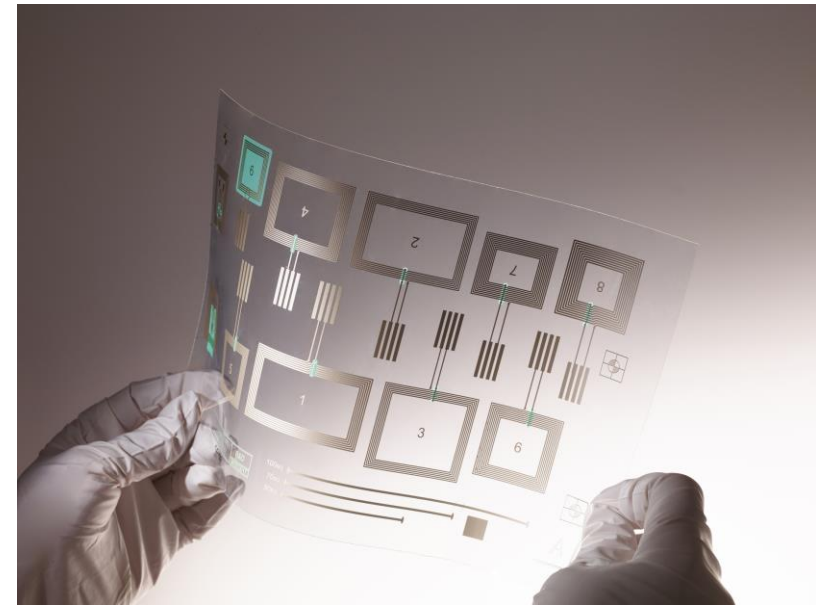


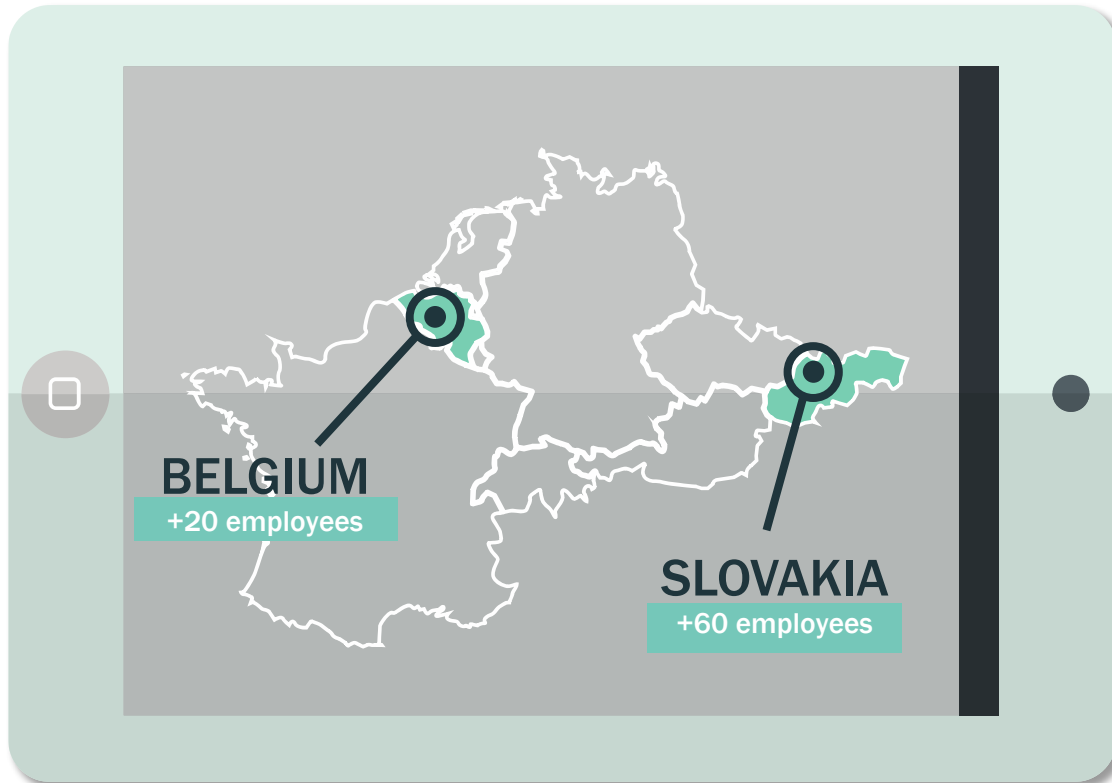
**How Printed Electronics leads to
innovation in User Interfacing**

INTRODUCTION

- Quad Industries
 - Company
 - Manufacturing activities
 - Business segments
- Printed & hybrid electronics
 - Features
 - Vision / roadmap
- Use cases
 - Temp logger
 - Arion running wearable
 - 3D Touch wheel
 - Haptic Touch



- Contract Manufacturing
- Headquartered in Sint-Niklaas, Belgium
- Family owned
- Founded in 1998
- Employees: +/- 80
- Revenues: ~ € 5.0 million



Belgium: 1500m²,
MGMT, sales,
procurement, R&D,
engineering, labo-scale
production

Slovakia: 3000m²,
local MGMT, sales,
engineering, main
production site

MANUFACTURING ACTIVITIES



- Screen-printing on flexible films > fully automated + semi automated lines
- PSA & OCA tape bonding + optical (vacuum) bonding
- Pick & place assembly on rigid and flexible substrates
- Laser- & knife cutting, punching
- Plastic film embossing
- Mechanical assembly



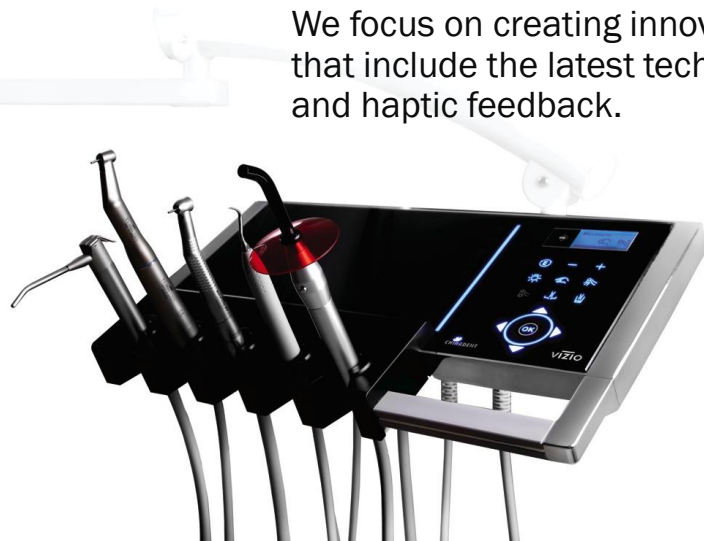
BUSINESS SEGMENTS

User interfaces

Quad Industries supplies a wide range of touch and switch solutions, such as:

- Membrane switches
- Capacitive touch keys & PCAP solutions
- Haptic piezo touch
- Pressure sensing

We focus on creating innovative interface solutions that include the latest technologies in backlighting and haptic feedback.

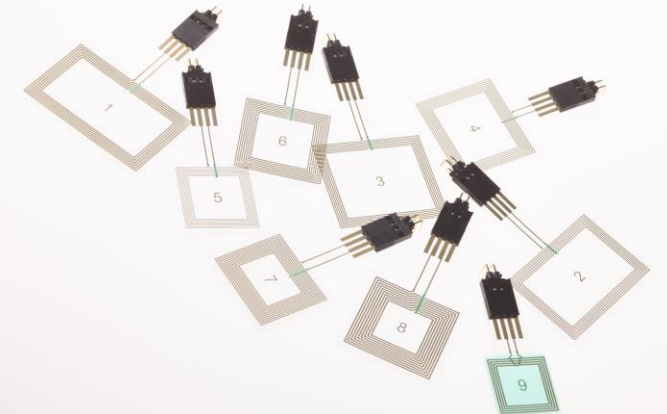


Printed Electronics

Manufacturing of electronics by standard screen-printing processes.

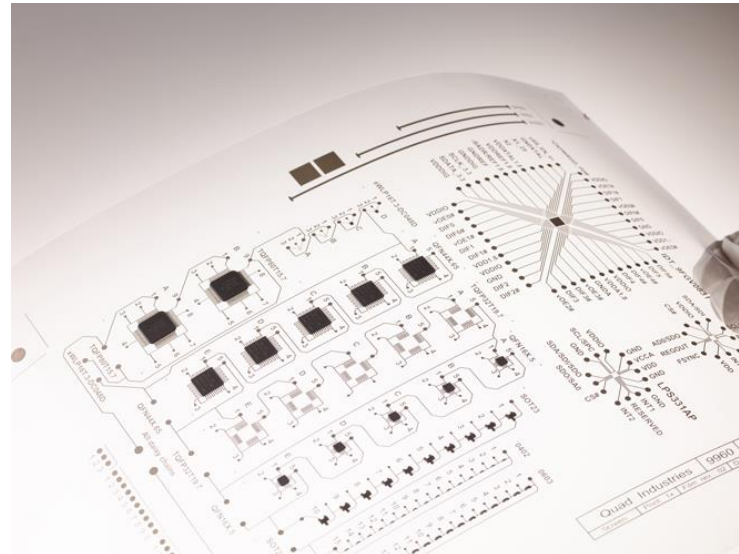
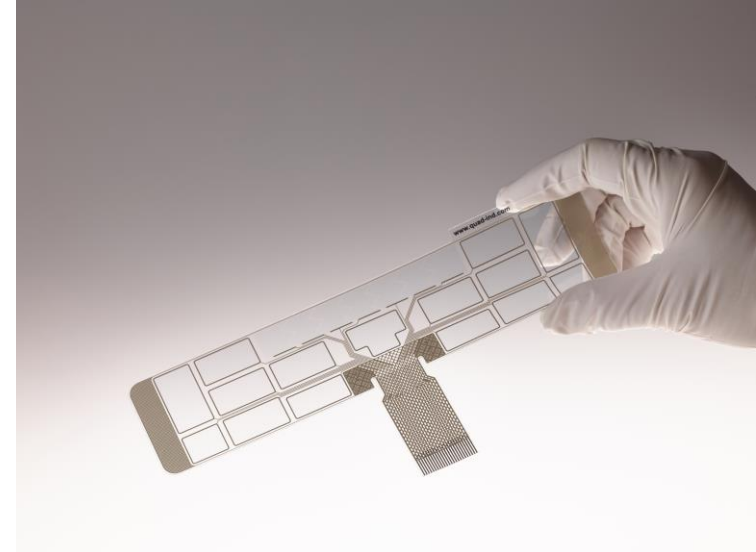
Combining with traditional electronics to exploit the competitive advantages of both technologies
= hybrid electronics

- Printed sensors (temperature, pressure, touch & proximity, liquid level,...)
- Printed batteries
- Printed antennas

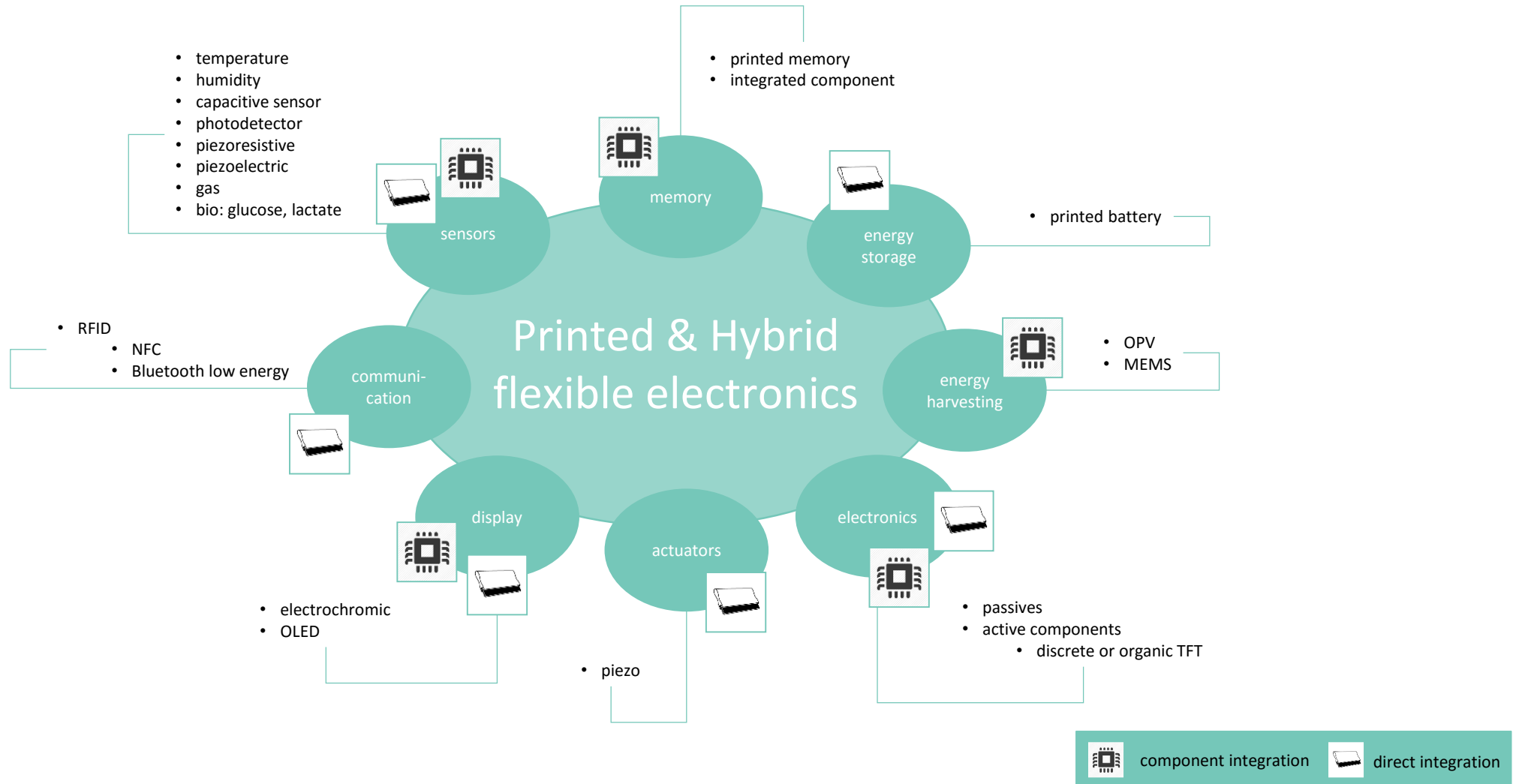


PE - FEATURES

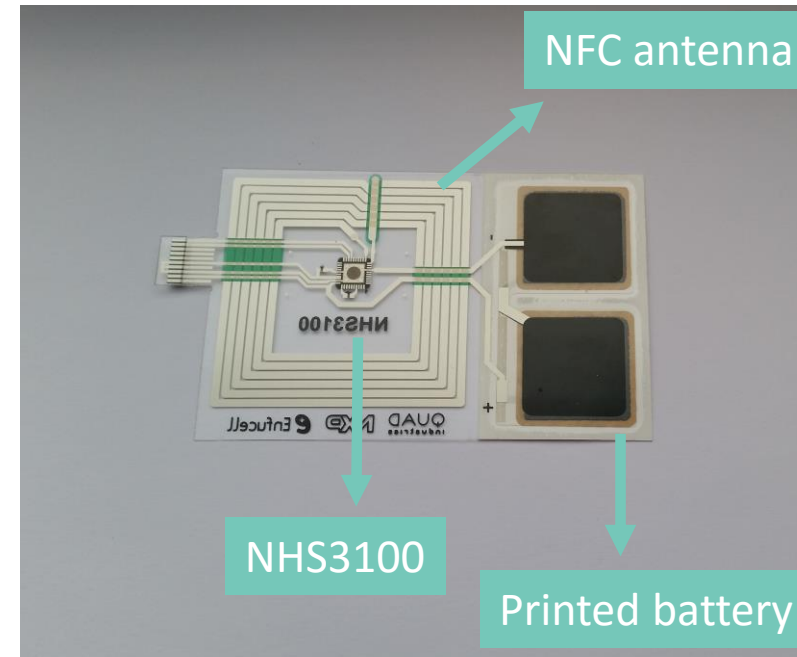
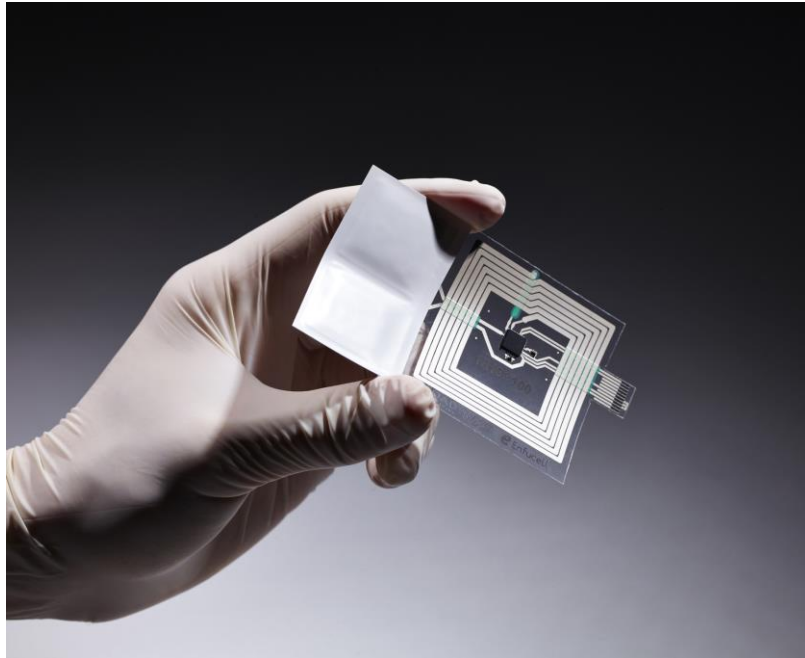
- Lightweight, flexible substrates
 - Flexible films
 - Textiles
 - TPU
 - Paper
- Low-cost + low ecological footprint
 - Additive manufacturing
 - no (etching) chemicals
 - less process steps



PE – VISION/ROADMAP

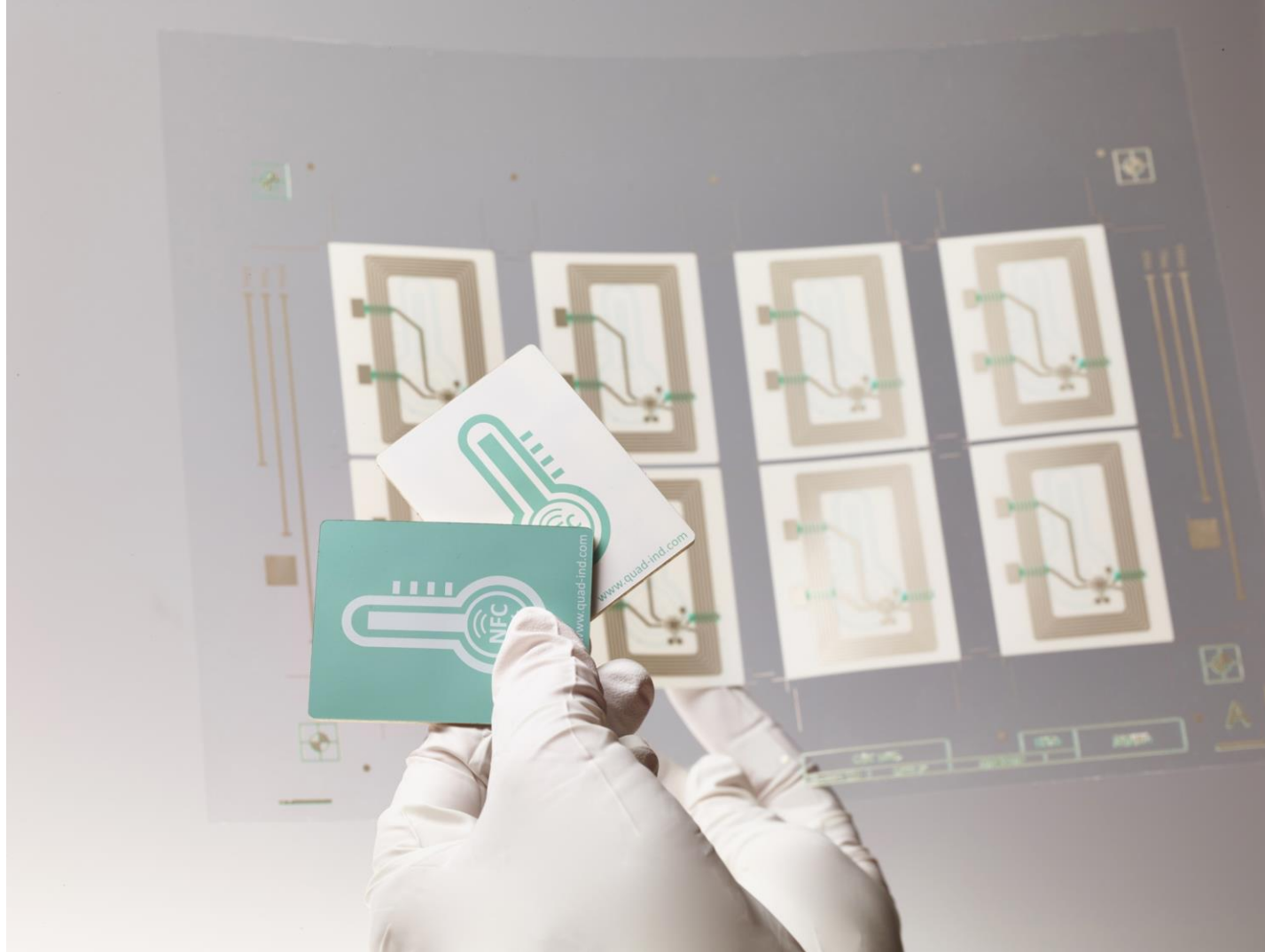


PE – TEMPERATURE LOGGER



- Smart, disposable tag, with
 - Integrated temp logger
 - NFC antenna
 - Printed battery
 - ALL-printed power source, flexible and thin
 - ECO-friendly materials, based on Zinc, Manganese Dioxide & Zinc-chlorite
 - Capacity of few mAh per cm²
 - Suitable for BLE or NFC enabled applications
- Application:
 - Item-level monitoring of temp sensitive products
 - Medical and pharmaceutical field

PE – TEMPERATURE LOGGER



PE – ARION

ULTRA-THIN SMART INSOLES

Advanced sensor technology

The smart, flexible and ultra-thin ARION insoles slip neatly under your existing running shoe insoles. With 8 sensors accurately measuring the interaction between your foot and the ground you are running on, the ARION smart insole transforms your shoe into a running lab.



PE – ARION



GPS-ENABLED TRAINING PODS

Accurately measure your movement

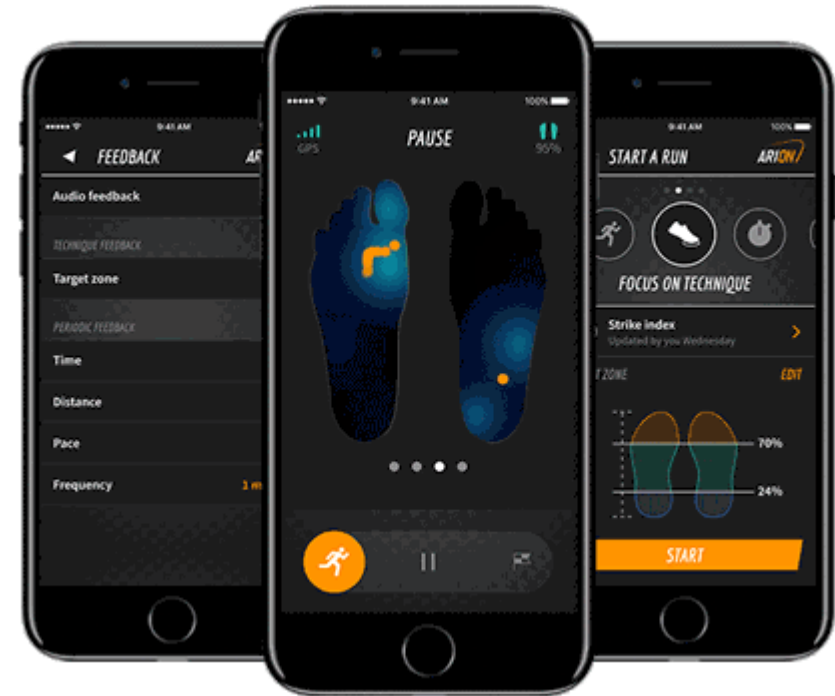
ARION training pods are rugged, waterproof and feature a multi-axis accelerometer, gyroscope and GPS. It's a high-performance instrument collecting and processing valuable data at lightning speed, providing a complete picture of your running technique.

PE – ARION

THE FREE ARION APP

Keep track of your performance

The ARION app is your portal to cutting-edge exercise science, creating simple, intuitive and easy to understand interfaces through which you can transform the way you run. Available for free on iOS, Android and market-leading smartwatches.



PE – ARION

Technology

- printed, force sensitive resistor (FSR) technology
- 8 embedded pressure sensors placed at strategic locations
- fully integrated solution
- flexible and thin

ARION

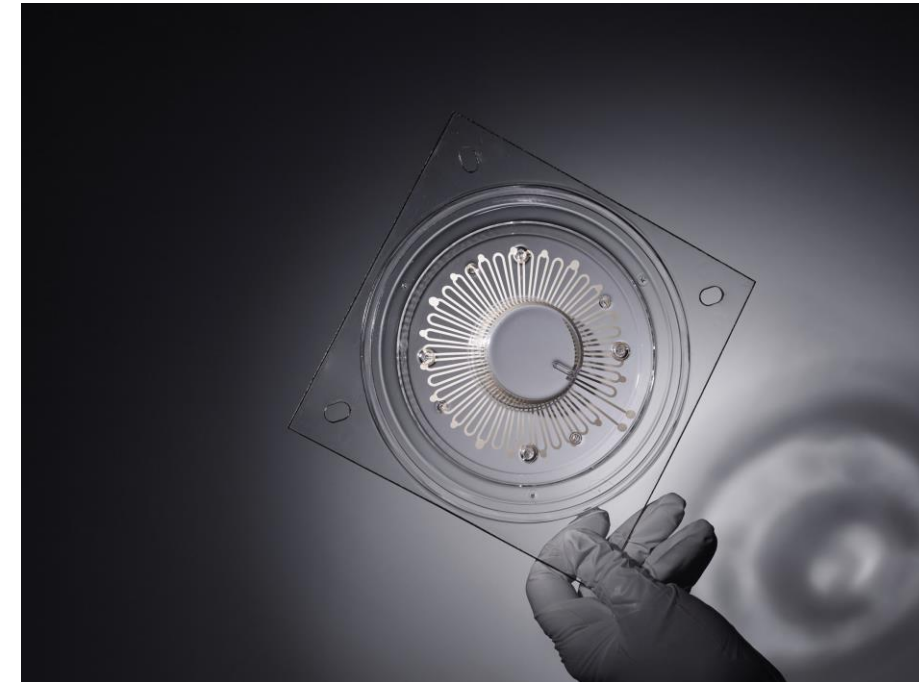
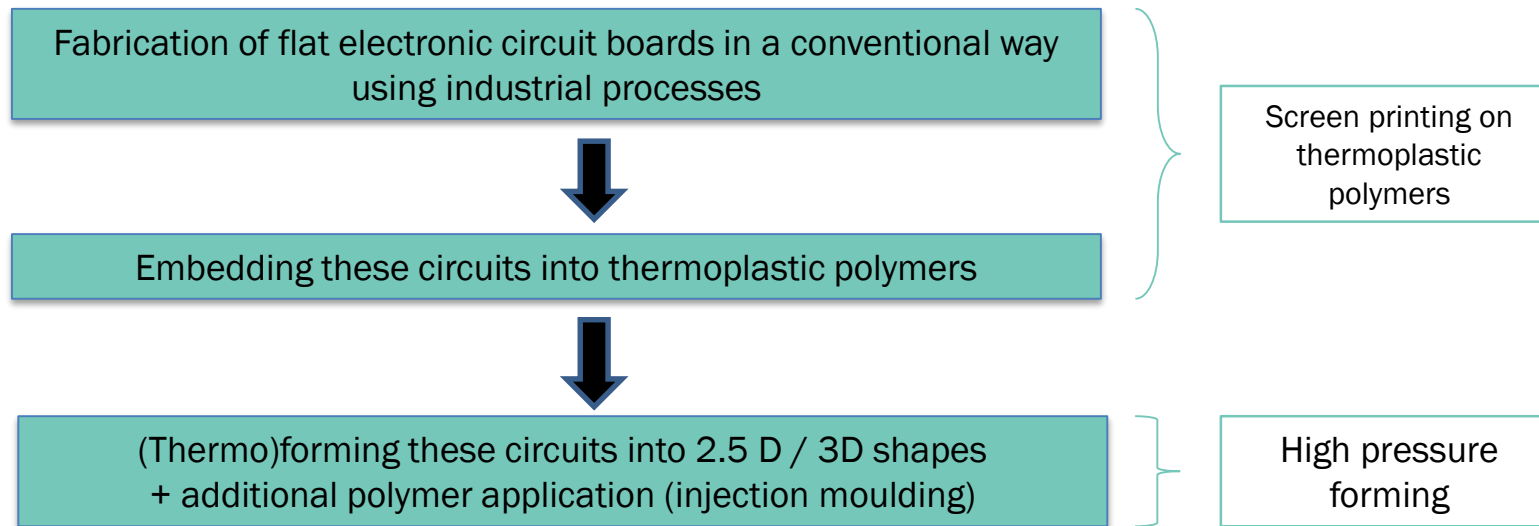


PE – 3D TOUCH WHEEL

- TERASEL - Thermoplastically deformable circuits for embedded randomly shaped electronics
- Based on 3 trends in user interfacing
 1. Increasing demand for touch sensitive interfaces
 2. Evolve from flat to flex or 3D shaped interfaces
 3. Increasing demand for IME (= In-Mold Electronics)
- Replacement of classic mechanical turning knob by 3D touch wheel
- A rotating movement with the fingertip is converted into the required signal (pulses)
- Main drivers:
 - Eliminate use of complex mechanical parts in UI
 - Reduced complexity
 - Increased reliability
 - Rotary knob is most extreme w.r.t. stretchability
 - > 100% stretchability
 - Same technology enables for any 3D shaped touch interface, including sliders & buttons



PE –3D TOUCH WHEEL



UI – HAPTIC TOUCH

- Capacitive sensing by means of an ultra-thin, printed capacitive touch sensor = Quad technology
- Haptic feedback by means of piezo discs attached to a printed circuit = Aito technology
- Capacitive sensing layer can be used as a trackpad or as backlit numpad with small keys
- Haptic feedback is controlled by advanced control software > Aito chip
- Some of the features:
 - Applicable with any surface material (Steel, Wood etc.)
 - Possibility for seamless user interfaces
 - Exceptional durability
 - Configurable user experience
 - Local haptic feedback
- Quad Industries = preferred supplier for Aito foil stacks



USE CASE - FAURECIA





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