

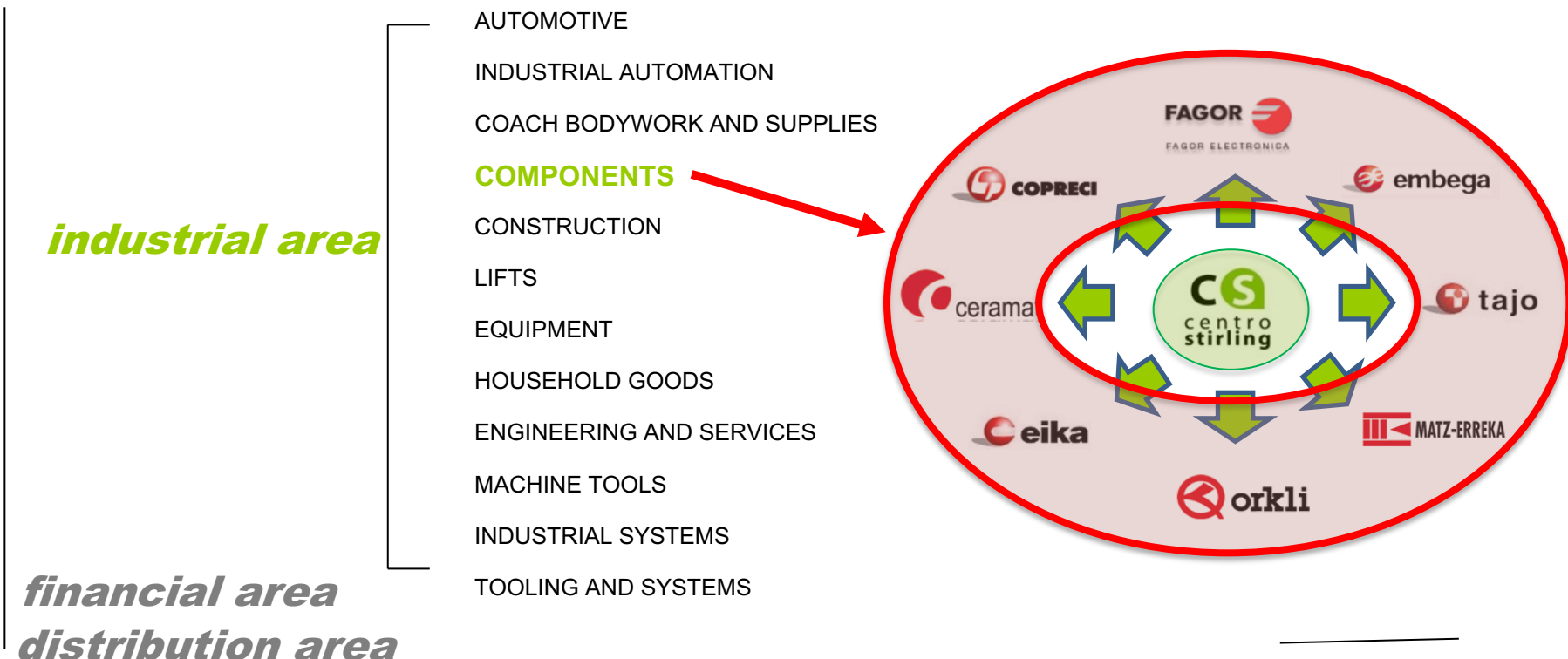


centro  
stirling

Abril 2020

# Mondragon Corporation

MONDRAGON is a business group which is divided into three areas: FINANCIAL, INDUSTRY and DISTRIBUTION. **MONDRAGON COMPONENTES** is a Division of MONDRAGON.



Research, Education and Training centers



## CS Centro Stirling

Centro Stirling S. Coop. is an R&D centre, fully owned by Mondragon Componentes' cooperatives.

Focussed to the introduction of new technologies and functions in Mondragon Componentes' products and cooperatives.

Its specialization in WHITE GOODS and HOME-SCALE-ENERGY-EFFICIENCY makes it unique among the Spanish research entities.

Medium-long term R&D and product development skills are concentrated and coordinated from this close-to-market entity to support and complement our cooperatives' high professional engineering teams.

Created in 2008, it is integrated in the Basque Network of excellent R&D entities.

# Collaborations



Gipuzkoako Foru Aldundia  
Diputación Foral de Gipuzkoa



Smart Cities  
and Communities





# Activity areas and Resources

2 work sites: Aretxabaleta (Gipuzkoa) and Villatuerta (Navarra)

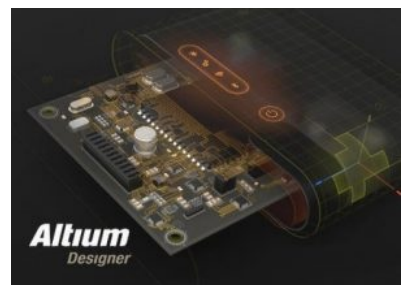
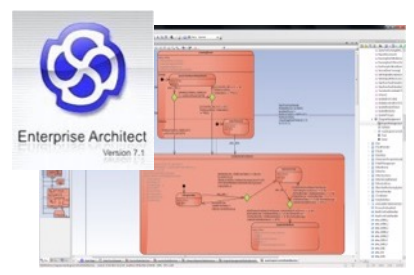
19 researchers: 4 Doctors, 14 Engineers, 1 technician.

Externalized administration (accounting, personnel, subsidy management...)

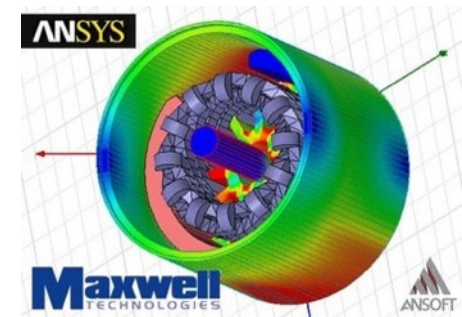
- **Mechanical Design & optimization** software tools:



- **SW/HW Modelling and Development** tools:



- Electromagnetic and thermal FEM tools:



- Communications and IOT



- Laboratory and Test Bench tools (distributed)



# Some Reference Projects

# Mechanical Design & optimization

## Intelligent pressure cooking

**1** Fagor's new LCD+ pressure cooker thanks to its control display and LCD indicator, offers general and detailed information about the pressure level inside the unit. This way, the cook has all the information needed about the cooking process.

**2** The innovative Pressure Level Indicator of Fagor's new LCD+ pressure cooker offers, above all, more safety and comfort of use.

**3** After equipping an LCD+ LCD which acts as a digital Pressure Level Indicator that lets the user control the pressure cooker from a distance.

**4** 5 safety systems

**5** USER FRIENDLY: Do not start cooking until the pressure is released.

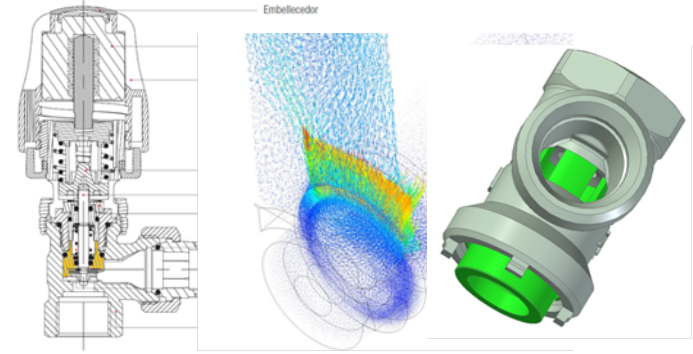
**6** SAFE: When the pressure is released, the LCD+ LCD shows the pressure level.

**7** SAFETY: The LCD+ LCD shows the pressure level.

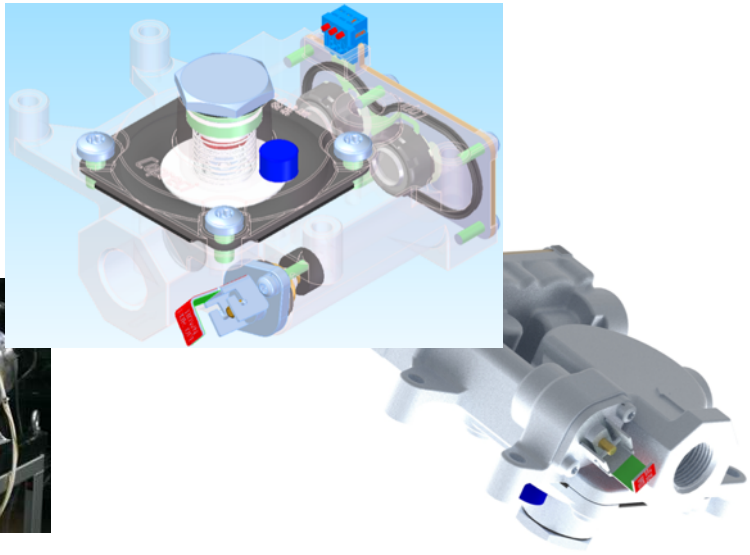
**8** SAFETY: The LCD+ LCD shows the pressure level.

**9** SAFETY: The LCD+ LCD shows the pressure level.

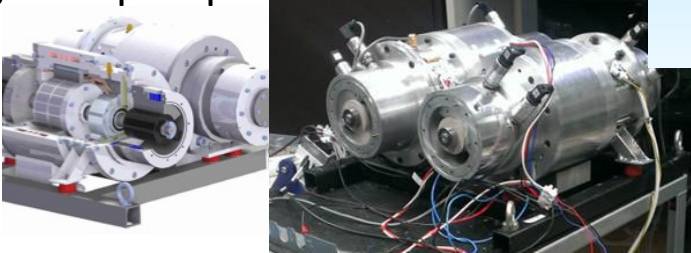
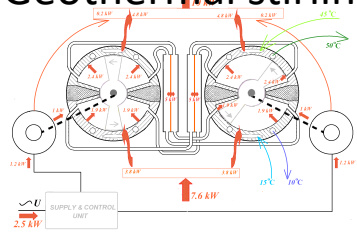
## Thermostatic valve optimization



## Gas valves

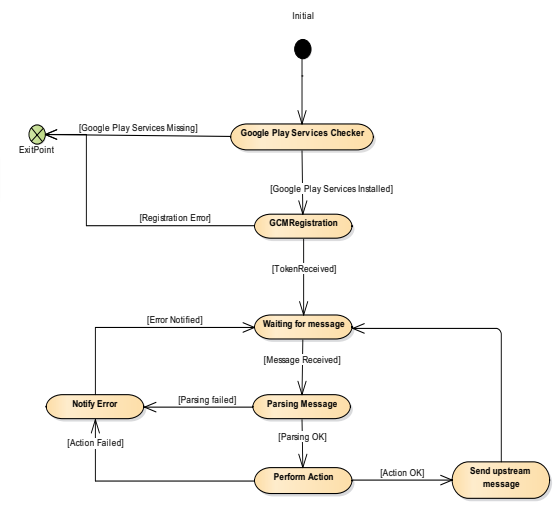
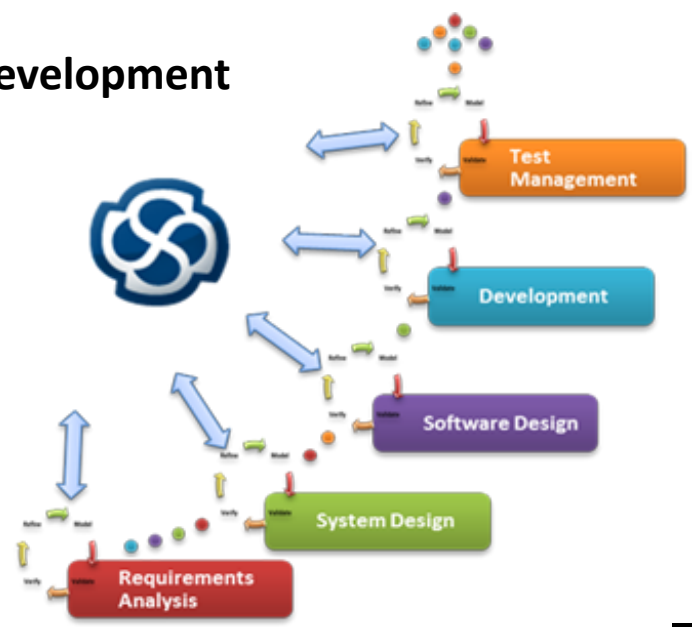


## Geothermal stirling heat-pump



# SW/HW Modelling and Development

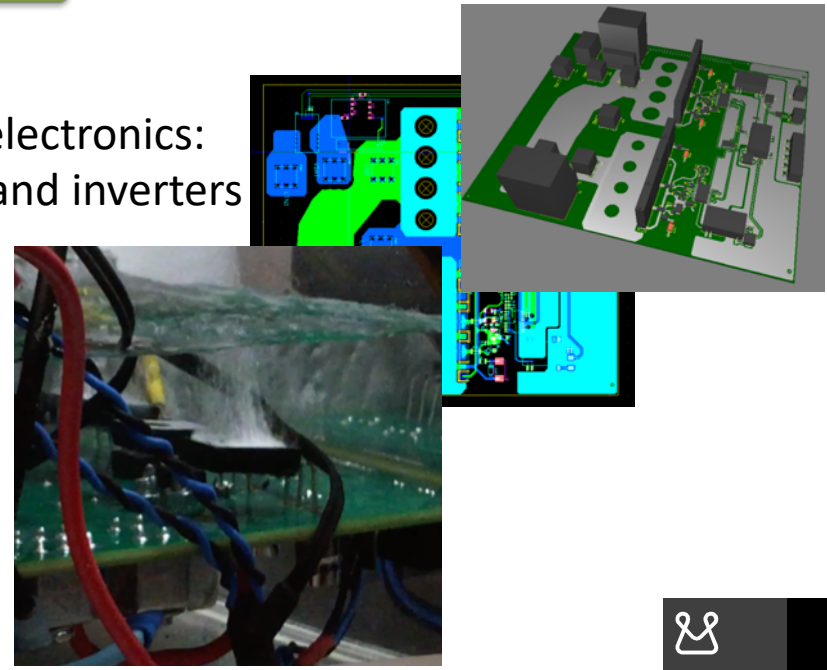
USA Oven



MDM OnRoute



Power electronics:  
DC/DC and inverters





# Laboratory and specific test design

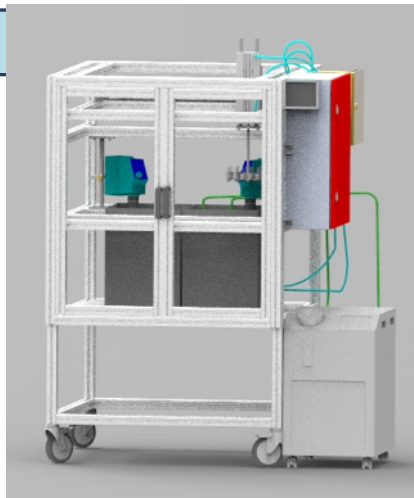
UltraCaps Accelerated Life Test



Radiant Heating Thermostat Life Test



Water Pump Rotor Stress Test





# Electromagnetic and thermal FEM

Modelling and simulation of electromagnetic circuits and devices

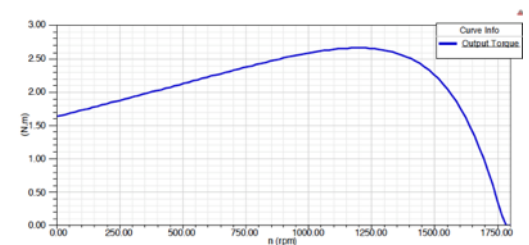
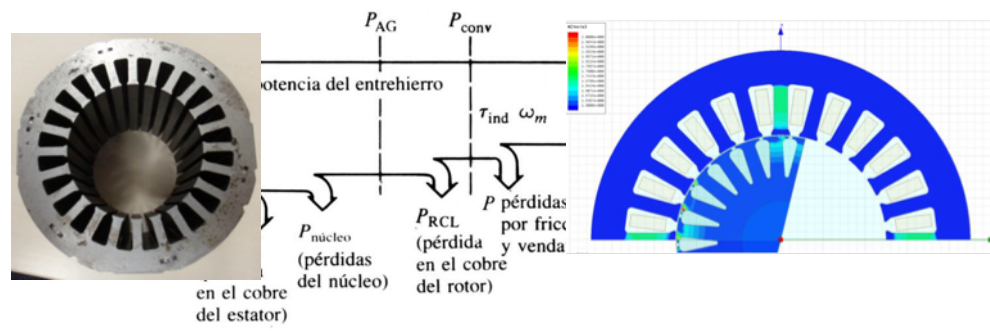
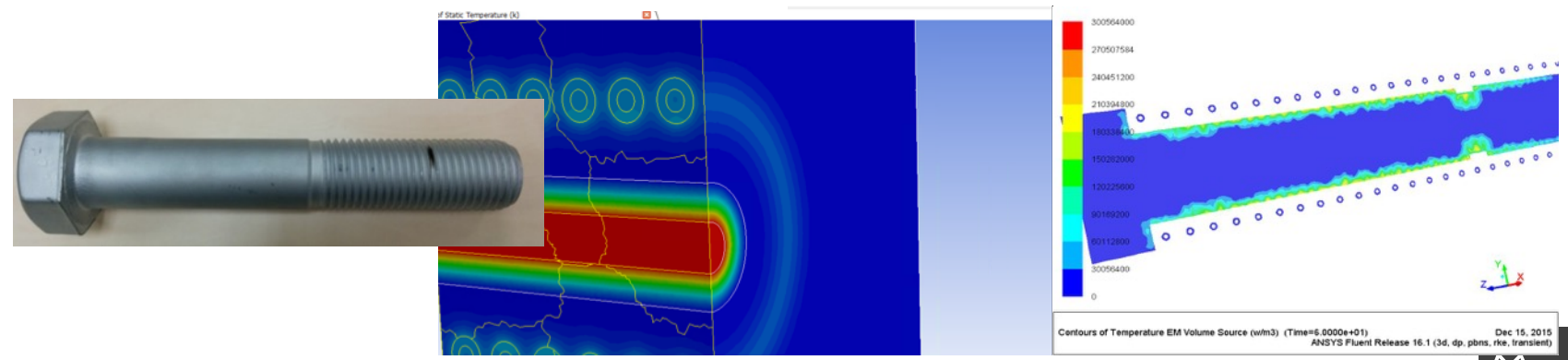


Ilustración 16: Curva Par-Velocidad del motor mexicano obtenida mediante FEM



Centours of Temperature EM Volume Source (w/m3) (Time=6.0000e+01) ANSYS Fluent Release 16.1 (3d, dp, pbns, rke, transient) Dec 15, 2015

# Communications and IOT

Remote management



- Metering
- Monitoring
- Control

Client/server model & topology

Wired or wireless communications

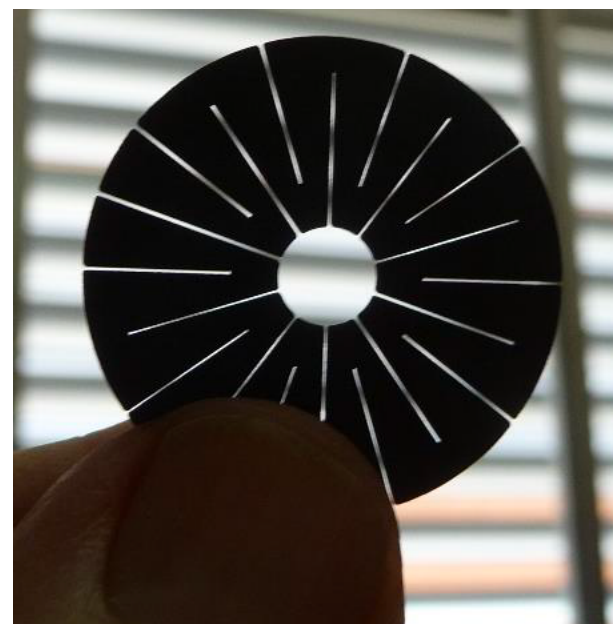
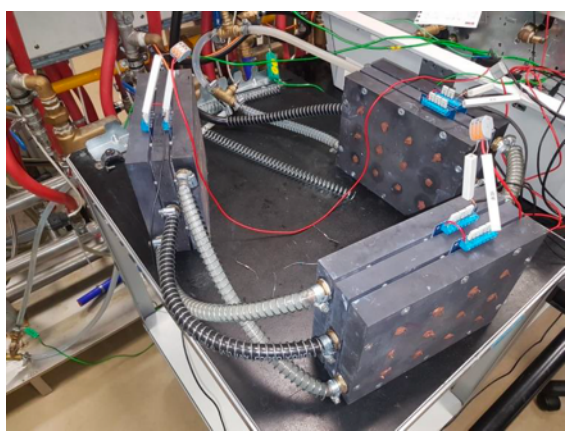
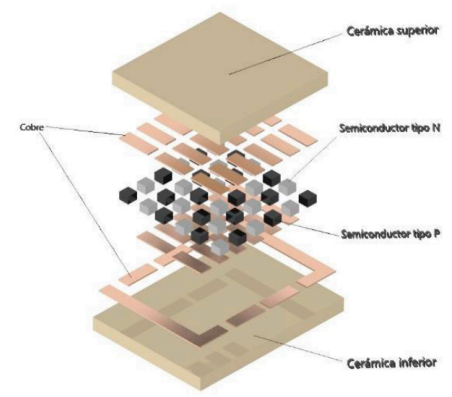
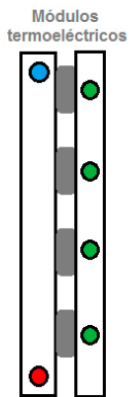
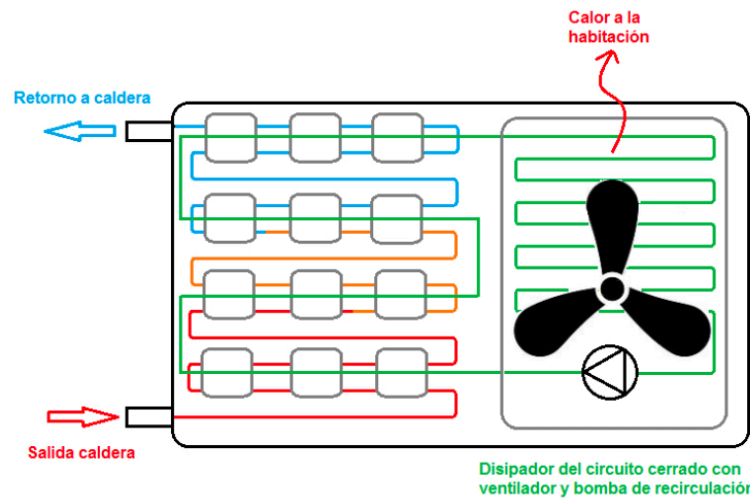
Ethernet

GPRS/UMTS

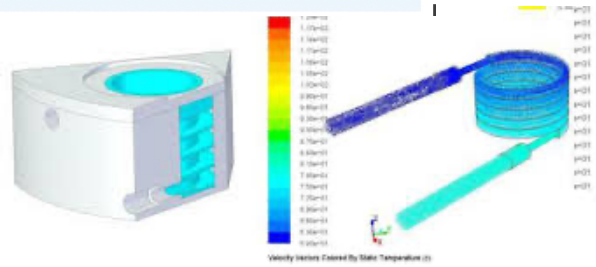
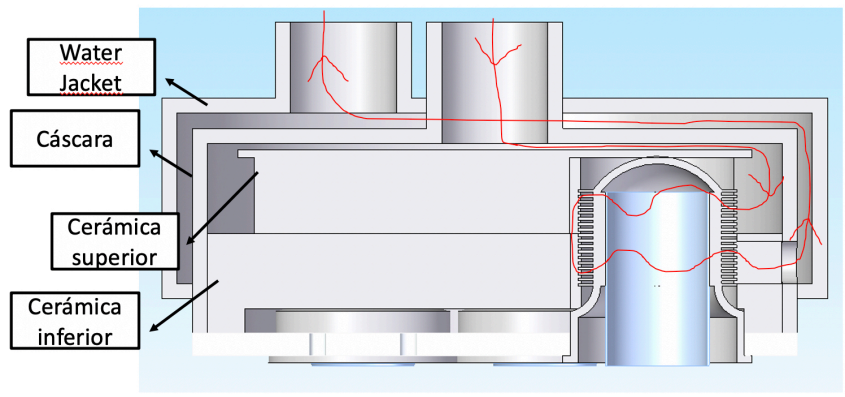
RF bands (free use / payment fee)



Listado de recetas		
Por favor, seleccione una de las recetas para empezar a cocinar.		
<p><b>Recetas cocinadas 02</b></p> <ul style="list-style-type: none"> <li>Arroz cocinado 02</li> <li>Arroz cocinado 01</li> </ul>	<p><b>Recetas cocinadas 03</b></p> <ul style="list-style-type: none"> <li>Arroz cocinado 03</li> <li>Arroz cocinado 01</li> </ul>	<p><b>Arroz</b></p> <ul style="list-style-type: none"> <li>Arroz cocinado 02</li> <li>Arroz cocinado 01</li> </ul>
<p><b>Patatas</b></p> <ul style="list-style-type: none"> <li>Patatas cocinadas 01</li> <li>Patatas cocinadas 02</li> </ul>	<p><b>Patatas</b></p> <ul style="list-style-type: none"> <li>Patatas cocinadas 01</li> <li>Patatas cocinadas 02</li> </ul>	<p><b>Hamburguesas</b></p> <ul style="list-style-type: none"> <li>Hamburguesas cocinadas 01</li> <li>Hamburguesas cocinadas 02</li> </ul>









# Thank you