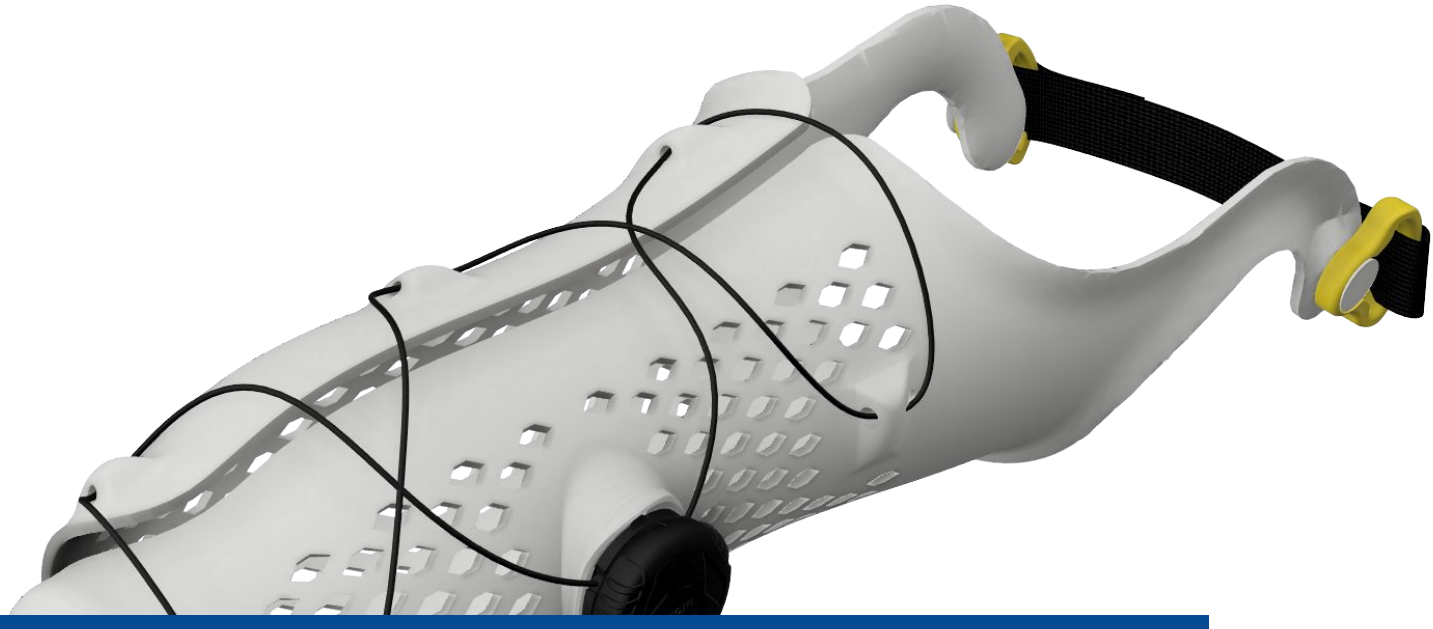


INNOVATION:

Innovate and adapt with 3D printing

sculpteo
A brand of BASF - We create chemistry

x

macu4

OVERVIEW

With over 20 million people worldwide missing a limb, Macu4 aims to provide access to affordable and quality prosthetics specifically for the forearm. With additive manufacturing, Macu4 can design customized forearm prosthetics that are lightweight, modular, and suitable for all activities that matter to people. Using 3D printing, they can also provide out-of-pocket payers with affordable prices increasing accessibility to prostheses that would otherwise cost thousands to produce. With 3D modeling and 3D printing, Macu4 customized arm prostheses are comfortable, versatile, and economical. This is particularly helpful for children who frequently need replacements as they grow.

Using the innovative potential of additive manufacturing technology, Macu4 created the explorer shaft that can be personalized and has various “activity hand” styles that allow for versatility. With 3D printing, Macu4 can provide greater accessibility in a shorter period and more economical cost to those needing an arm prosthesis than traditional alternatives could produce.

The Challenges:

1. To produce custom-made designs at a lower cost and with less weight.
2. Run the design-development phase with less cost and manufacturing repeatability.

macu4

Macu4 is a Zurich-based start-up founded in 2021 by a dedicated team of medical and entrepreneurs with expertise in healthcare to revolutionize arm prosthetics through new technologies such as design automation and 3D printing. Combining new technologies such as additive manufacturing and advanced materials creates unique and economical solutions that are tailor-made and optimal for each individual’s needs.

Macu4.com

"Working with Sculpteo is a very convenient experience. The customer service attention is fast and precise, the time to delivery including the logistic partner is exactly what we need at Macu4."

- Dr Myriam Linn, CEO & Co-founder of Macu4

Customization and Freedom of Design

To achieve their vision, Macu4 turned to additive manufacturing for its freedom of design and tailored solutions to create their highly successful arm prosthesis, the explorer. A crucial element in the designing process was creating a lightweight device with integrated parts for easy assembly and comfort while maintaining cost-effectiveness. With 3D printing, Macu4 can create a socket especially tailored for the user's limb to fit perfectly, allowing for more comfortable wear and a more extended range of use.

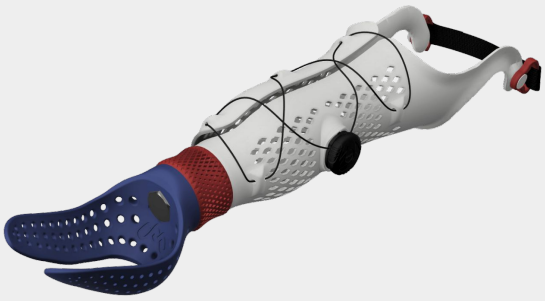
Another design possibility by AM for the Macu4 explorer was creating versatility with a selection of "activity hands" that would allow the user to go from everyday *hands* to various sports grips for a ball, biking, swimming, and other outdoor activities. With AM's design freedom, designing a single component hand could reduce supply chain and assembly and keep costs efficient.

Rapid Prototyping and Manufacturing Repeatability

For Macu4, using 3D printing for rapid prototyping made it possible to develop and create their successful device, the explorer, with limited resources as a startup. It would not have been possible with traditional manufacturing, which requires months to develop molds and a particular volume to be economically feasible. Macu4 found an affordable and quick way to produce, test, and iterate their explorer with additive manufacturing.

A further advantage of 3D printing is that parts are easy to reproduce. Once developed, the explorer can be produced again at any time. 3D printing enables Macu4 to scale its devices quickly. Like children's development, the explorer can be replaced on a different side, maintaining the same functionality, comfort, and structure.

Using powder bed technology SLS and PA12, Macu4 can print each customized explorer in various colors quickly and economically. SLS technology allows for printing complex geometries in a single print run that otherwise would require multiple parts to produce. Multiple parts can easily be printed simultaneously, saving considerable time and effort while maximizing build space. With traditional methods, although the fit is perfect and individually made, the cost is very high, with long lead times, and would need to be replaced if the recipient is still growing. Considering the growth rate of children, Macu4 can meet their needs by reproducing the explorer quickly as they grow without any higher costs. The main benefits of powder-based technologies over traditional manufacturing are surface quality, breathability, lightweight, and accuracy.



The Explorer with a Ball Activity Hand printed in PA12

The Explorer with a Bike Grip Activity Hand printed in PA12

The Explorer with a TWIN grip Activity Hand printed in PA12

Material Spotlight: PA12

PA12 is the most used 3D printing material for scaled production. As a powder based technology, the surface finish is uniform and smooth to the touch without visible layers. Available in unfinished form in both white (SLS technology) and grey (Jet Fusion technology), PA12 is the most versatile polymer with good all-around mechanical properties.

Both SLS and Jet Fusion PA12 technologies offer a variety of finishing options from dying to chemical smoothing, giving the quality and aesthetics of injection molded plastics.

Learn more about PA12.