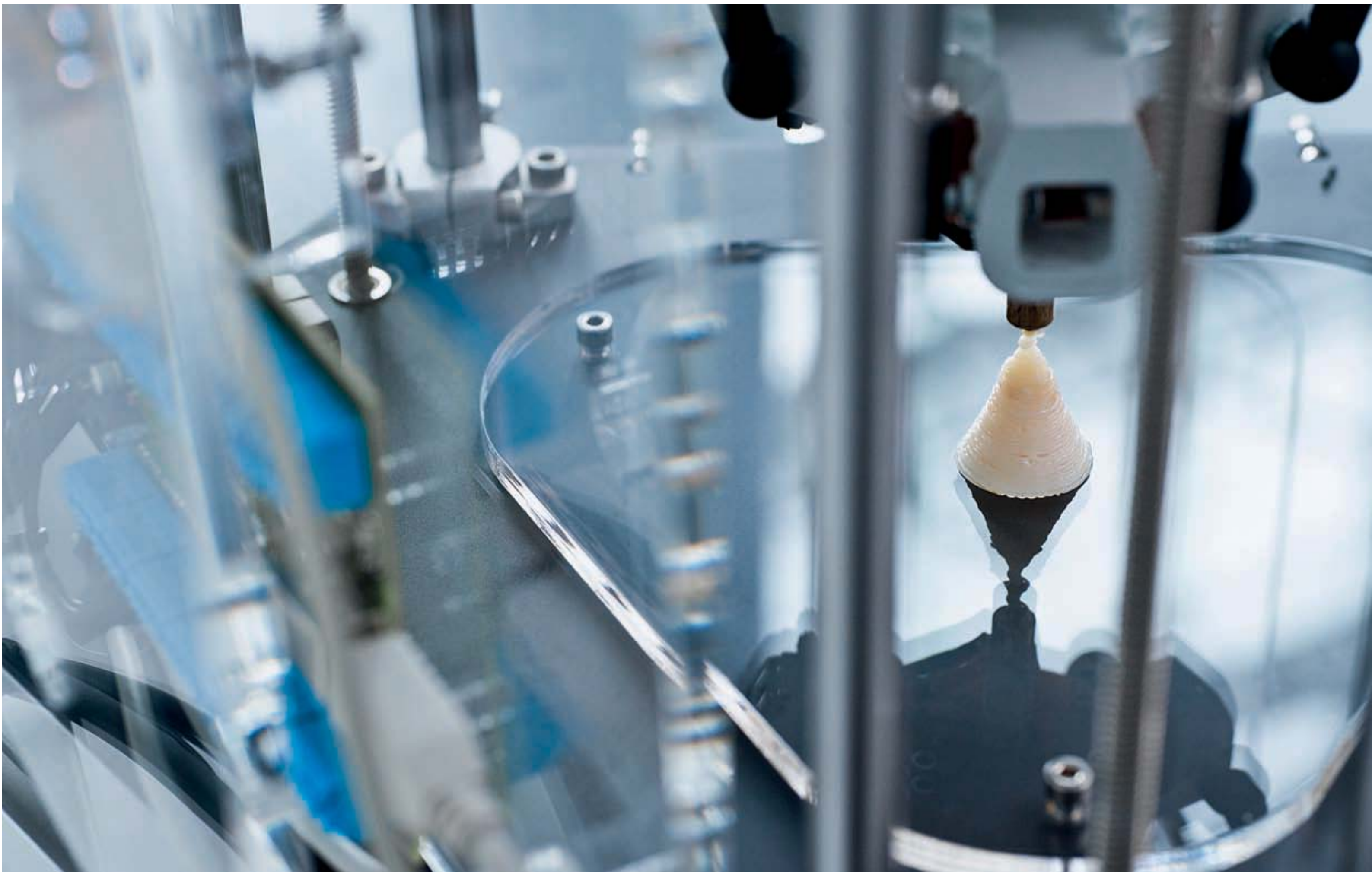
iFab

FESTO



3D printing made easy

Info

Effortless production




Printing in three dimensions

What sounds like a vision of the future has long been industrial reality with rapid prototyping. The previously unattainable dream of being able to “print” one’s own products in the living-room has come much closer to realisation thanks to iFab.

The principle of rapid prototyping is similar to that of the ink-jet printer. Inks of various colours are applied as droplets to paper in thin layers in two dimensions (2D). On drying, the inks form the desired image.

By superimposing several layers, it is now possible to print in three dimensions. Various materials can be used in place of inks of different colours to theoretically produce any desired product.

In rapid prototyping, a wide range of materials can be applied layer for layer to match the object designed on PC, and are bonded together. The 3D prototypes thereby produced are an exact replica of the designed component, with an attainable precision within a range of micrometers. The objects reach such levels of durability and surface quality that rapid prototyping can even be used for the individual manufacture of functional prototypes or small-series and pre-series production.

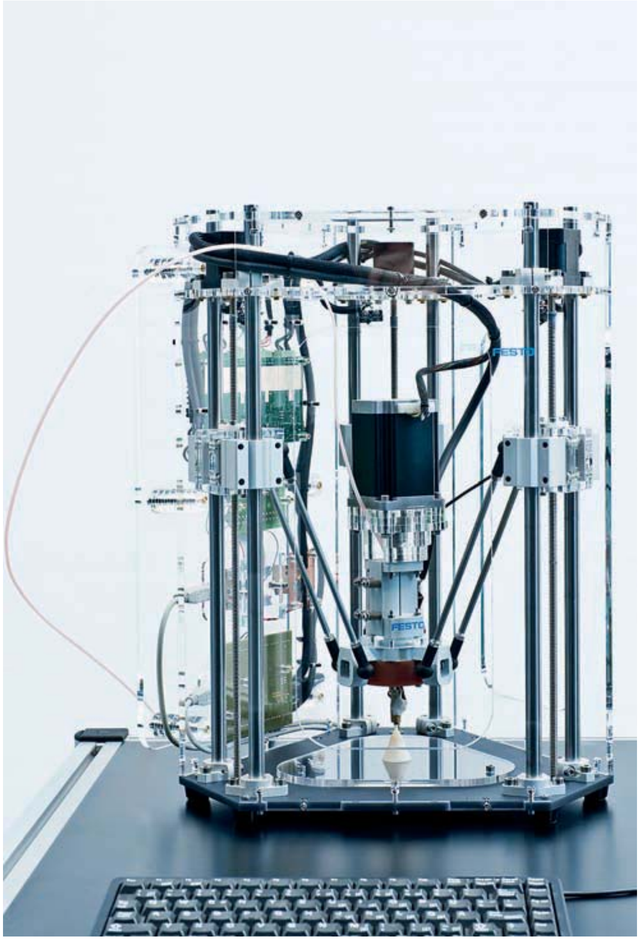
Prototype or praline – iFab makes it possible

With iFab, exchangeable “print heads” make it possible to print with various materials. The range of these “printable” substances is now very large and extends from chocolate to conducting and semiconducting compounds, such as silicones or thermoplasts. A suitable material must be able to be applied in viscous condition and then harden relatively quickly.

The ambitious development aims for iFab are only attainable thanks to Festo’s expertise in tripods with a simplified mechanical structure. The material is applied not with a mechanically intricate three-axis Cartesian system, but with a tripod system comprising three identical mechanically linked electrically driven linear units.

The advantage of this mechanical simplification is gained at the cost of necessitating a transformation from Cartesian coordinates in the software for the tripod. A standard software module from Festo that enhances quality and efficiency is available for this task.

Injection nozzle



Tripod system

Home production – learning from history

History may well repeat itself here: forty years ago, all required processing power was provided by mainframe computers. These were extremely expensive and were operated by specialists in air-conditioned rooms. The demand for "home computers" (the term "personal computer" was not coined until 1981 with the IBM PC) was estimated at only a few hundred units annually.

This radically changed in 1975, when the Altair 8800 appeared on the market for a price of US$ 397. Computers had thus become universally affordable and operable by all; the rest is history. Today, the digital world of bits is accessible to almost everybody via the Internet: in countless software packages we manipulate bits, which are then interpreted by software as images, texts, graphics or as new software packages.

As computer-supported construction design data, bits are the basis for the production of goods, from the smallest electronic sensor component up to the largest electric locomotive. And what took place forty years ago in mainframe computers is carried out today in large production facilities. These are extremely expensive and are operated by specialists. The demand for "home production" is – once again – regarded as negligible.

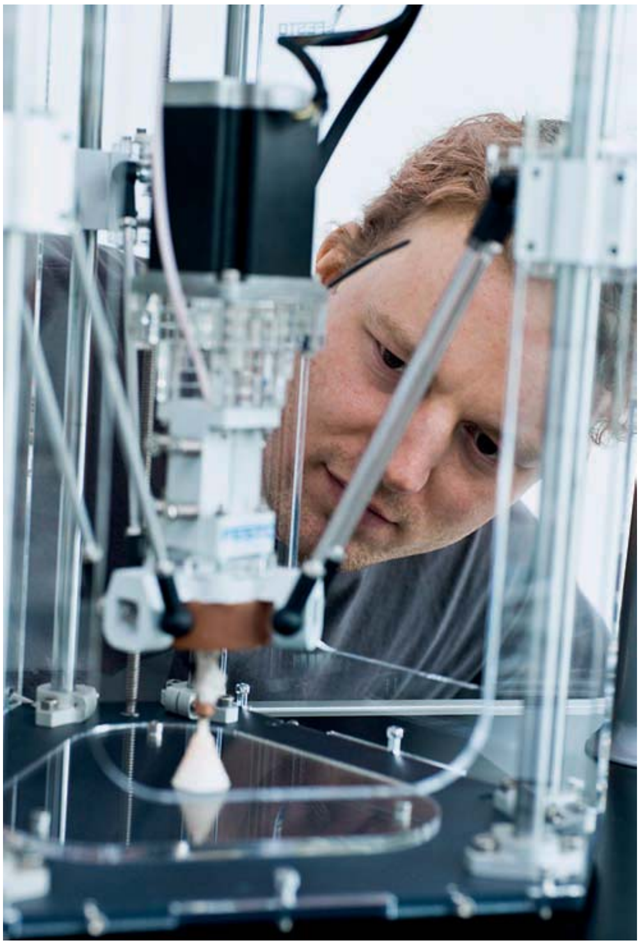
In 2008, Professor Hod Lipson from the Cornell University in Ithaca, USA and his team succeeded in producing an entire elementary robot with battery, sensors and actuators. Hod Lipson commented: "Our goal is to one day see little automatons wriggle, completely finished, out of our apparatus, their electronic and mechanical subsystems having been created in one seamless process – batteries included."

3D printing for domestic use

With the iFab from Festo, the door to 3D printing is to be opened even wider for interested private individuals and for purposes of eduction and vocational training – for example for high-school students, for students of mechatronics, mechanical engineering, architecture and design, or for avid model-builders at home.

Technology of Festo – an initiator of innovation

Festo intends to use the iFab project to come closer to realising the future vision of personalised production. The success story of the PC is to be repeated with the iFab for individualised fabrication. Festo intends to play a leading role in attaining this technological leap brimming with unimagined opportunities.



Project partners

Project initiator:
Dr. Wilfried Stoll, Chairman of the Supervisory Board, Festo AG

Project manager:
Dr. Hermann Klinger, Festo AG & Co. KG

Concept and design:
Dr. Evan Malone, Cornell University, Ithaca NY, USA
Prof. Dr. Hod Lipson, Cornell University, Ithaca NY, USA
Dr. Hermann Klinger, Festo AG & Co. KG

Mechanical components:
Bastian Dolde, Festo AG & Co. KG

Software and electronics:
Dr. Evan Malone, Cornell University, Ithaca NY, USA
Ákos Maróy, Budapest, Hungary
Bastian Dolde, Festo AG & Co. KG

Photos:
Walter Fogel, Angelbachtal, Germany

Graphic design:
Atelier Frank, Berlin, Germany

Technical data

Configuration:	tripod system
Max. object size:	height 8 cm, diameter 15 cm
Actuators:	bipolar multiphase motors with threaded spindle
Print head:	exchangeable module, injector, extruder
Casing:	acrylic
Input signal:	LPC-H2148 ARM7 micro-controller with USB interface
Driver stages:	4-axis multiphase motors
Software:	Windows platform
File format:	STL

Festo AG & Co. KG

Business Development
Knowledge
Ruiter Straße 82
73734 Esslingen
Germany
www.applied-knowing.org
Telefon +49 711 / 347-40 55
Telefax + 49 711 / 347-54 40 55
kli@de.festo.com

54717 / EN