# COMPACT LOADING DEVICE FOR X-RAY SCANNER

Interreg ATCZ215
ImageHeadstart

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EUROPEAN UNION
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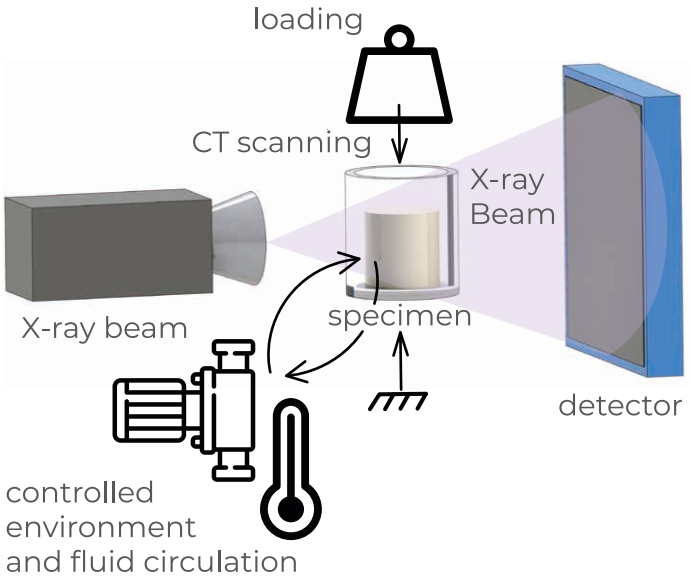
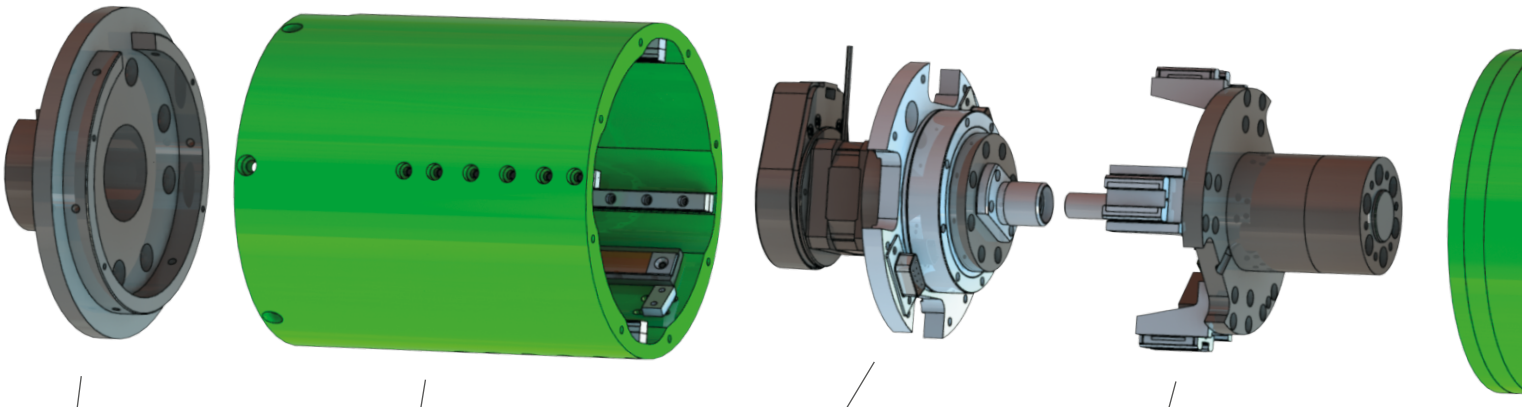
European Regional Development Fund

## Overview

The table top loading device is designed for investigation of the deformation behaviour of materials and constructs with complex internal (micro)structure. Compact design together with the carbon fibre composite frame make this device compatible with laboratory X-ray micro-tomography scanners for time-lapse and on-the-fly imaging.

Available accessories allow to perform compression, tension, and bending experiments. For biomechanical testing and tissue engineering applications, the experiment can be performed under controlled ambient conditions using integrated bioreactor. Thin 3-ply carbon fibre frame with diameter of 56 mm, thickness of 0.45 mm and load capacity of 3 kN is delivered as a standard loading chamber. Optionally, a small diameter tube (20 mm) with load capacity of 1 kN is available for micro-testing and a metallic frame designed for general loading procedures performed out of micro-CT scanner are available.



rotary table adapter

loading device frame

motor assembly with harmonic gear

linear guide assembly

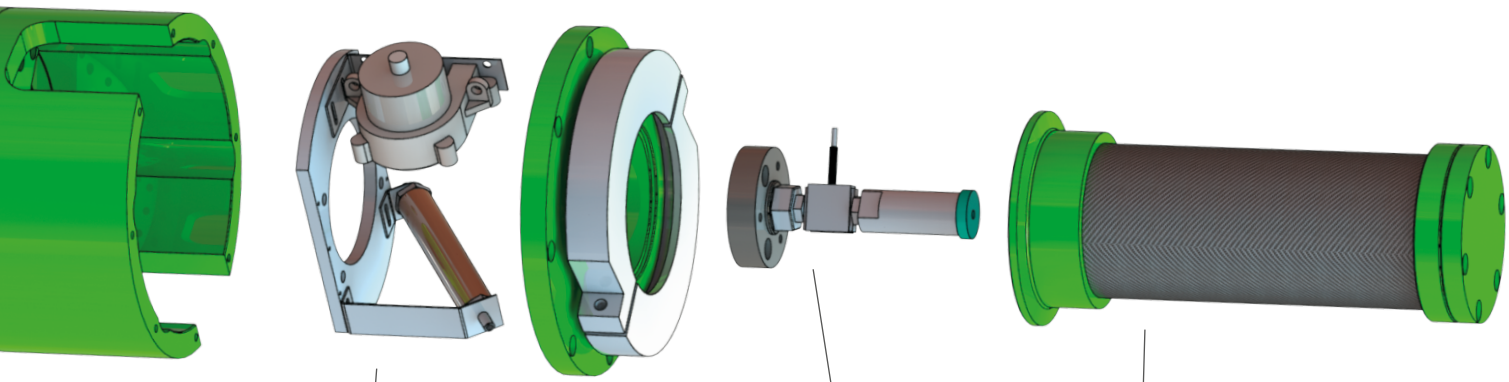
The device can be fully integrated into customized as well as standard imaging systems. Control is performed by the RaPo software supporting monotonic, low-cycle, and creep testing.

Specification

- Load capacity 3000 N
- Min. velocity 0.1 µm/s
- Max. velocity 100 µm/s
- Absolute position accuracy 20 µm
- Position repeatability 1 µm
- Position tracking sensitivity 0.25 µm
- Stroke 30 mm
- Sampling rate 200 Hz
- Mass ca. 8 kg
- Dimensions Ø130x465 mm (with bioreactor)

Features

- Real-time data logging
- CNC controlled w. custom SW
- Linear magnetic encoders
- Rotary slip rings



bioreactor frame

bioreactor assembly

main body cover – clamp

loadcell and specimen support

carbon-composite frame

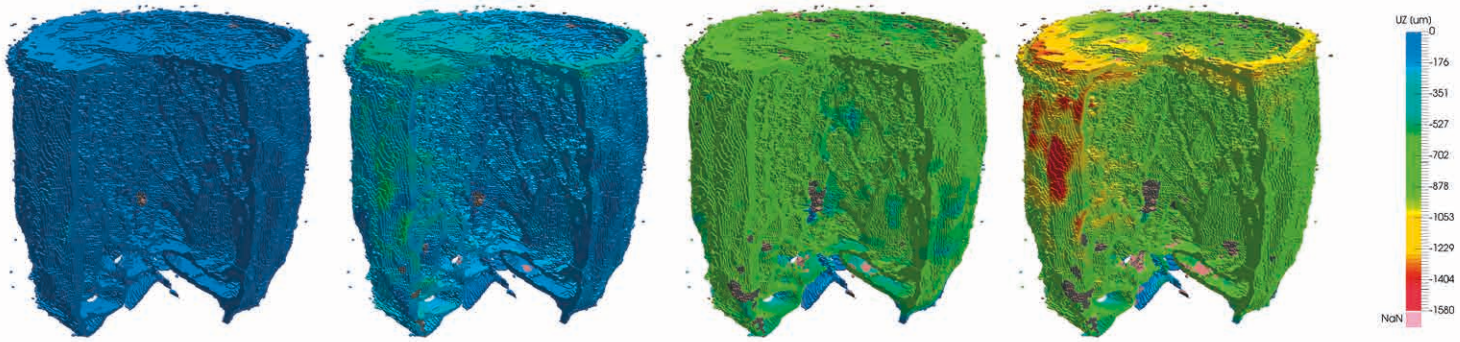
## Accessories

The device is delivered in wheeled safety transport case. Loading frame can be customized and equipped with various accessories.

- 20 mm carbon frame for micro-testing
- metallic frame for non-X-ray procedures
- adapter for three-point bending
- heating and cooling stages
- customized loading plates/grips
- environmental chamber

## Application

A bone scaffold was subjected to the continual compression and simultaneously scanned in the computed tomography scanner. Deformation characteristics were evaluated using digital volume correlation (DVC) method on the reconstructed volumetric datasets[1].




*Visualisation of the deformed full-scale voxel model of the scaffold's microstructure showing the displacements during the loading procedure.*

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[1] *Kytyr, D. et al., Deformation analysis of gellan-gum based bone scaffold using on-the-fly tomography, Mater. Des. 134 (2017) 400, DOI:10.1016/j.matdes.2017.08.036*

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