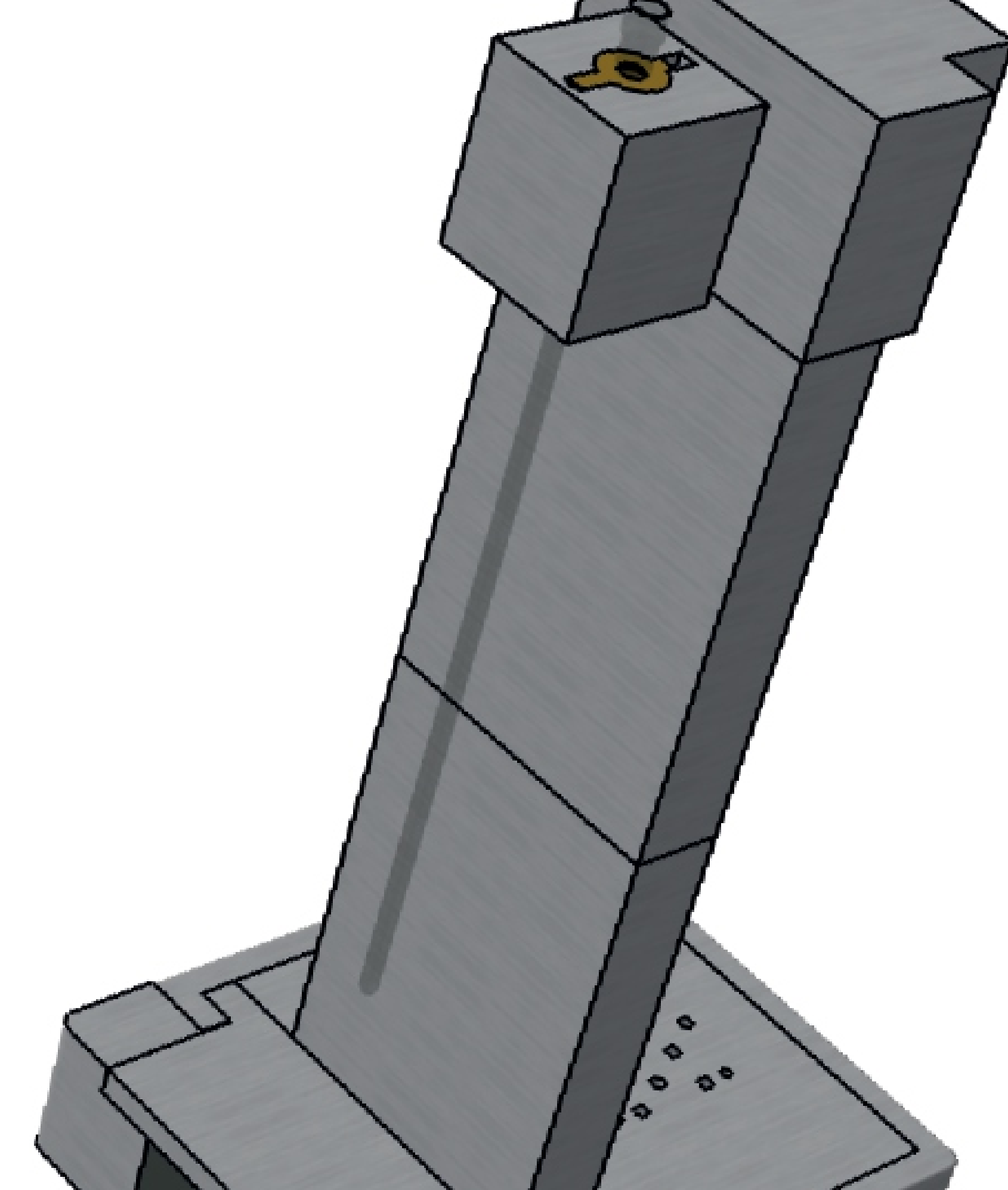


# Rotation Device for Tubes of Nuclear Magnetic Resonance

# NMR ROTOR



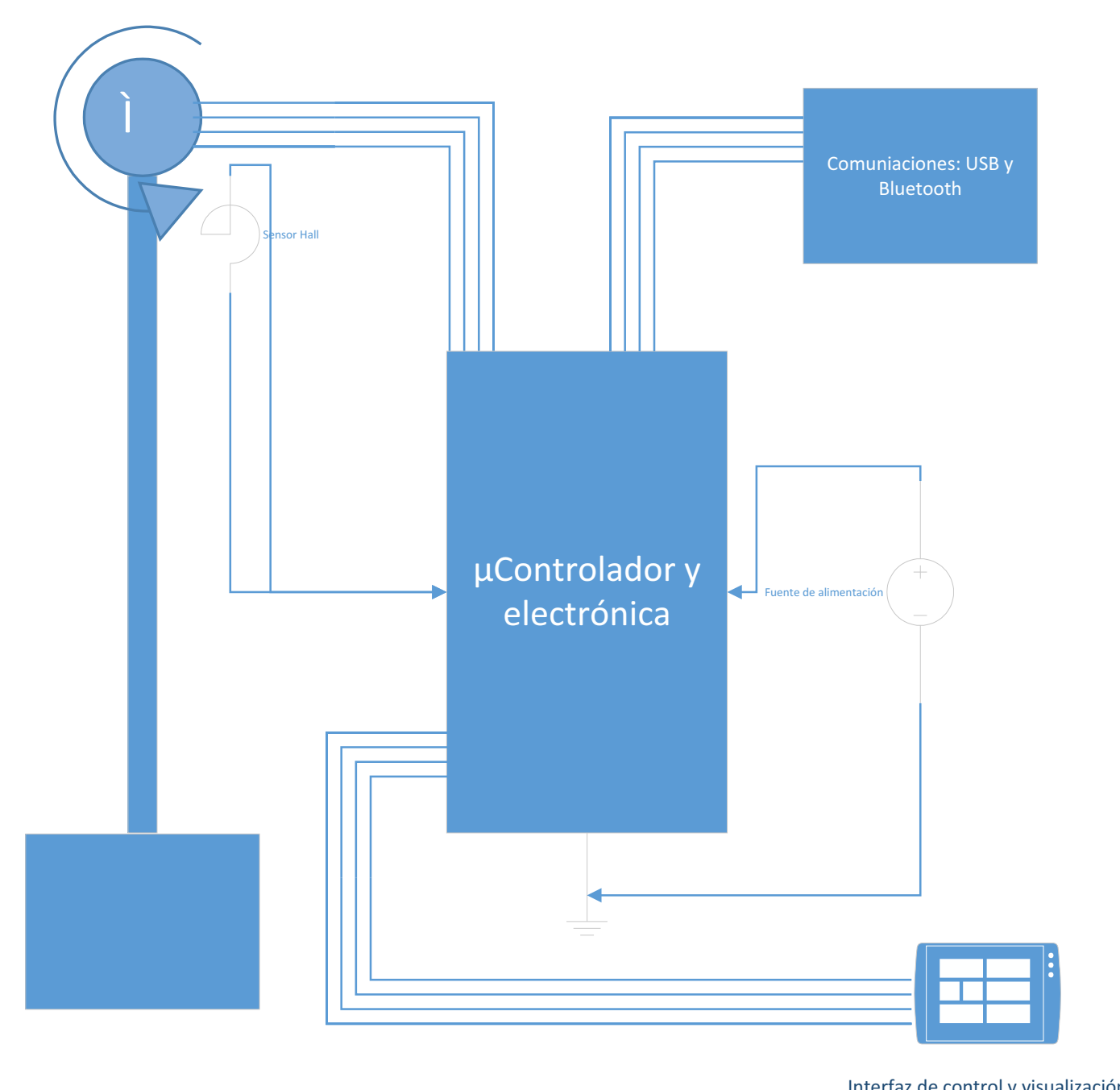
## A FULLY PROGRAMMABLE ROBOT DEVICE

### Why do we need an NMR ROTOR?

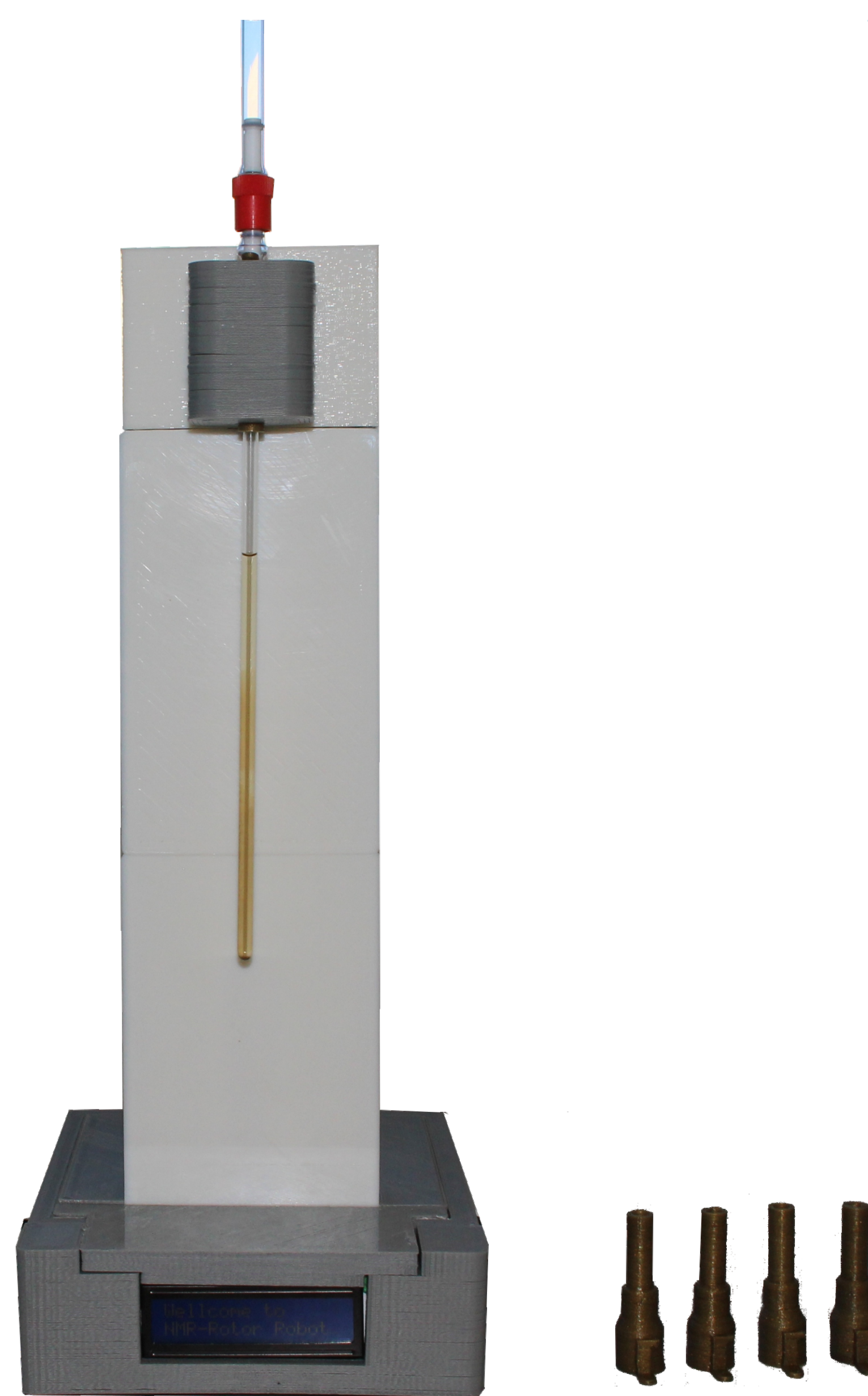
Nuclear Magnetic Resonance (NMR) is a well-known technique in many fields but in particular in chemistry. One of its main applications is the structural determination of reactive intermediates in solution. A common task is the monitor of such species through NMR which comprises the mixing of reacting liquids and also gases contained in an NMR tube, usually of J-Young type. This methodology makes necessary to control the mode and rate in which the tube is moved, in order to achieve a homogenous and uniform mixing of the reagents. After an exhaustive search through patent and non-patent sources, we could not find any device for this specific purpose, probably due to the longitudinal shape of the NMR tubes which do not fit to conventional machines, NMR tubes are fragile, and the importance of ensuring reproducibility.

### Schematic of NMR ROTOR

NMR ROTOR has five different parts: the stepper motor, several communications paths, a microcontroller, an interface system, a structural base that gives rigidity and finally the power source. In parallel, the protective covering of the NMR tubes is achieved by means of a polymer adaptor which is designed to include a holder made of a thermoplastic elastomer. Both the adaptor and the protective cage are exchangeable according to the standard tube dimensions considered by the main manufacturers.

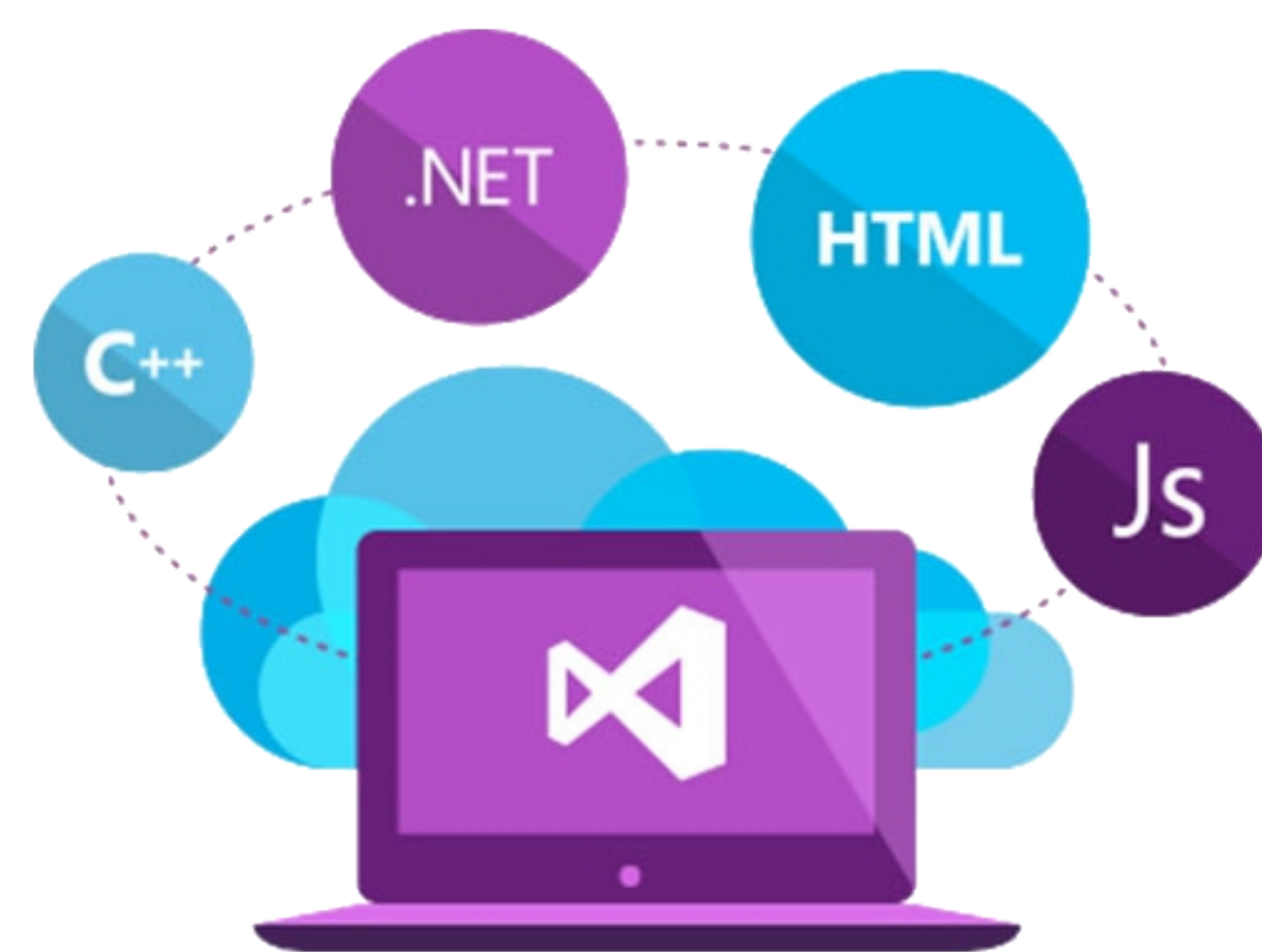


## FOR NMR TUBES<sup>1</sup>



### NMR ROTOR features

NMR ROTOR is controlled by a program which is written in the latest software technology such as .NET and Visual C# in a free-standing compiled version for PC-platforms. It will very soon be transformed into XALM technology. The whole unit is manufactured with three different polymers such as ABS (Acrylonitrile butadiene styrene), PLA (Polylactic acid) and an elastomeric thermoplastic polymer.

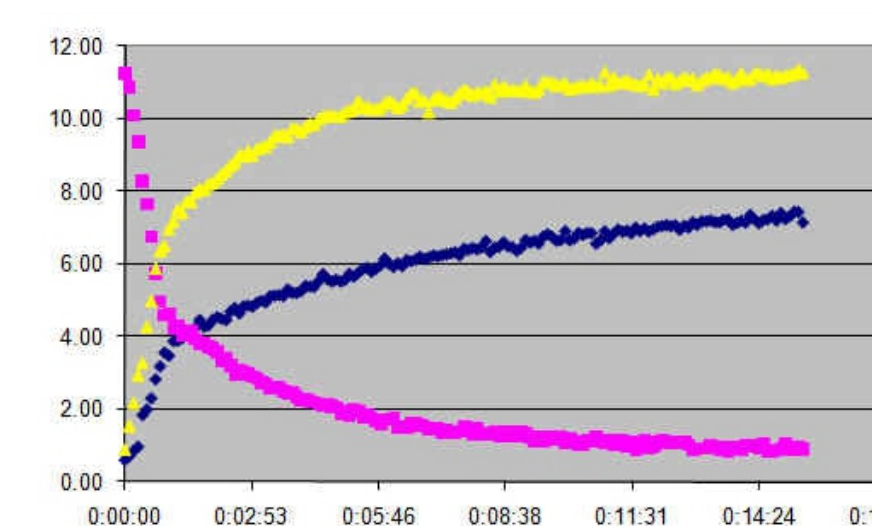
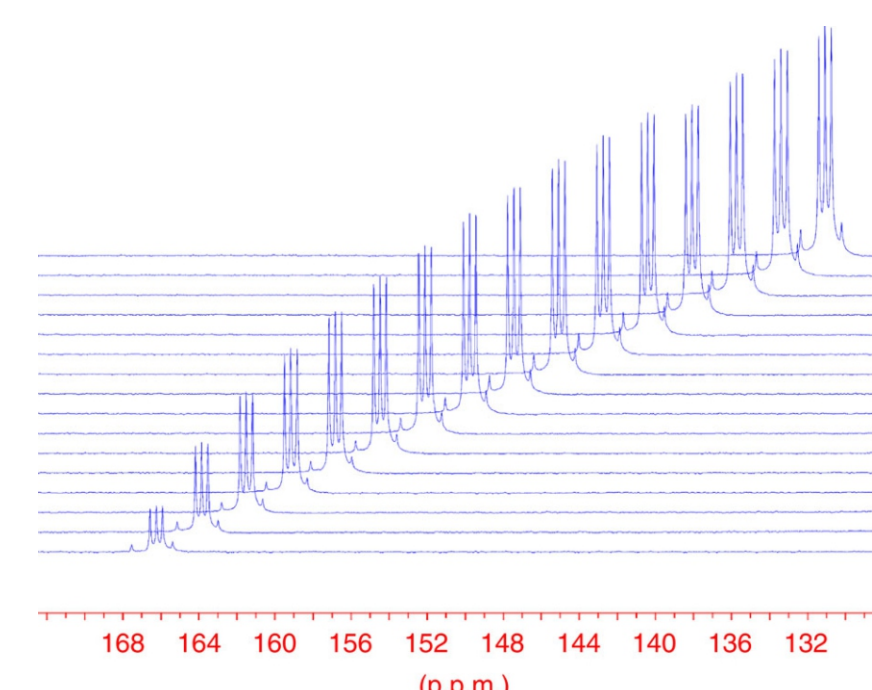
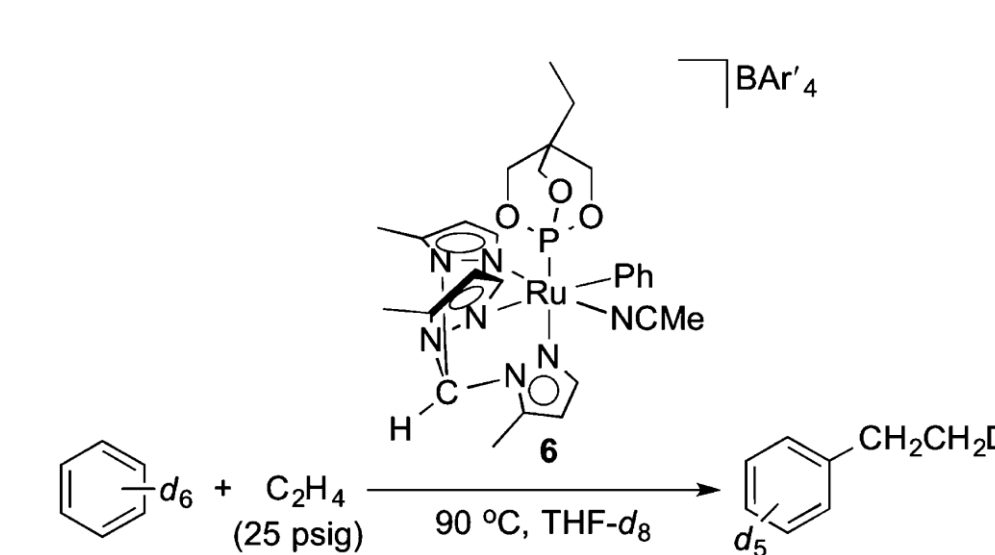
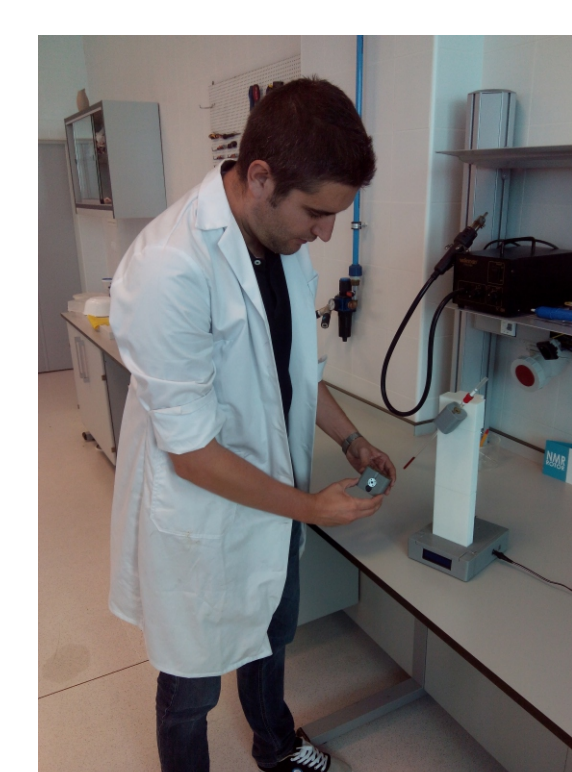
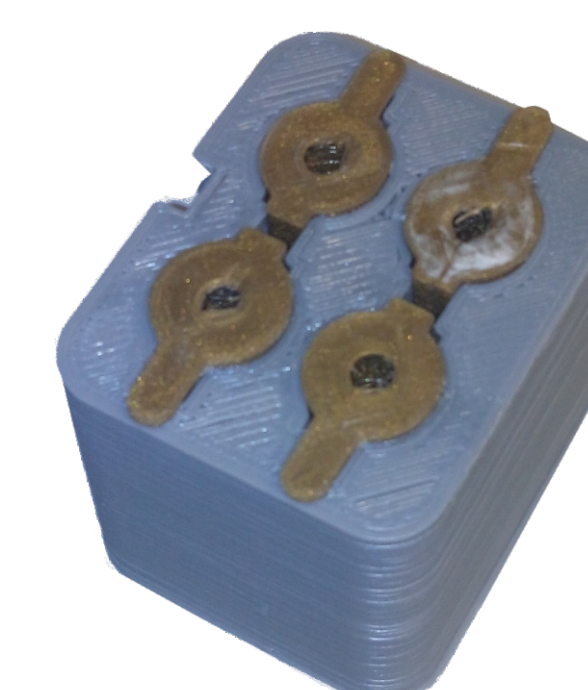


### How does the NMR ROTOR work?

The device basically operates as follows:

- 1.- The holder containing the NMR tube together with the protective cover are fixed as a whole onto the shaft of the electric motor.
- 2.- The shaft is always at the 360° position thanks to the Hall Effect sensor already integrated.
- 3.- The start/stop button gives the order to the micro-controller to start the rotation.
- 4.- Once the experiment is completed, the rotation of the electric motor stops and the adapter moves back to its initial 360° position.
- 5.- All the variables are controlled by a free software available at [ingmec.ual.es](http://ingmec.ual.es) that allows the control of the robot via PC, tablet or smartphone, even in remote control procedures.

### NMR ROTOR adapters



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