

Doctoral candidate 8: Manufacturing and functional characterisation of 3D printed smart devices

Host Institution	Slovenian National Building and Civil Engineering Institute
PhD enrolment	Delft University of Technology
Primary Supervisor	Dr. Lucia Mancini
Subject area	Shape morphing materials and functional characterization by dynamic X-ray imaging

About this doctoral project and your tasks

You will design, manufacture and characterise 3D printed Shape Memory Alloys (SMA)-based devices starting from the process parameters optimisation for printing SMA samples. The functional characterisation of 3D printed devices either by ex situ or in situ experiments by 4D (3D + time) X-ray phase contrast Computed Tomography (CT) will enable correlation between the process parameters and the functional properties by observing phase formation under external stimuli.

You will focus on defining rules of design and manufacturing of 3D printed SMA-based devices for self-compliant devices. After training on 3D X-ray imaging, 3D printing technologies and SMA materials, you will focus on the correlation of the process parameters and functional properties of SMA materials. The influence of process parameters on the composition of 3D printed parts will be investigated to optimise the printing process for functional properties tailoring. After assessment of samples on processes and functional properties, the applied research will be focused on the design and characterisation of a SMA-based self-compliant mechanism.

You will investigate proof of concepts for designing self-compliant mechanisms as well as the 3D structure and final functional properties. Finally, a prototype of SMA-based self-compliant will be manufactured and tested ex situ and in situ by 4DCT.

Your tasks will include:

- Methods and protocols for the design of 3D printed SMA-based devices
- optimised printing process for functional properties tailoring
- characterised SMA-based self-compliant mechanisms

Foreseen secondments

For this project, we foresee secondments to:

- **Eng. Fabio Mercandelli** (2 months) at GFM (Italy)
- **Dr. Sepideh Ghodrat** (8 months) at Delft University of Technology (The Netherlands)

About the host institution and research group

The Slovenian National Building and Civil Engineering Institute (ZAG, <https://www.zag.si>) is a public research institute having the main headquarter in Ljubljana. ZAG has 255 employees, is the leading Slovenian institute in the field of building and civil engineering but also strongly involved in circular economy projects, widely recognized by means of its experts, state-of-the-art equipment and multi-disciplinary work. It is involved in numerous national and international collaborations.

Research work is focused on materials, either natural or artificial, including those potentially hazardous to human health, spanning from their characterization to novel solutions for recycling and reusing secondary raw materials. In this project, the 3D X-ray Imaging team in the Department of Materials will contribute to characterize smart material systems by a non-destructive approach, including testing in dynamic conditions to optimize their design and functional properties.

About the offer

- The selected candidate will be employed by The Slovenian National Building and Civil Engineering Institute for **36 months** on the MSCA-DN project. Delft University of Technology and ZAG may provide additional funding for a maximum of 12 months to complete the doctoral degree.
- Doctoral candidates are offered a **competitive remuneration** based on the MSCA allowances and the regulations of the host institution. The gross monthly amount at ZAG will be 3.300 €. Moreover, funding is available for technical and personal skills training and participation in international research events.
- **Expected start date:** between April and September 2026. We encourage last-year master students who will graduate by this time to already apply.

More information is available in the [general information document](#) for X-CELERATE positions.

Specific Profile requirements

- Your profile aligns with the [general requirements and eligibility criteria](#) of the X-CELERATE project.
- You have a master's degree in **physics, material science, computer engineering, mechanical engineering**, or related field (or will have by the time of your appointment).
- Background in **scientific computing and/or computed tomography** is appreciated.
- You are proficient in at least one programming language

How to apply

All applications must be submitted via the [X-CELERATE job platform](#).

Deadline for applications: 16 November, 23:59. More information about the application procedure is available in the [general information document](#) for X-CELERATE positions.

Additional information

For additional information about the research project, contact:

Dr. Lucia Mancini

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