

# Digimat

The multiscale material modelling platform





# Unlocking the power of materials

Materials are used everywhere across multiple industries, ranging from material suppliers through automotive and aerospace to electronics and medical applications. By leveraging materials usages at their full potential, Digimat enables material innovation, lightweight product designs and reduces waste materials to create a significant and sustainable impact.

Digimat is the state-of-the-art multiscale material modelling platform focusing on the micromechanical modelling of complex multiphase materials such as plastics, composites, metals, and elastomers, revealing how they perform at part and system levels. Digimat bridges the gap between materials, manufacturing processes, and structural part performance to design innovative high-performance products while minimising weight, cost and time-to-market.

## **Digimat solutions form a holistic system based on three pillars:**

- Digital materials laboratory to virtually design and test materials
- Multiscale simulations to enrich FEA and connect materials, manufacturing and performances
- Additive manufacturing focusing on polymers and composites

Back in 2003, Digimat was developed and commercialised by e-Xstream Engineering. The company became part of MSC Software in 2012 and part of Hexagon AB in 2017 further connecting the virtual and physical worlds.

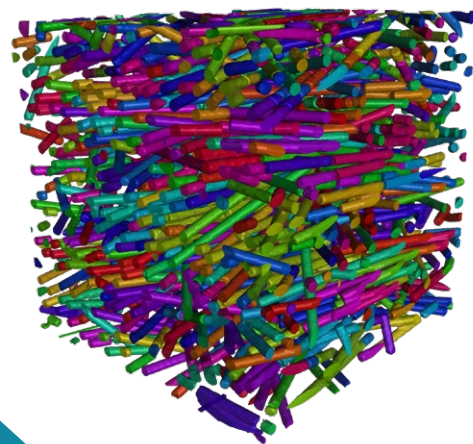


# Digital Materials Laboratory

Multiscale material simulations give insights into microscopic mechanisms that dominate the material macroscopic properties, empowering scientists and engineers with an accurate understanding of complex material behaviours. Multiphysics performance of composite materials, reinforced plastics, foams, metallic and many other material systems can be predicted by virtual testing of material properties and microstructures. The creation of these material digital twins connects the real world and the virtual world to efficiently screen materials and identify promising candidates, while minimising physical testing and saving development time and costs to accelerate material innovations.

## Key capabilities and benefits:

- Perform advanced simulations on real microstructures based on CT-scan data
- Access extensive libraries of material models, microstructures, physics and tests to create your digital twin
- Investigate and understand the material behaviour and predict damage and failure evolutions
- Study the effect of out-of-ply waviness, fibre tow gaps, porosity, delamination and other manufacturing defects
- Account for variability of the material, process and testing parameters while reducing the amount of experimental tests
- Define a full test matrix of materials, layups, tests and environmental conditions and predict the virtual stiffness and strength of the composite laminate in just a few clicks



## Tools and solutions:



**MF**

Digmat-MF computes the macroscopic properties of multiphase materials based on a mean field homogenisation approach that provides fast and accurate results.

Digmat-FE generates a representative volume element (RVE) of the material microstructure. The finite element analysis of the RVE allows an in-depth view into composites.

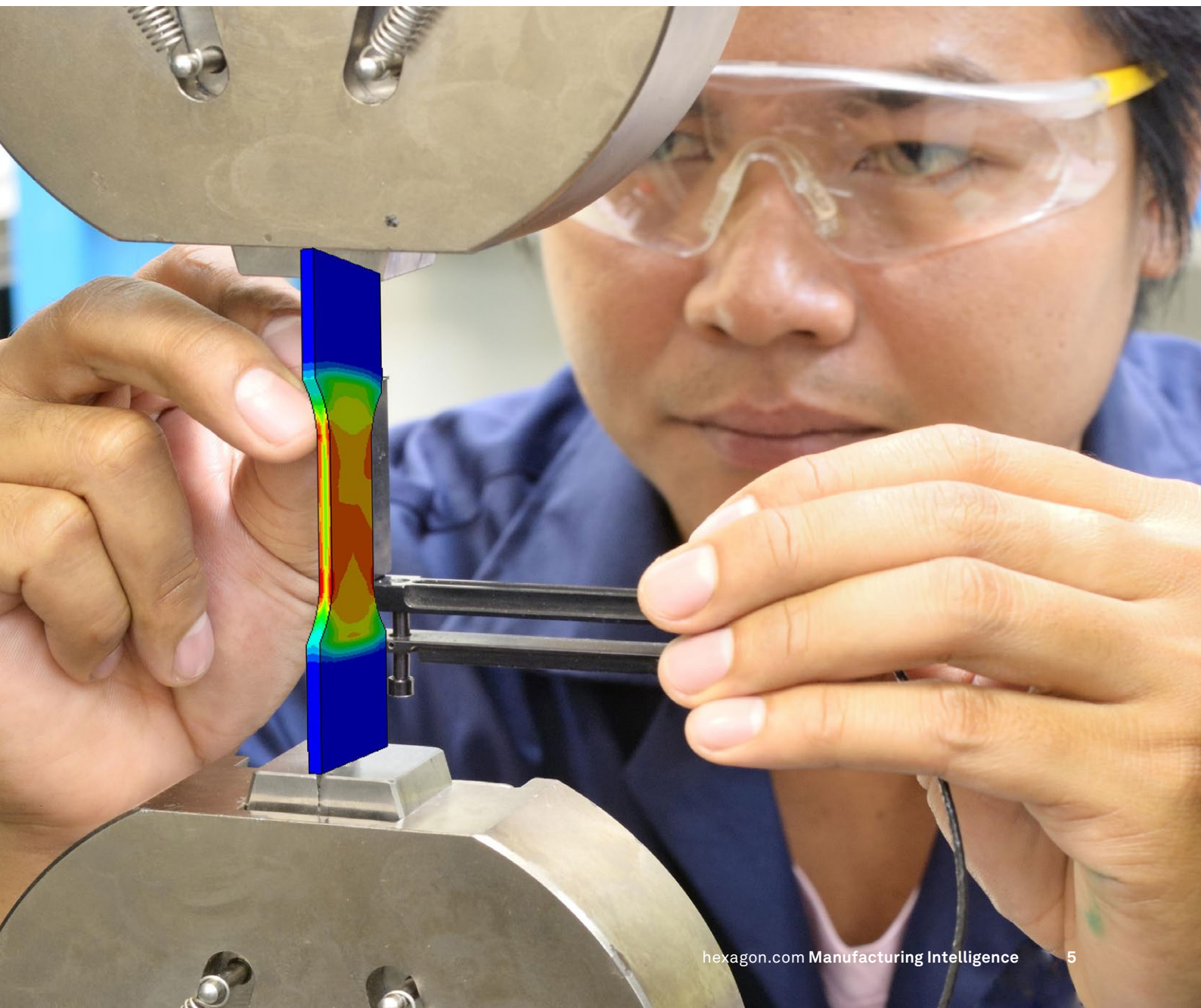


**FE**



**VA**

Digmat-VA enables the user to virtually define a test matrix to characterise composite laminates while taking into account the material, process and testing related variability.

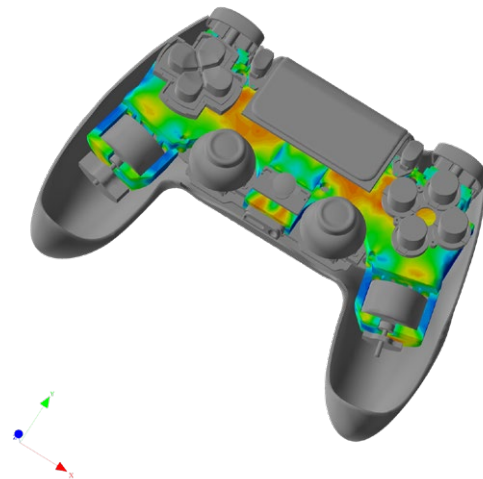


# Multiscale Simulations

The Digimat solution, empowered by Integrated Computational Materials Engineering (ICME), enriches CAE analyses by intrinsically connecting the manufacturing process, material properties and structural part performance. Manufacturing processes, ranging from injection and compression moulding, draping, thermoforming, additive manufacturing and many more, induce local microstructures, residual stresses and defects. These are captured by Digimat material models bridging the gap between the manufacturing process and structural part performance, making design simulations more accurate and reliable. This holistic solution unlocks lightweight designs with no compromise on performance and quality, while reducing the time-to-market and CO<sub>2</sub> footprint of these components.

## Key capabilities and benefits:

- Benefit from a unique material supplier ecosystem offering high-fidelity Digimat material cards ready to be used in CAE on a large number of situations
- Create quantitative or semi-quantitative materials cards within a few minutes thanks to powerful reverse engineering workflows
- Speed up the development process with an easy-to-use fibre orientation estimator that allows non-specialists to quickly evaluate the best gate positions to maximise material and part performance
- Interface with most of manufacturing process software and structural FEA solvers
- Design and validate a part performance with confidence for any loading scenario (static, crash, creep, durability, NVH, thermal management and many more)
- Actively contribute to sustainability objectives by designing lightweight products that use less materials for tests and qualification



## Tools and solutions:



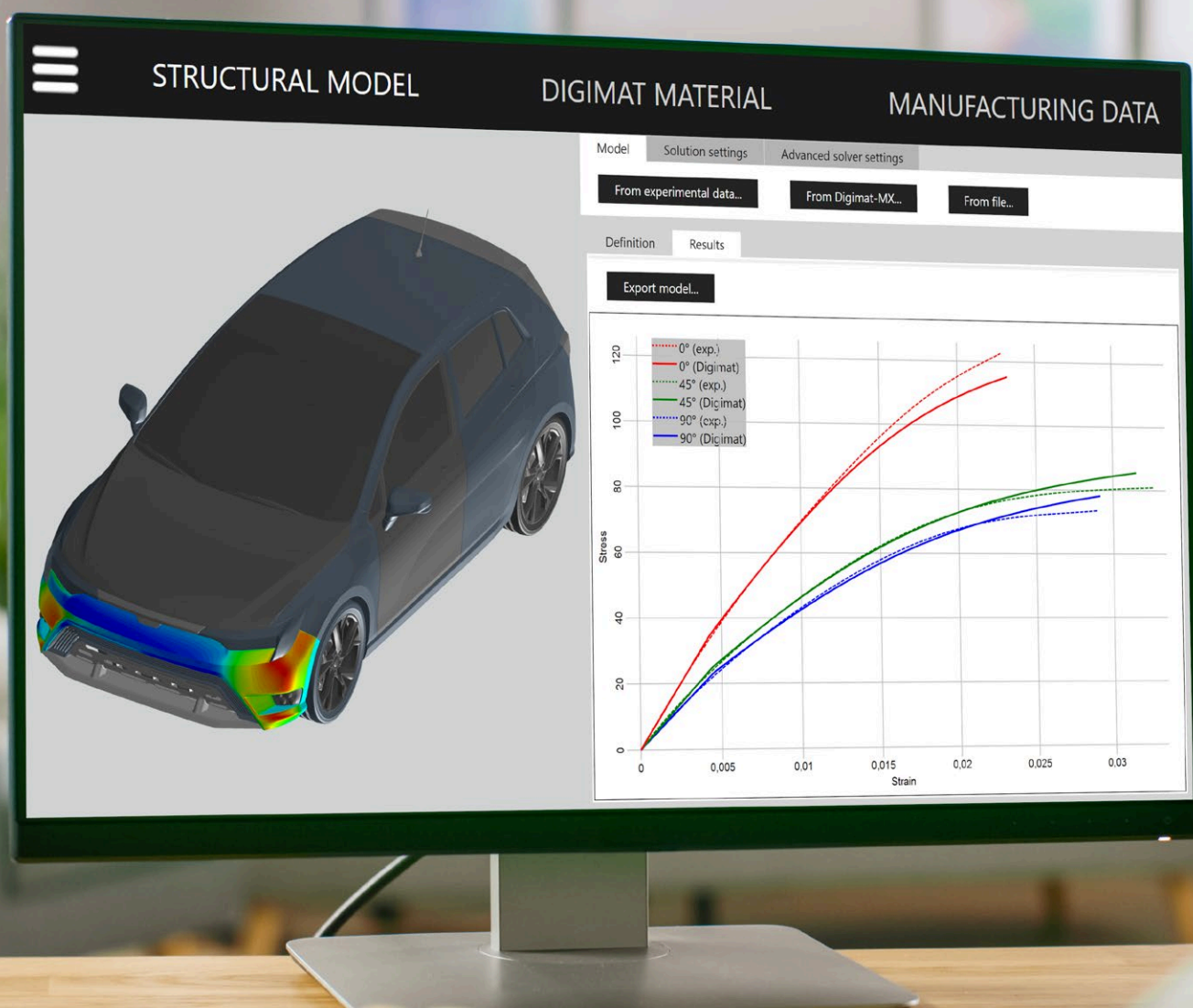
Digmat-MX provides access to the ecosystem of material suppliers with an extensive database of material cards. The tool also allows easy and fast calibrations of new material cards based on limited experimental data.

Digmat-MAP allows the transfer of manufacturing data from a processing mesh to a structural mesh with a high versatility in supported data and formats.



Digmat-CAE interfaces with structural FEA solvers to couple material cards and manufacturing data in integrative simulations.

Digmat-RP is a comprehensive solution that takes into account the process-induced material microstructure in the finite element analysis of the component.

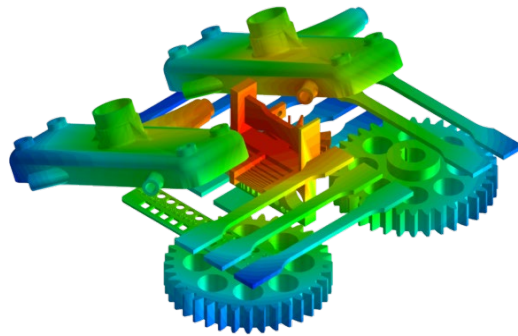


# Polymer Additive Manufacturing

Digmat offers a dedicated solution for additive manufacturing of plastics and composite materials. It helps process engineers anticipate and overcome manufacturing issues with the adoption of warpage compensation strategies that enable first time right prints. Sensitivity analyses allow to assess the effect of process parameters on the prediction of warpage, residual stresses, temperature fields, crystallinity evolutions, layer adhesion, porosity and many more. Integrated within a holistic approach that combines material modelling, process manufacturing and structural part performance, the behaviour of these high-performance printing materials can be analysed to optimise the productivity and the quality of the printed parts.

## Key capabilities and benefits:

- Benefit from printing machines and materials databases
- Reproduce the SLS, FFF or FDM printing process and predict the as-printed warpage and residual stresses
- Tune material properties and process parameters through sensitivity analyses to account for variability and manufacturing defects
- Reduce hundreds of trials and errors in a couple of clicks to optimise the part's productivity and structural performance
- Enjoy a streamlined user interface with guided workflows as well as a dedicated FDM wizard for a fast setup of the analyses





## Tools and solutions:



**FE**

**Digmat-FE** generates a representative volume element (RVE) of dense and lattice microstructures. The finite element analysis of the RVE allows an in-depth view into unfilled and reinforced materials.

**Digmat-RP** is a comprehensive solution that takes into account the additive manufacturing process-induced material microstructure in the finite element analysis of the component.

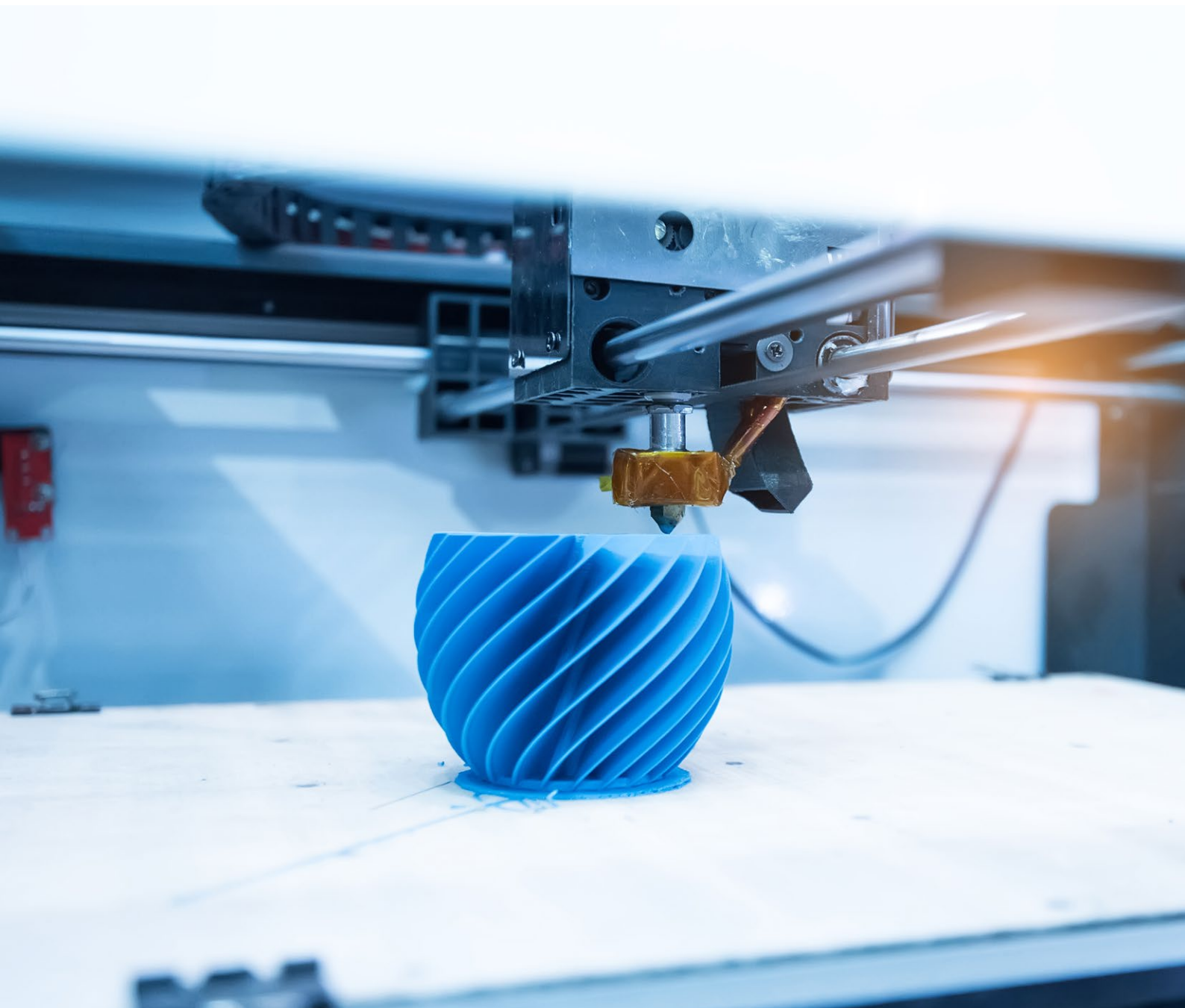


**RP**



**AM**

**Digmat-AM** simulates and optimises the selective laser sintering (SLS), fused deposition modelling (FDM), fused filament fabrication (FFF) processes of polymers and composites.



## Helping our customers with the digital transformation of materials



Proven **efficiency** – We shorten the time-to-market by 40% with ICME of designed products with increased quality.



Committed to **innovation** – We accelerate materials innovation by 90% with AI and machine learning, saving design time and cost.



Driven by **sustainability** – We achieve up to 40% lightweighting, resulting in fewer resources used, less waste, less pollution.



Focused on **autonomy** – We leverage materials data to the fullest potential and our ultimate goal is materials autonomy.

# Training

We provide a complete training offer, including beginners and advanced levels. The aim is to unlock the full power of the Digimat software with training created and led by product experts. These training courses are a combination of presentations and live product demos followed by practical hands-on sessions. They aim to answer the users' questions and demonstrate the best practices for using Digimat's new capabilities.

Customised trainings are tailored to the customers' specific needs and organised at the customers' premises. Besides general training and technology transfer, we aim to directly set up customer specific models.

Contact our Training Services team at [digmat.support@mscsoftware.com](mailto:digmat.support@mscsoftware.com)

# Services

Thanks to an outstanding team, we offer consulting support based on your specific needs and requirements. This could range from performing analysis for you on a project basis, several times a year or providing full time staff members to help you create repeatable processes in-house.

Our different areas of expertise include among others, material characterisation, CT scanning studies, material engineering & virtual testing, engineering in design and manufacturing, and data science (AI/ML) in ICME for various material systems, for various processes and across all industries.

Contact our Engineering Services team at [thierry.malo@hexagon.com](mailto:thierry.malo@hexagon.com)





Hexagon is a global leader in digital reality solutions, combining sensor, software and autonomous technologies. We are putting data to work to boost efficiency, productivity, quality and safety across industrial, manufacturing, infrastructure, public sector, and mobility applications.

Our technologies are shaping production and people-related ecosystems to become increasingly connected and autonomous – ensuring a scalable, sustainable future.

Hexagon's Manufacturing Intelligence division provides solutions that use data from design and engineering, production and metrology to make manufacturing smarter.

Learn more about Hexagon (Nasdaq Stockholm: HEXA B) at [hexagon.com](https://www.hexagon.com) and follow us [@HexagonAB](https://twitter.com/HexagonAB).