Water
2. Soil
3. Air
4. Energy
5. Waste
6. Environmental impact
7. Batteries
8. Climate change

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Functional Printing & Embedded Devices unit
At a glance

"innovating for business"

An interdisciplinary group focused on thin-film printed, flexible and hybrid devices embedded into smart surfaces and objects.

Printed Health & Environmental Sensors

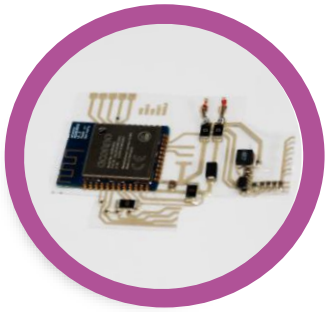
Design and development printed devices with adhoc functionalities to tackle major issues in health and environmental monitoring

Printed Energy Devices

Design and development of ad hoc printed devices for energy harvesting, generation & conversion with emphasis in green hydrogen technologies

In Mould Electronics

Design and manufacturing of functional and decorative films for plastic, composites, silicone and elastomers devices integration.



Smart Engineering

Design and development of embedded systems and IoT devices to fulfill any need in the industry, smart cities or health/medical environment.

+40 Projects in execution

9 Tech Patents

+30 papers

5 Labs. From research to industrial preseries

https://eurecat.org/en/field-of-knowledge/functional-printing-embedded-devices/

Labs Virtual Tour

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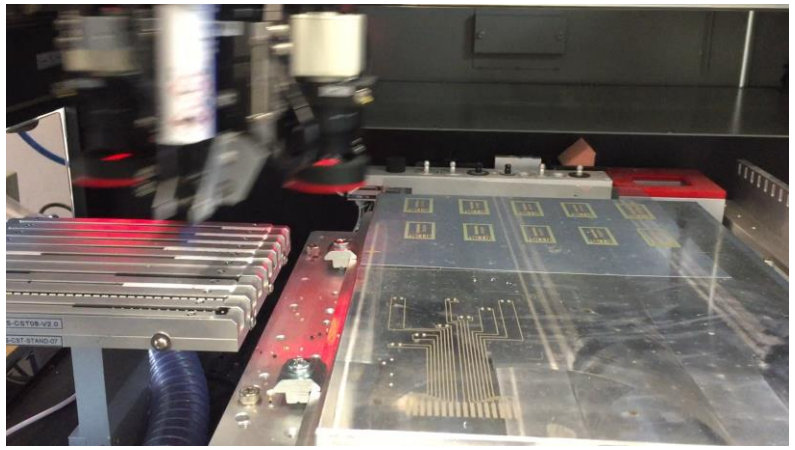
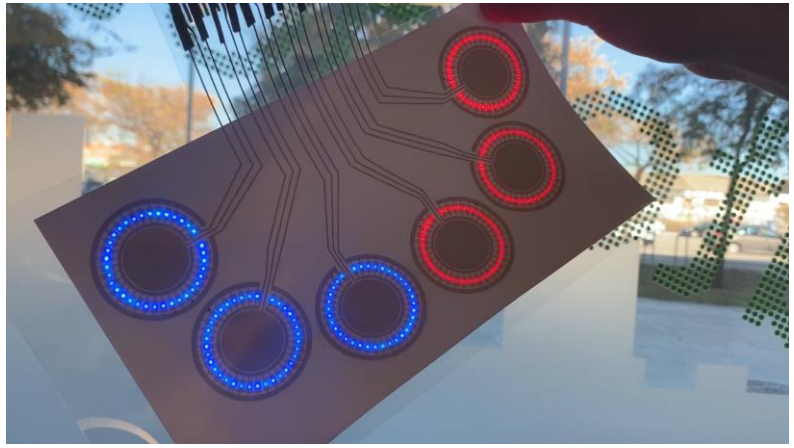
Printed Electronics

Printed electronics enables the production of flexible and large-area components and complements silicon electronics.





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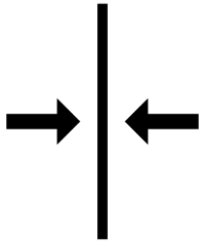
Printed Electronics

Printed electronics enables the production of flexible and large-area components and complements silicon electronics.

lightweight

flexible



thin

robust

Large area

stretchable

Less carbon foot

These **key features distinguish** organic and printed electronics from traditional semiconductor technologies.

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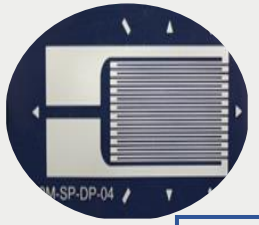
RAIL – Opportunities for flexible electronics

Car Body Shell

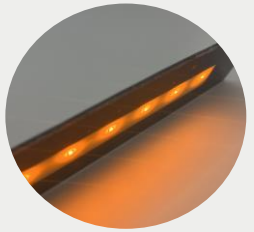


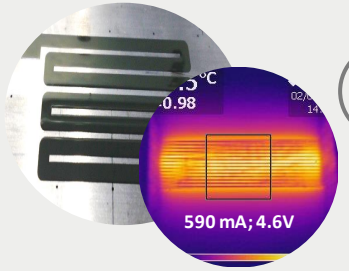
Structural Health Monitoring

Organic photovoltaic cells

Doors

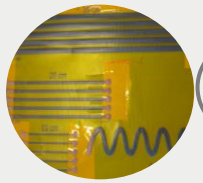
Lightweight composites



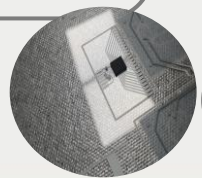


Heating, sensing

Lighting



Printed wires



Integrated low voltage circuits

Interiors

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Functional Printing & Embedded Devices unit

CARBODIN - Car body shells, doors and interiors

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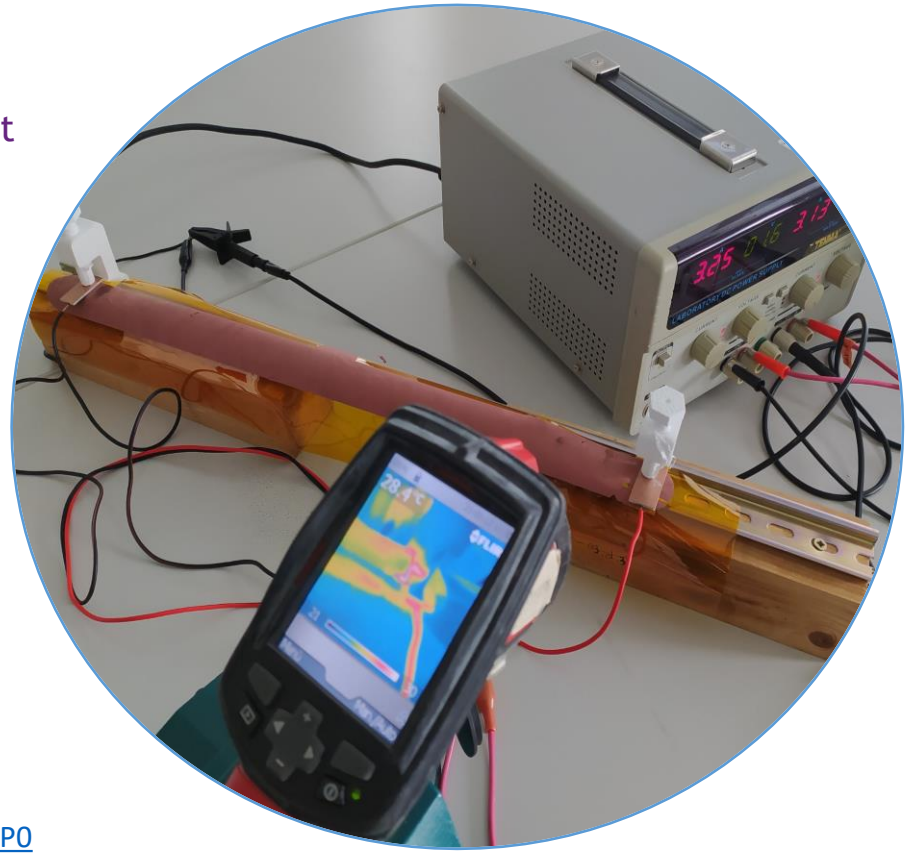
The CARBODIN project, coordinated by Eurecat, has the objective to contribute to the next generation of passenger trains that will be lighter and more energy and cost efficient than the current ones.

CARBODIN
CAR BODY SHELL, DOORS AND INTERIORS

Eurecat participates in design of molds, modular floor development and printed wires integration for low voltage circuits inside composite panels.



Shift2Rail

Project reference
S2R-OC-IP1-01-2019/ 881814

Programme and call for tender
Project funded by the European Union's programme Horizon 2020 within the Shift2Rail (S2R) initiative, H2020-JTI-Shift2Rail-2019, and more specifically under the call *S2R-OC-IP1-01-2019: Advanced car Body shells for railways and light material and innovative doors*

Project website
www.carbodin.eu

https://youtube.com/watch?v=VH4sEFY5YP0

European Commission | Horizon 2020 European Union funding for Research & Innovation

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Functional Printing & Embedded Devices unit

CARBODIN - Printed Wires

"innovating for business"

Printed cables to replace part of the interior wiring of trains

Project reference

S2R-OC-IP1-01-2019/ 881814

Programme and call for tender

Project funded by the European Union's programme Horizon 2020 within the Shift2Rail (S2R) initiative, H2020-JTI-Shift2Rail-2019, and more specifically under
car Body shells for railways and light material and innovative doors

Project website

www.carbodin.eu

Horizon 2020
European Union funding
for Research & Innovation

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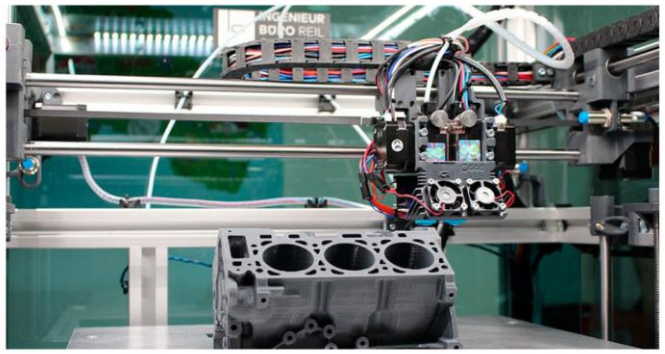
Structural Health Monitoring

Strain gauges printed on foils 2D or in 3D shapes for structural health monitoring



The objective of **3DELECPRINT** is to develop an integrated flexible robotic platform to print electronic sensors and/or cables on geometric complex rigid parts in 3D.

The resulting parts are made of different materials, including metal, composites, and ceramic.

The printing system to be used for the project is based on a spray head for ultrasound. This is a versatile technique enabling the use of a wide variety of dyes, with perfect adaptation to the shape of the substrate and a more efficient use of resources given that is works with very low movements.

General details

Project

3DELECPRINT

Project reference

RTC-2016-5569-7

Programme and call for tender

A project financed by the MINISTRY OF ECONOMY, INDUSTRY AND COMPETITIVENESS and by the European Union, as part of the Challenges-Collaboration tender under the State Investigation, Development and Innovation Programme for Challenges in Society. This forms part of the 2013-2016 State Science, Technical and Innovation Plan, the mission of which is to foster technological development and quality innovation.

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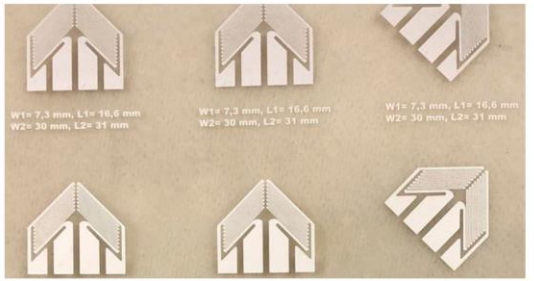
Unión Europea
Fondo Europeo de Desarrollo Regional
"Una manera de hacer Europa"

https://eurecat.org/es/portfolio-items/3delecprint/



The FLEXRAPIDMAN project aims at the **development and maturation of flexible and rapid manufacturing technologies for mobility sub-sectors**, such as air or road transport, as well as **researching on design methodologies for additive manufacturing**, including generative design and the topological optimization of the components.

In the field of aeronautics, the research will focus on studying the feasibility of the production of aircraft parts, currently mechanized, by additive printing using the SLM technique (Sintering Laser Melting and, promoting the use of the ISF technology (Incremental Sheet Forming) for manufacturing 3D parts, tools and sensors for aeronautical systems by means of additive electronic printing.

As part of the automotive research line, the project aims to demonstrate the feasibility of the sensorization and manufacturing of auxiliary tools by LMD (Laser Metal Deposition), manufacture closed foaming moulds with FDM technology (Fused Deposition Modelling), use the ISF technology (Incremental Sheet Forming) for the development of 3D pieces with advanced steels or the DMLS technology (Direct Metal Laser Sintering) for the manufacture of stamping dies. We will also investigate the printing of extensor gels by means of print electronics.

General details

Project

FLEXRAPIDMAN – Maturation and development of efficient manufacturing technologies, fast and flexible, applied to the mobility sector

Project reference

CDTI IDI-2017 1014

Programme and call for tender

Project funded by the call CIEN 2017 of CDTI (Centre for Technological and Industrial Development) and cofunded by the Fondo Europeo de Desarrollo Regional (FEDER).

CDTI Centro para el Desarrollo Tecnológico Industrial

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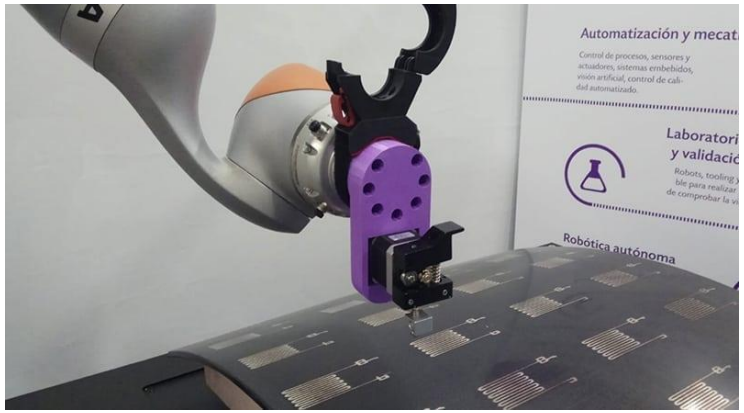
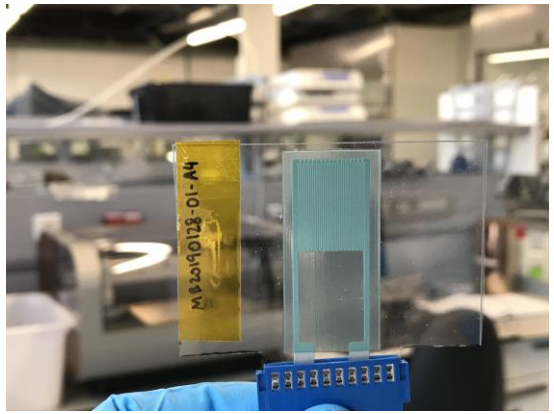
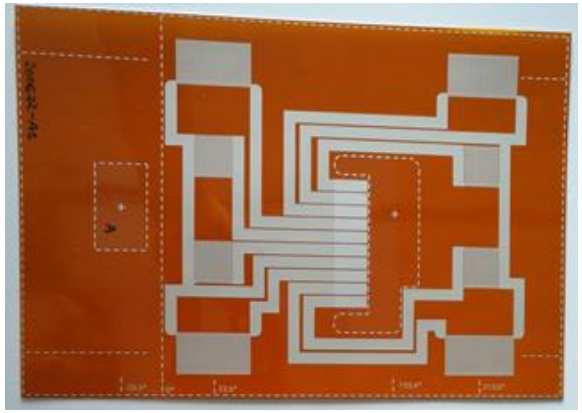
https://eurecat.org/en/portfolio-items/flexirapidman/



Printed strain gauges on 3D surfaces





From a single gauge To a sophisticated design to compensate for the effect of temperature

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Heating

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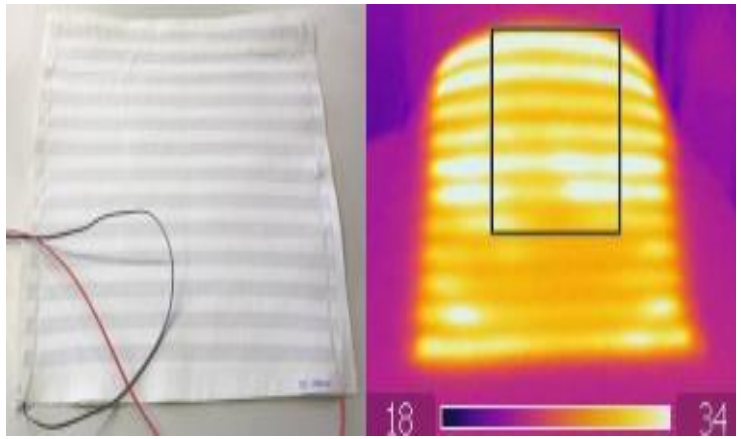
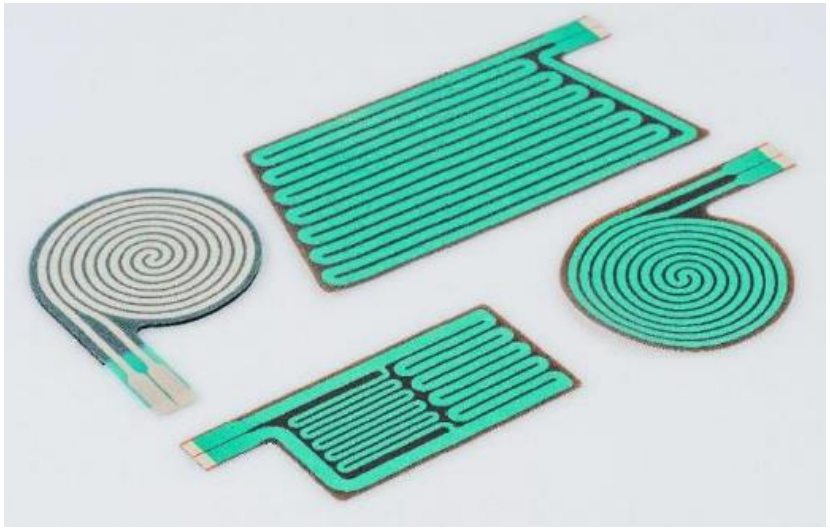
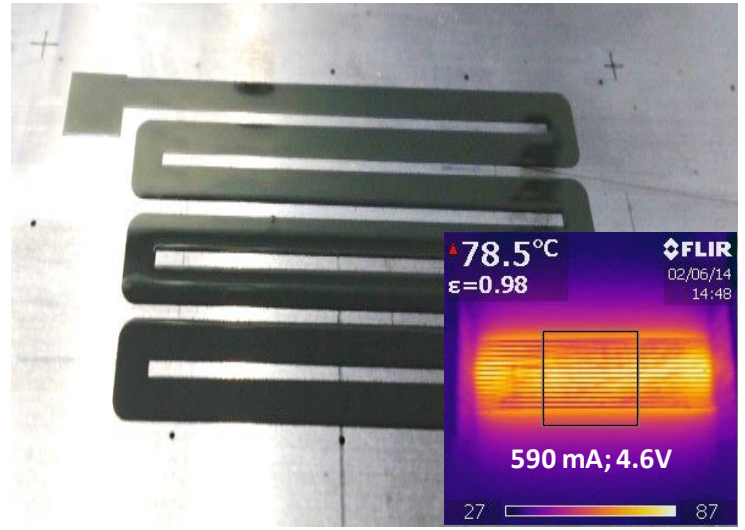
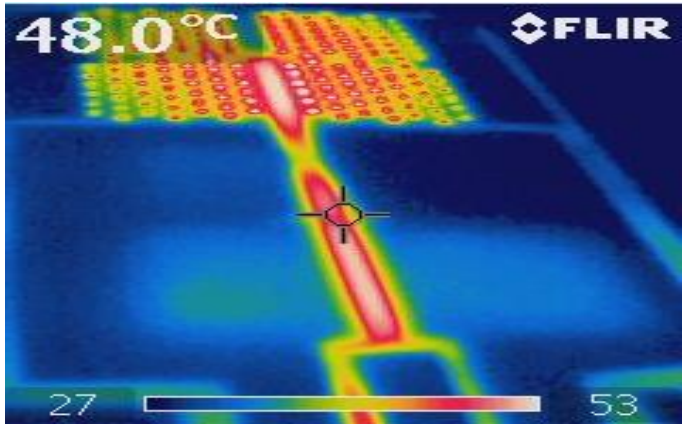
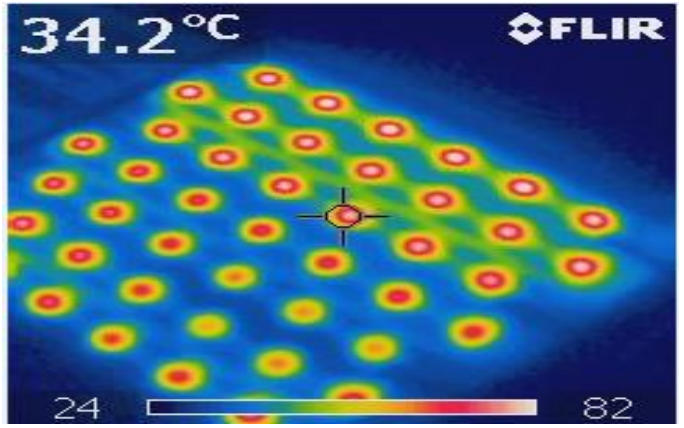
Flexible self-regulating printed heaters to integrate into furniture











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Printed & Embedded Light

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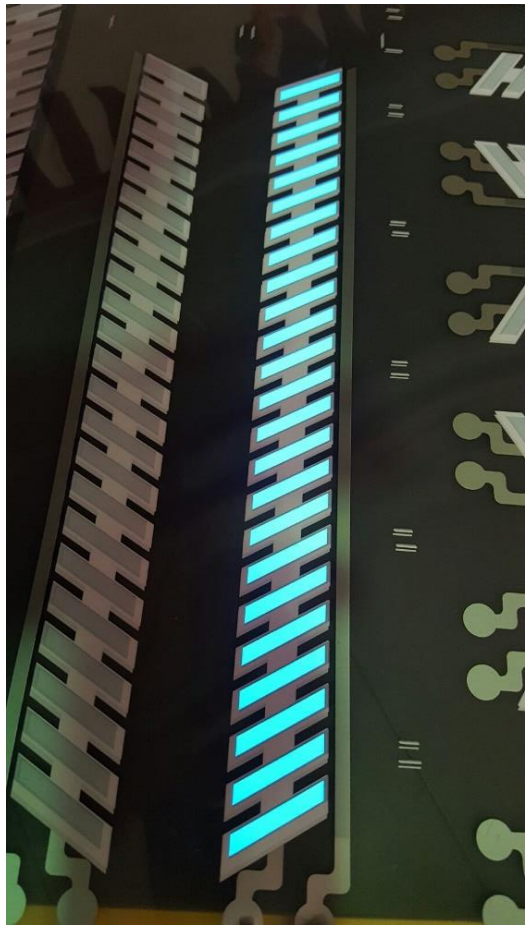
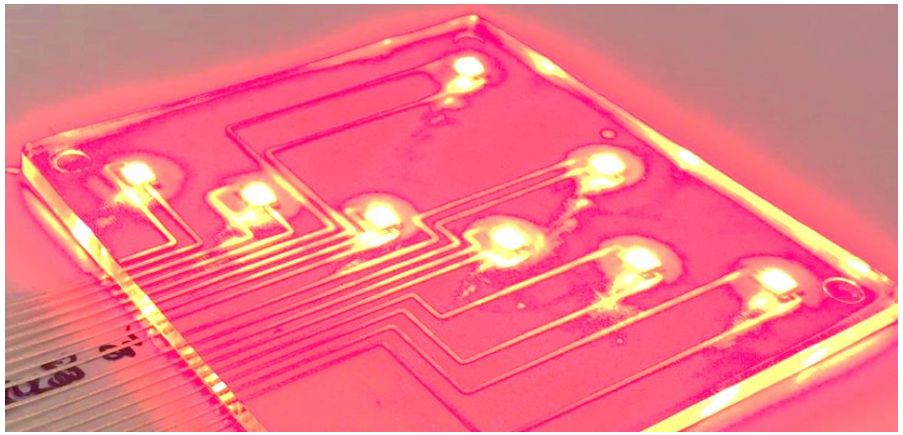
Printed & integrated light in plastic, textile & composites





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Smart Touchless Sensors

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Non-contact capacitive sensors for indoor use in the railway sector

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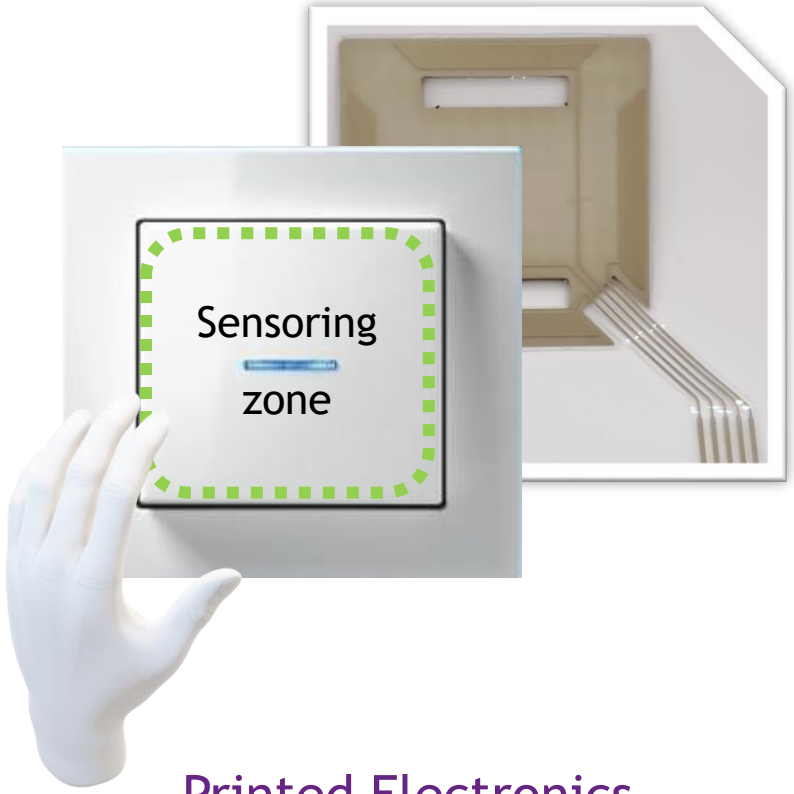
Smart Touchless Sensors with embedded AI

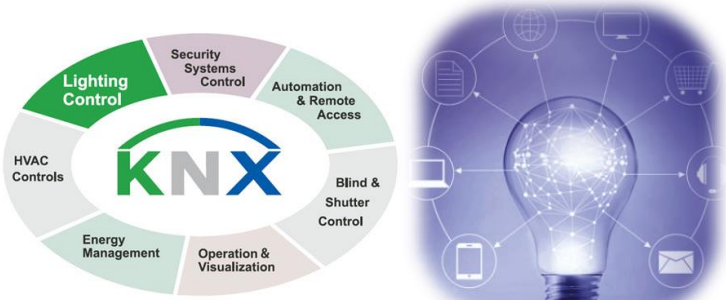
"innovating for business"

Gesture recognition with embedded Artificial Intelligence algorithms with digital output in switches to adapt them to the new needs detected in the market (non-contact-high influx of people)



Printed Electronics

Machine Learning



Domotics

AEI-010500-2022b-331: Proyecto financiado a través de la convocatoria "Agrupaciones Empresariales Innovadoras 2022" de la Agencia Estatal de Investigación (Ministerio de Industria, Comercio y Turismo) y la Unión Europea NextGenerationEU / PRTR

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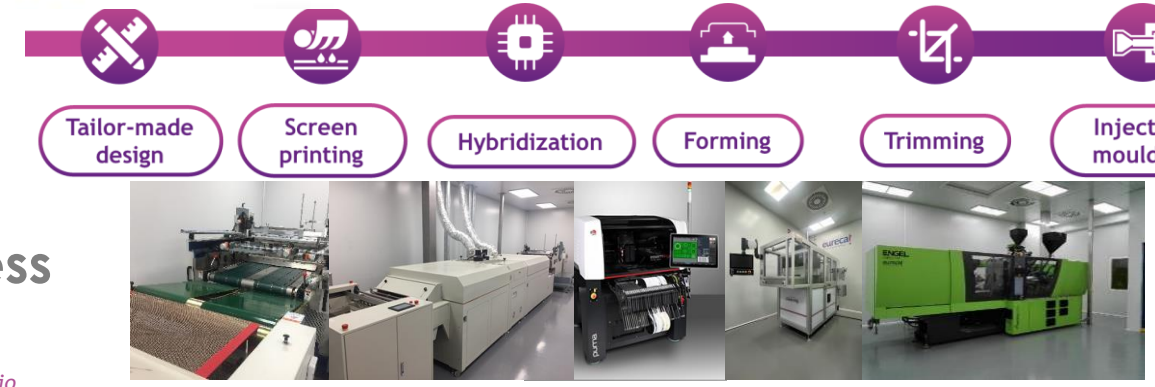
Púlsar - Smart Human Machine Interfaces

Púlsar demonstrates the application of In Mold Electronics in a vehicle centre console. Only 3mm thickness, this smart plastic surface presents an intuitive Humane Machine Interface (HMI) with seamless LED illumination and capacitive sensors, embedded in a monolithical device.

oe-a Competition 2024

Best Demo Public Award

Process



https://youtu.be/6NpnFmZgl_Y

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Partners

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Clusters, associations, and Hubs

SmartEEs
The European Flexible & Wearable Electronics Association

oe-a

EPoSS.
European Association on Smart Systems Integration

DIH4CAT
Digital Innovation Hub de Catalunya

Clúster Digital

in-move by Railgrup
Cluster de Movilidad y Logística Multimodal

Railway Innovation Hub

FUNCTIONAL PRINT CLUSTER

3NEO
Plataforma Tecnológica Española de Impresión Avanzada

GREMI

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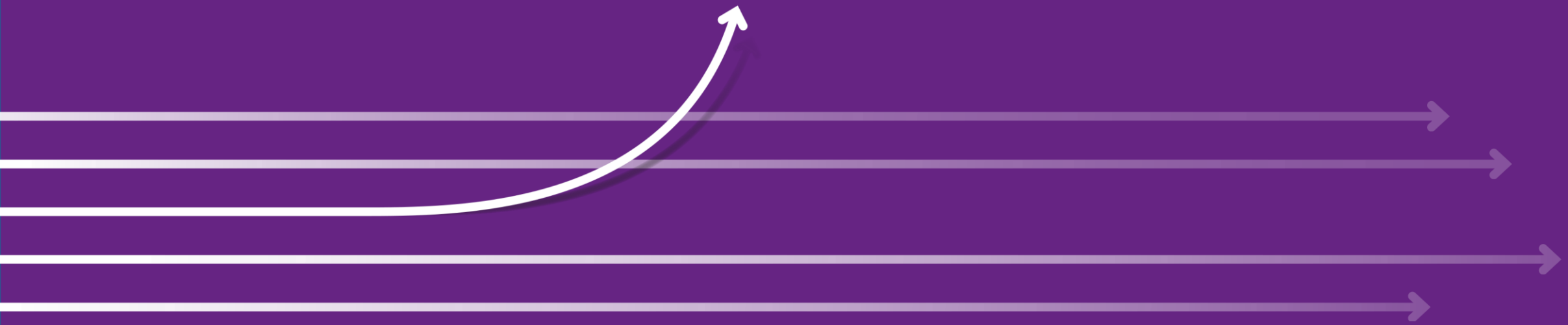
Thank you!



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