ProDesk-3D Multi-Process reconfigurable Desktop production centre for holistic 3D manufacture of micro-parts Apart

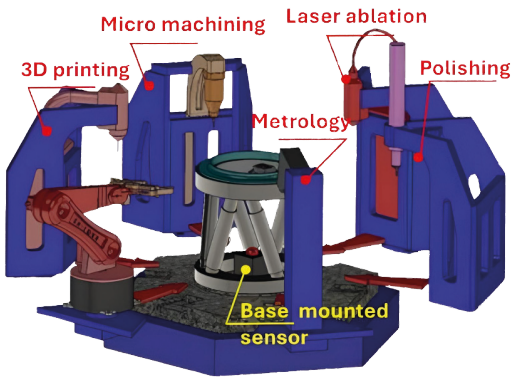
Abstract:

ProDesk-3D is a multi-process, multi-axis desktop machine for high-precision 3D components.

Reconfigurable slot-in posts: Standardized modules that let parts be transferred in-situ between processes under an intelligent controller, reducing handling errors and idle time.

Central hybrid parallel-kinematic positioner: A compact multi-axis stage at the center of the machine sets the geometric layout for the slot-in posts and provides low compound positioning error during operations.

The resulting multi-functional parts target medical, aerospace, electronics, instrumentation, and automotive applications.



Countries involved

Application sectors
Aerospace, Automotive, Industrial components

Research and innovation domains
Advanced manufacturing processes, Smart & adaptative manufacturing systems, Sustainable manufacturing, Customer-based manufacturing

Total cost in M€ (millions)
1.944 M€

Starting date
01/02/2025

Duration (in months)
36 months

Project website
am-coe.com/single-project

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ADDITIVE MANUFACTURING CENTRE OF EXCELLENCE

Project participans
ATTENBOROUGH DENTAL LABORATORIES LTD - OPTEK LTD - METEASE LTD - UNIVERSITY OF NOTTINGHAM - Solidvision - ECHOTools - The Czech Technical University

RATIONALE OF THE PROJECT

The growing demand for miniaturised 3D components in medical, aerospace, electronics, and other sectors is exposing major manufacturing challenges. Current parts require multiple processes—printing, machining, polishing, and inspection—typically performed on large, inflexible and costly machines. These systems are oversized for small parts, consume excessive energy, and need ancillary equipment, creating high costs and inefficiencies. As a result, many conceived miniature devices never reach production. A lack of integrated, agile, and affordable solutions limits Europe's competitiveness in high-value micro-manufacturing. ProDesk-3D addresses this by developing a compact, modular "DeskMach": a reconfigurable desktop machine that integrates additive, subtractive, and finishing processes with in-situ metrology and automation. This one-stop system reduces errors from multiple handling steps, lowers energy and material use, and minimises cost. By enabling precise, sustainable, and accessible micro-manufacturing, ProDesk-3D will unlock innovation and growth across critical industries.

TECHNOLOGICAL INNOVATION, ACHIEVEMENTS AND RESULTS

ProDesk-3D introduces a disruptive advance over the state of the art by integrating additive, subtractive, laser, and polishing processes with in-situ metrology into a compact, reconfigurable desktop platform. Unlike conventional bulky machines that perform single tasks, the modular "DeskMach" architecture enables slot-in processing posts around a hybrid 6+2 axis kinematic positioner, reducing footprint, cost, and handling errors. Integrated machine vision and confocal sensors allow real-time inspection and corrective actions, creating a closed-loop quality control environment.

Key technological achievements include: (i) a working prototype of DeskMach with interchangeable micro-processing units; (ii) a hybrid kinematic positioner with repeatability; (iii) advanced automation for part and end-effector manipulation; (iv) a hybrid control system linking CNC with distributed modules; and (v) simulation/error-compensation tools ensuring precision despite reconfigurations. Expected results are validated prototypes and software demonstrating 100% faster production of medical implants, 30% fewer rejects, 60% energy savings, and scalable deployment for SMEs and industry.

MARKET POTENTIAL

Global demand for miniaturised, high-precision 3D components is accelerating, with the medical implants market alone projected to reach USD 157.6B by 2028. Similar growth trends exist in aerospace, electronics, and instrumentation, driven by needs for customised, compact, and complex parts. Current solutions rely on expensive, oversized precision machines, limiting accessibility and profitability for SMEs.

ProDesk-3D unlocks this market by offering an affordable, modular, and sustainable desktop platform. The consortium combines strong market access: AM-COE and Attenborough Medical connect to medical and casting markets; MetLase and OpTek provide industrial integration and laser processing expertise; UNOTT and CTU ensure cutting-edge research; SolidVision and ECHOTools link to EU manufacturing and tooling sectors. Together, they enable wide adoption and exploitation of ProDesk-3D across medical, aerospace, electronics, and automotive value chains.

IMPACT POTENTIAL

ProDesk-3D will significantly enhance European competitiveness in manufacturing by delivering a compact, reconfigurable platform that reduces cost, energy use, and waste while improving accuracy and throughput. It enables SMEs and large industries to access advanced part production without heavy infrastructure, fostering innovation in medical, aerospace, electronics, and automotive sectors. By combining sustainability with high precision, ProDesk-3D supports SMART's goals of intelligent, adaptive, and resource-efficient manufacturing, accelerating market uptake of miniaturised, high-value products.