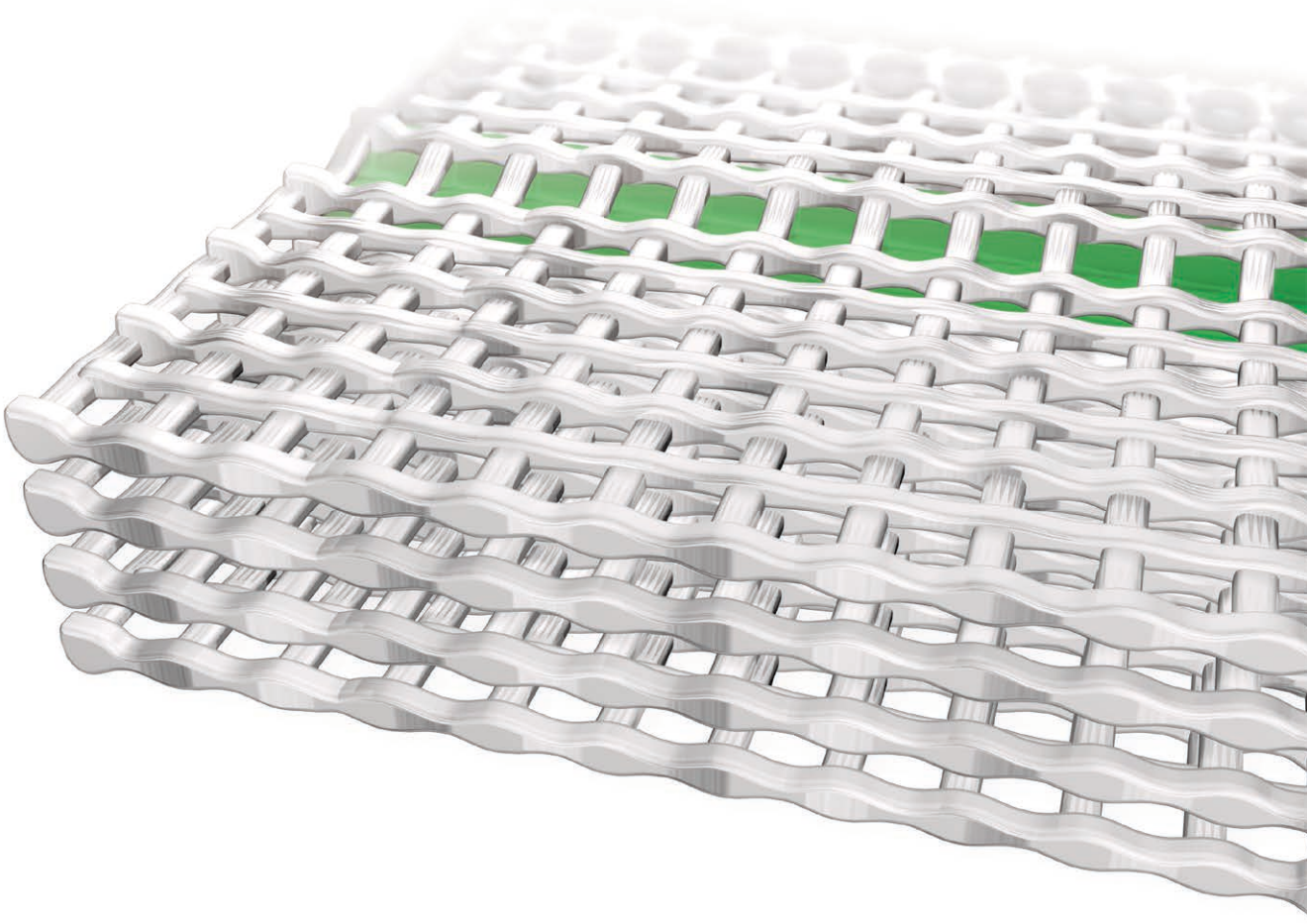
BioScaffolder 3.2

3D Prototyping, Cell Printing and More

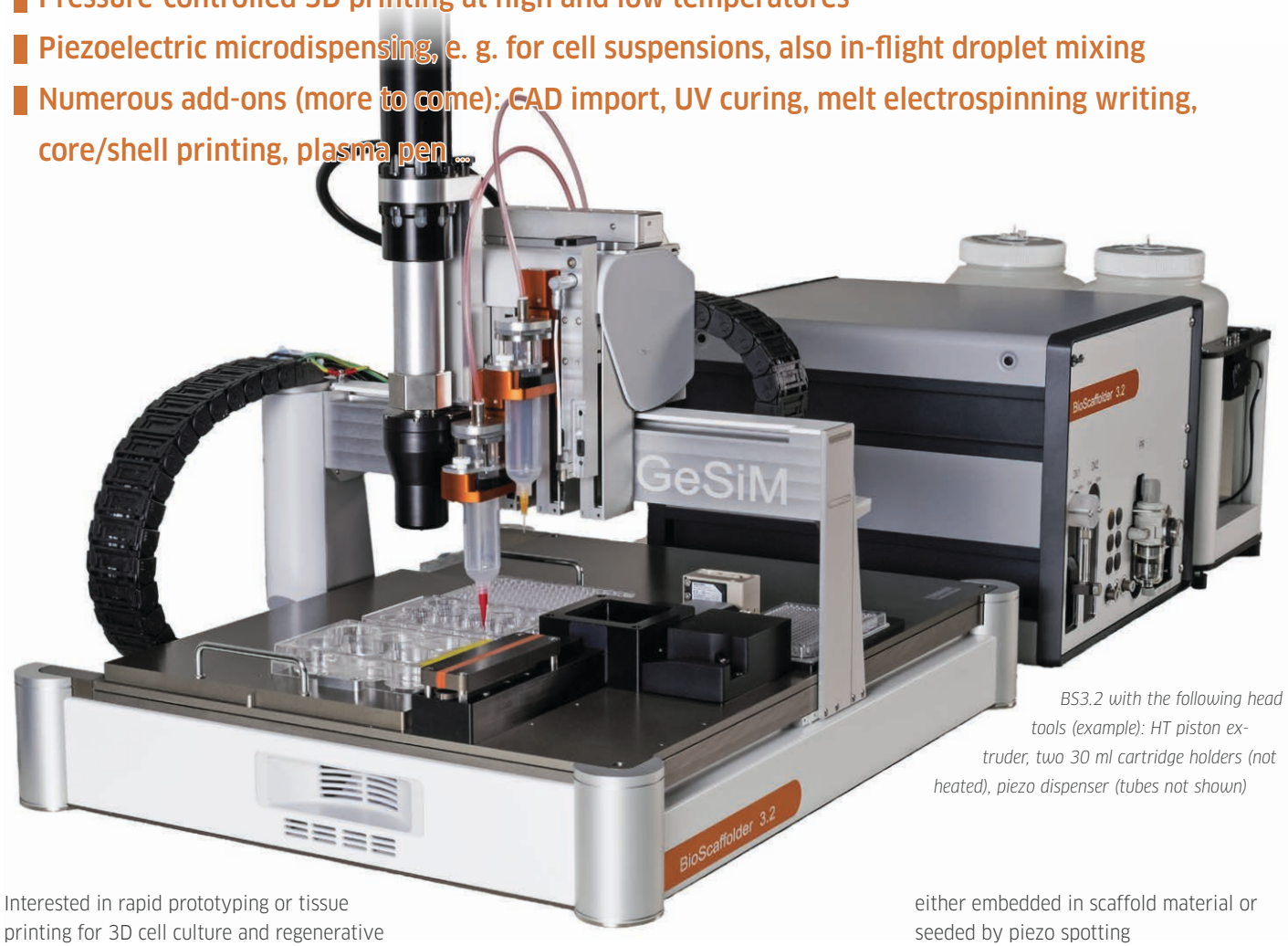


GESIM

GESIM BioScaffolder 3.2

3D Prototyping, Cell Printing and More

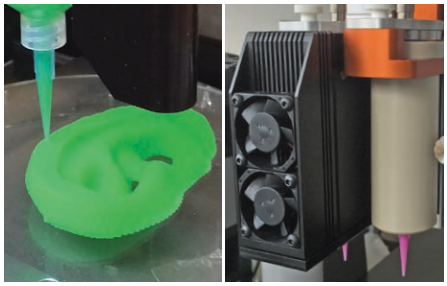
- **Four independent Z-axes for maximum flexibility**
- **Pressure-controlled 3D printing at high and low temperatures**
- **Piezoelectric microdispensing, e. g. for cell suspensions, also in-flight droplet mixing**
- **Numerous add-ons (more to come): CAD import, UV curing, melt electrospinning writing, core/shell printing, plasma pen …**



BS3.2 with the following head tools (example): HT piston extruder, two 30 ml cartridge holders (not heated), piezo dispenser (tubes not shown)

Interested in rapid prototyping or tissue printing for 3D cell culture and regenerative medicine? Look no further. The GeSiM BioScaffolder BS3.2 prints 3D scaffolds from cartridges and also seeds cells using the well-known GeSiM piezoelectric pipettes.

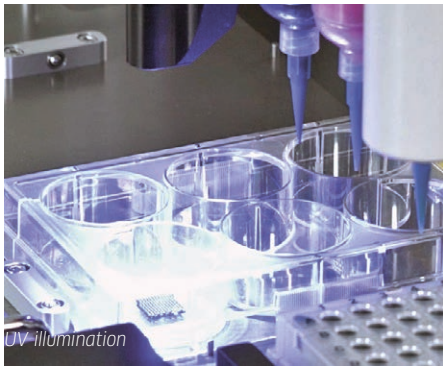
Scaffolds can act as mesh-like support on which cells grow in culture or even replace tissues. Or conductive material is printed onto elastic polymers to create sensors employed for surgery. Channels can be kept open by sugar paste that is washed away afterwards.



Paste printing (left); Peltier-cooled and heatable cartridge holders

The platform fits in a biological safety cabinet. Options are:

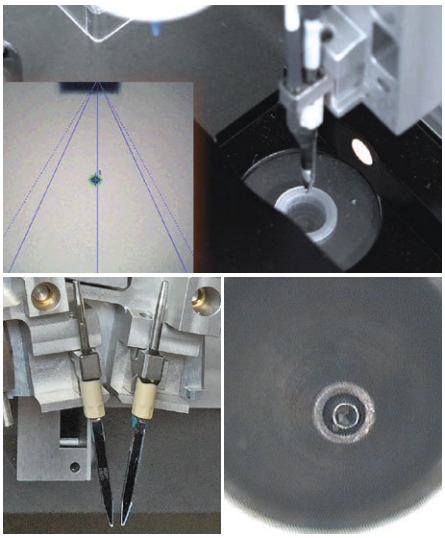
- Production of 3D scaffolds as substrate for cell culture and organoids
- Pneumatically actuated paste printing at various temperatures
- **Piezoelectric (ink-jet) microdispensing**, e.g. to coat scaffolds with matrix proteins or to spot cell suspensions
- Printing of live cells (“organ printing”), either embedded in scaffold material or seeded by piezo spotting
- Precise temperature control for thermoplast printing guaranteed by all-metal nozzles and cartridges
- Other dispensers possible (bulk/capillary dispenser, adhesive dispenser)
- **UV curing** of printed photosensitive material
- **Melt electrospinning writing** (MEW) at high voltage to produce position-controlled fine polymer meshes
- **Core/shell** dispenser for creating tubular structures
- **High-temperature piston extruder** for printing plastic granules at up to 250 °C (works great in the BS3.2, but due to its weight better suited for the BS4.x)



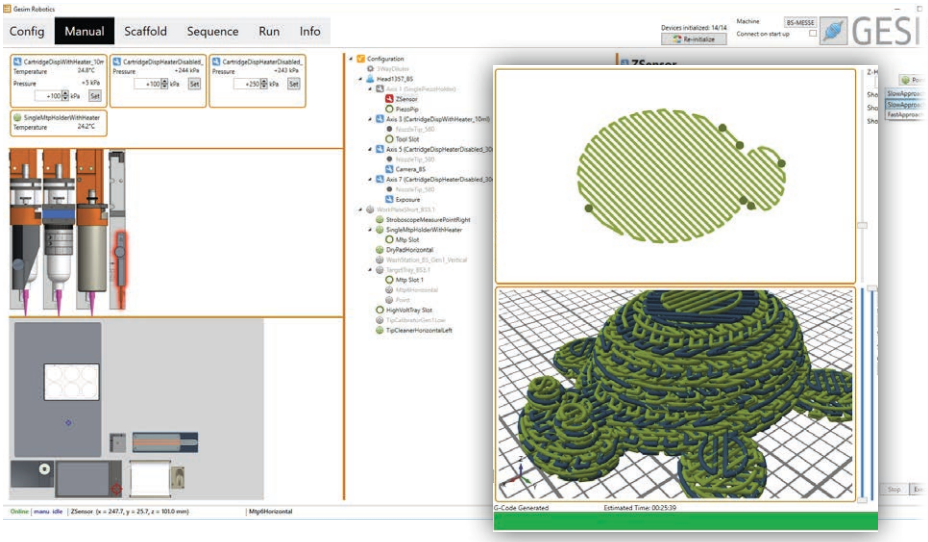
UV illumination

The four **multi-Z-drives** can handle different materials at various pressures and temperatures without exchanging cartridges. Many additional tools can be mounted.

Extras are easily installed and configured.



Top, piezo pipette dispensing test in a stroboscope. Bottom, twin piezo tip for in-flight/on-chip droplet mixing and core/shell dispenser tip for two materials.

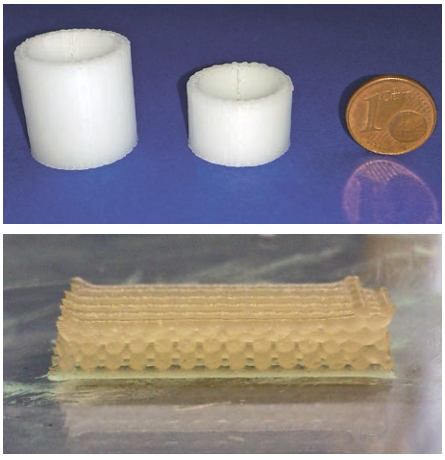


Control software with graphical representation of print head and work deck configuration. Tool properties are pre-defined by templates, and so the configuration can be changed easily. The Scaffold tab lets you define simple forms or import CAD files (STL and 3MF) and generate G-code for printing, as shown in the inset.

Features

- GUI-based Windows app, pre-configured
- Intuitive "scaffold generator" for the easy generation of simple forms and comfortable slicing of **CAD data** (STL and 3MF)
- Three independent worm gear Z-drives for cartridges, plus one for a liquid dispenser (piezo or other) and a **Z-sensor**
- Paste printing actuated by compressed air
- Choice of cartridge holders: for ambient temperature, heatable to up to 190 °C or **Peltier-cooled** (to 4 °C; also heatable)
- **Tip cleaner** for wiping off excess material
- **Tip measurement tool** for easy tip alignment
- **Z-sensor** to measure substrate heights, so no tedious manual procedure necessary
- Piezoelectric GeSiM pipette (heatable/non-heatable, various sub-nanolitre volumes), can aspirate samples from a (heatable) microtitre plate
- The piezo dispenser includes bottles, tubing, syringe pump, wash/dry stations, and stroboscope for a functional test
- Also available as **twin piezo pipette** for mixing two droplets in flight!
- Options: bulk dispenser, **solenoid dispenser** for adhesives, core-shell dispenser (controlled by two different pressures)
- External electronic control unit with embedded computer ("F-Box"), connects to sensor cables, compressed air and system liquid (ultrapure water)
- Adjustable dosage pressure: 100 – 600 kPa (1 – 6 bar); slight vacuum optional
- Step width: 1 µm in X/Y (belt-driven), 10 µm in Z, encoder-controlled
- Target holders for three microtitre plates, also coolable
- **Heat plate** for up to 60 °C, vacuum fixation
- Option: insulated collector plate and grounded metal tip for melt electrospinning writing of thin strands (> 5 µm), including DC power supply for ±30 kV (both polarities) and safety kit
- Further options: object camera, triggered UV lamp + optical fibre for UV cross-linking, plasma pen (also for surface coating), more to come
- Requirements: filtered and dried compressed air, (0.7 – 1 MPa; ask for our oil-free compressor), 115 – 240 V AC, Windows computer (pre-configured), enclosure or biological safety cabinet. See extra document.

Printable materials include bioinks (collagen, alginate, etc.) and other hydrogels, bone cement paste, Bioglass, biocompatible silicones, thermoplastic polymers (polycaprolactone, polylactic acid etc.), composites such as alginate/methyl cellulose, and many more. Please read also our BioScaffolder catalogue.



Examples of additive manufacturing. Top row: polycaprolactone (PCL) cylinders, melt electrospinning writing of PCL and printed microfluidic channels. Bottom row: alginate scaffold and scanning electron micrograph of a bone cement scaffold after setting (material: InnoTERE, Radebeul).

GESIM BioScaffolder 3.2

2018

Manufactured by GeSiM, distributed in the UK and Ireland by **analytik**.

analytik

Analytik Ltd | Barn B, 2 Cygnus Business Park, Middle Watch, Swavesey, Cambridge CB24 4AA

Tel: +44(0)1954 716 324 | Email: info@analytik.co.uk | Web: analytik.co.uk

Gesellschaft
für Silizium-Mikrosysteme mbH
Bautzner Landstraße 45
01454 Radeberg, Germany
Tel. +49-351-2695 322
Fax +49-351-2695 320
info@gesim.de

For more information (applications, systems, distributors etc.), please visit
www.gesim.de

Specifications subject to change without notice

GESIM