

## 4D manufacturing for mechatronics systems

### AMPERE

Paris, 10 March 2022- PENTA project, AMPERE, is creating innovative techniques, materials and processes for '4D manufacturing' methods: that is, combining Additive Manufacturing (AM, also known as 3D printing) with embedded (built-in) reliable electronics. These new methods will enable more flexible, local and customised production to faster respond to market changes. In addition, by combining for the first time, the manufacture of electronics, mechanical and optical functionalities (mechatronics) into a hybrid approach, AMPERE's results will allow for new unique product designs.

Today, most of the goods we use are produced in factories optimised to deliver high volumes of low cost, high-quality products. And much of this manufacturing is concentrated in specific regions of the world, particularly Asia. However, as digitalisation advances, industrial production is becoming increasingly automated, based on computer-controlled machines and systems, artificial intelligence and machine learning (known as Industry 4.0 or Smart Industry).

At the same time, products themselves are becoming digital or include digital functionalities, from LED lighting in our homes to medical devices that keep us well. Plus, there is growing demand for more personalisation which requires flexible, customisable production instead of today's highly standardized designs and components.

AMPERE is responding to these challenges by creating hybrid 4D manufacturing processes that will enable mechanical, electrical and optical functionalities to be integrated into end-products. The project will develop essential technology, smart processes and industrial production systems tailored to the needs of real-world industry. The resulting scalable hybrid 4D manufacturing will allow for flexible and cost-effective production, from small series mass customization through to higher volumes. And the project partners will demonstrate the approach in product cases covering LED luminaires, signal and power electronics, and medical devices.

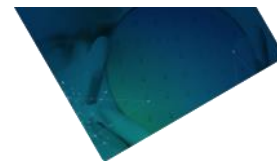
To achieve its goals, the AMPERE project has brought together companies and research institutes with technical competencies and expertise across the complete value chain of materials, processes, equipment, product design, manufacturing, and applications. Its outcomes will be important in maintaining Europe's existing strength in high-quality equipment, materials, and products and extending its leadership to the digital domain.

Commercially, the project's results will be relevant for three huge markets. Firstly, AM which is a rapidly growing market (21% from 2017-2018) valued at USD 10 billion in 2019.<sup>1</sup> Secondly, 3D printed electronics, likewise a growing sector, expected to reach a total value in excess of USD 2 billion by 2029.<sup>2</sup> And thirdly,

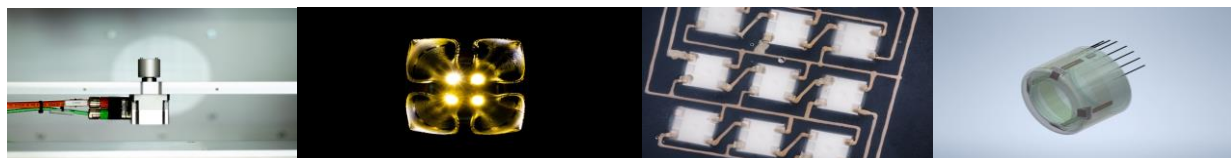
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<sup>1</sup> Wohlers Report 2018

<sup>2</sup> 3D Printed Electronics and Circuit Prototyping 2019-2029, IDTechEx



Electronic Manufacturing Services which was worth USD 463.2 billion globally in 2019<sup>3</sup> with annual growth currently exceeding 10%. For European companies, this new 4D manufacturing approach offers not only opportunities for leadership in digital design and manufacture in these major markets, but also the potential to bring back an important portion of the electronics manufacturing value chain to Europe.



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#### About the PENTA programme

**PENTA** is a **EUREKA** cluster whose purpose is to catalyse research, development and innovation in areas of micro and nanoelectronics enabled systems and applications. Guided by the **Electronic Components & Systems (ECS) Strategic Research and Innovation Agenda (SRIA)** four technology layers, four cross-sectional technologies and six ECS key application areas, the PENTA programme enables the development of electronic solutions to help drive the digital economy through the formation of collaborative ecosystems along the ECS value chain. This creates the opportunity for rapid competitive exploitation and a strong impact on European societal challenges. PENTA supports SMEs, large corporations, research organisations and universities to work together in project consortia by facilitating access to funding, fostering collaborative work and creating consortia in areas of mutual industrial and National interest. PENTA is managed by the Industry Association AENEAS

More on PENTA: <http://www.penta-eureka.eu>

More on AENEAS: <https://aeneas-office.org>

#### About the AMPERE project:

AMPERE is a RD&I project consortium involving 10 partners. The project partners are: Philips Electronics Nederland BV (Project Leader), Eindhoven University of Technology, Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V., Neotech AMT GmbH, Reden BV, Signify, TNO, VSL BV, Würth Elektronik GmbH & Co KG and XENON Automation GmbH. The project is funded by Germany and the Netherlands.

AMPERE website: <https://ampere-penta.eu/>

More on Ampere: <https://penta-eureka.eu/project-overview/penta-call-4/sentinel/>

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<sup>3</sup> Electronic Manufacturing Services Market Analysis and Global Outlook, Beroe Report 2019