

NEW MULTIFUNCTIONAL AND CUSTOMISABLE UPPER LIMB PROSTHESIS



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RESUMEN

The **Joint Research Unit for Biomedical Design and Manufacturing (BioFab)**, consisting researchers from the University of Alicante and the Alicante Institute for Health and Biomedical Research (ISABIAL), has developed a new **multifunctional upper limb prosthesis** designed for people with agenesis, or the complete absence, of the brachial segment and the elbow joint. The lack of self-sufficiency experienced by these individuals has a significant impact on their mental health, negatively affecting self-esteem and generating feelings of inferiority. All of this can lead to social isolation, as well as increased stress, anxiety and, in some cases, the development of depressive symptoms. Therefore, thanks to this customisable and adaptable prosthesis, they will be able to perform basic activities of daily living (BADL) such as eating, dressing or writing independently.

BioFab is seeking **manufacturers of assistive and rehabilitation products** interested in validating and exploiting it (through licensing agreements) or in designing other new devices.

VENTAJAS Y ASPECTOS INNOVADORES

MAIN ADVANTAGES OF THE TECHNOLOGY

It is worth highlighting the numerous advantages of the device:

- The alternative devices mentioned above operate using cables or electromechanical mechanisms, which increases the cost of the product. However, the prosthesis described in this invention features a design with simple mechanical joints that are manufactured directly using 3D printing. Consequently, **the assembly and replacement of modules is straightforward** for the user, directly leading to increased self-sufficiency during various activities.
- The **socket is easily customisable and adaptable** to the user's anatomy, even allowing for the manufacture of different standardised models and/or models of varying dimensions to ensure a better fit and greater comfort for users. Furthermore, the material used is **lightweight, biocompatible, flexible, adaptable and comfortable**. Moreover, its simple fit allows the patient to fit the prosthesis themselves in most cases. Additionally, it incorporates a further adjustment at the shoulder to improve posture during prolonged use or for certain functions requiring greater strength.
- The **telescopic shaft** allows the total length of the prosthesis to be adjusted to suit different scenarios, ensuring the ergonomics and usability of the prosthesis.
- Thanks to the **modular design** of the device and the ability to easily swap heads depending on the activity, it offers clear advantages over other commercial models, **providing different functionalities with a single device**. These heads or gadgets can be standard for all users and can be adapted to various everyday tasks (eating, grasping objects, etc.), unlike commercial models, which feature either a very specific hook for a particular task or an aesthetically realistic silicone hand, but with little practical use.

INNOVATIVE ASPECTS

The manufacturing process utilises **3D printing** technology, which facilitates rapid **customisation and adaptation to different users**, without the need for moulds and at **low cost**. The cup (*Fig. 1-a*) is manufactured using a flexible, washable, biocompatible material that is comfortable for direct contact with the user, ensuring an ergonomic and comfortable fit during prolonged use. The body of the device (*Fig. 1-b and Fig. 1-c*) is

manufactured using a flexible, impact-resistant material with high heat tolerance. The heat tolerance of this material facilitates cleaning and ensures that its use maintains adequate hygienic standards, for example, when handling food.

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APLICACIONES DE LA OFERTA

Essentially, it is aimed at the **assistive and rehabilitation products sector**, that is, the range of companies, services and professionals that develop and provide tools to improve mobility, recovery and quality of life for people with injuries, illnesses or physical limitations.

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COLABORACIÓN BUSCADA

We are seeking manufacturers of assistive and rehabilitation products who are interested in validating and commercialising this product (through licensing agreements) or in designing new devices.

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