



**Termolab**

HIGH TEMPERATURE TECHNOLOGY

[www.termolab.pt](http://www.termolab.pt)

# **HIGH TEMPERATURE FURNACES**

## General Catalogue



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Termolab was founded in 1987 and was the first company to produce high temperature furnaces in Portugal. For the past 20 years has been developing and producing furnaces for a wide range of processes and applications.

The company has been in the national and international market and has furnaces installed in all five continents with great success and satisfaction from customers.

From 25°C to 2500°C, with metallic, SiC, MOSi<sub>2</sub>, graphite or tungsten heating elements, Termolab has a line of standard products and also builds many special equipments to meet specific customers requirements.

Using high quality materials, experience and know-how, we are able to produce equipments for a numerous type of applications in wide range of temperatures and atmospheres, with quality engineering solutions.

For technical information consult our website [www.termolab.pt](http://www.termolab.pt) or contact [geral@termolab.pt](mailto:geral@termolab.pt).

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## CHAMBER FURNACES (type MLM)

- Maximum Operating Temperature: 1.100 / 1.200 / 1.350 °C;
- Fast heat up and cool down rates;
- Dimensions from 3 up to 1000 litres;
- Heating elements with Kanthal metallic alloys (Kanthal A1 and Kanthal APM);
- Insulation with Rigid Ceramic Fibre;
- Temperature Control with Eurotherm Temperature Controllers;
- Power Control through Solid State Relays or Thyristor Units (phase angle fired).



### Options:

- Possibility of data acquisition through Eurotherm Software 'I-Tools'.
- Possibility of multi-zone temperature control.
- Possibility of door opening system through horizontal axis.
- Gas control accessories.

### Standard Models:

Model	Useful Dimensions WxHxD (mm)	Maximum Operating Temperature (°C)	Power (kW)
MLM110	150x150x250	1.100°C	2,5
	200x150x300		3,5
	200x200x300		3,75
MLM120	150x150x250	1.200°C	2,5
	200x150x300		3,5
	200x200x300		3,75
MLM135	200x200x325	1.350°C	5
	200x250x400		6,5

**Note** – Other models can be quoted under request.

## CHAMBER FURNACES (type MLR - SiC)

- Maximum Operating Temperature: 1.400 / 1.500 / 1.550 °C;
- Fast heat up and cool down rates;
- Dimensions from 3 up to 250 litres;
- Kanthal Silicon carbide heating elements;
- Insulation with Rigid Ceramic Fibre;
- Temperature Control with Eurotherm Temperature Controllers;
- Power Control through Solid State Relays or Thyristor Units (phase angle fired).



### Options:

- Possibility of data acquisition through Eurotherm Software 'I-Tools'.
- Possibility of multi-zone temperature control.
- Possibility of door opening system through horizontal axis.
- Gas control accessories.

### Standard Models:

Model	Useful Dimensions WxHxD (mm)	Maximum Operating Temperature (°C)	Power (kW)
MLM14	140x160x250	1.450°C	5
	200x200x300		6
MLM15	140x160x250	1.550°C	5
	200x200x300		6
MLM16	140x160x250	1.600°C	5
	200x200x300		6

**Note** – Other models can be quoted under request.

## CHAMBER FURNACES (type MLR)

- Maximum Operating Temperature: 1.550 / 1.600 / 1.700 / 1.800 °C;
- Fast heat up and cool down rates;
- Dimensions from 3 up to 250 litres;
- Kanthal Super heating elements;
- Insulation with Rigid Ceramic Fibre;
- Temperature Control with Eurotherm Temperature Controllers;
- Power Control through Thyristor Units (phase angle fired);



### Standard Models:

Model	Useful Dimensions WxHxD (mm)	Maximum Operating Temperature (°C)	Power (kW)
MLR16	200x200x300	1.600°C	8
	200x260x300		10,5
MLR17	135x160x160	1.700°C	4,5
	135x160x210		5,5
	200x200x300		8
	200x260x300		12
MLR18	200x200x300	1.800°C	8
	200x260x300		10

**Note** – Other models can be quoted under request.

CHAMBER FURNACES (type MLR)



## BOTTOM LOADING / TOP HAT FURNACES

This type of furnaces has the advantage of easy loading and tight sealing. The bottom earth, or the chamber itself, has pneumatic or hydraulic actuated movement to facilitate the loading. The heating elements are installed in the four lateral walls, resulting in excellent temperature uniformity.

- Maximum Operating Temperature: 1.100/1.200/1.300/1.500/1.600/1.700/1.800 °C;
- Fast heat up and cool down rates;
- Heating elements with Kanthal metallic alloys or Molybdenum disilicide Kanthal;
- Insulation with Rigid Ceramic Fibre;
- Temperature Control with Eurotherm Temperature Controllers;
- Power Control through Solid State Relays or Thyristor Units (phase angle fired).



Furnace for 1.800°C with the possibility to work as tubular vertical (under protective atmosphere) or normal bottom loading chamber furnace.





Top Hat Furnaces for 1.700°C

In these furnaces the bottom earth is static and the furnace chamber moves



Hot Zone Detail

## TOP LOADING FURNACES

- Maximum Operating Temperature: 1.200 / 1.350 / 1.500 / 1.600 / 1.700 / 1.800 °C;
- Fast heat up and cool down rates;
- Dimensions from 3 up to 250 litres;
- Kanthal metallic alloys or Kanthal Super heating elements;
- Insulation with Rigid Ceramic Fibre;
- Temperature Control with Eurotherm Temperature Controllers;
- Power Control through Solid State Relays or Thyristor Units (phase angle fired).



## TUBE FURNACES

- Maximum Operating Temperature: 1.200/1.300/1.500/1.600/1.700/1.800 °C;
- Fast heat up and cool down rates;
- Heating elements with Kanthal metallic alloys or Molybdenum disilicide Kanthal;
- Insulation with Rigid Ceramic Fibre;
- Temperature Control with Eurotherm Temperature Controllers;
- Power Control through Solid State Relays or Thyristor Units (phase angle fired).
- Alumina recrystallized tubes, with cooled flanges sealed by Viton O’rings, to work under vacuum or controlled atmosphere.



### Options:

- Possibility of data acquisition through Eurotherm Software 'I-Tools'.
- Possibility of multi-zone temperature control.
- Gas and vacuum control accessories.

### Standard Models:

Model	Useful Dimensions Ø x HZL or HZH mm	Maximum Operating Temperature (°C)
TH/TV	40x200	Up to 1.800 °C
	40x300	
	50x200	
	50x300	
	60x200	
	60x300	

**Note** – Other models can be quoted under request.

## ROTARY TUBE FURNACES

Rotary tube furnaces are used for continuous processing of powders under controlled atmospheres. They can be supplied with an automatic feeding device.

### Main characteristics:

- Adjustable tube rotation
- Adjustable tube tilting
- Adjustable feeding rotation
  
- Maximum Operating Temperature: 1.100/1.200/1.300/1.500/1.600/1.700 °C;
- Fast heat up and cool down rates;
- Heating elements with Kanthal metallic alloys or Molybdenum disilicide Kanthal
- Insulation with Rigid Ceramic Fibre;
- Temperature Control with Eurotherm Temperature Controllers;
- Power Control through Solid State Relays or Thyristor Units (phase angle fired).



## SPLIT FURNACES

Split Furnaces are vertical or horizontal furnaces with the capability of opening the chamber in two halves. They can work as tubular furnaces or to be installed in tensile testing systems.

- Maximum Operating Temperature: 1.100/1.200/1.300/1.500/1.600/1.700°C
- Fast heat up and cool down rates;
- Heating elements with Kanthal metallic alloys or Molybdenum disilicide Kanthal;
- Insulation with Rigid Ceramic Fibre;
- Temperature Control with Eurotherm Temperature Controllers;
- Power Control through Solid State Relays or Thyristor Units (phase angle fired).



## RETORT FURNACES

Furnaces with refractory steel chambers to work under vacuum or controlled atmosphere

- Maximum Operating Temperature: 1.000 / 1.150 °C;
- Fast heat up and cool down rates;
- Heating elements with Kanthal metallic alloys;
- Insulation with Rigid Ceramic Fibre;
- Temperature Control with Eurotherm Temperature Controllers;
- Power Control through Solid State Relays or Thyristor Unit (phase angle fired);



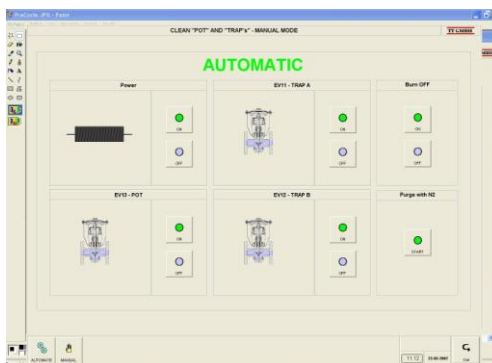
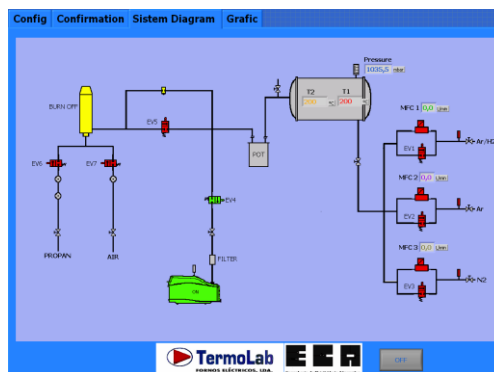
## DEBINDING RETORT FURNACES

Furnaces with refractory steel chambers to work under vacuum or controlled atmosphere

- Maximum Operating Temperature: up to 1.450 °C;
- Heat up rates of 10 °C / minute (possibility of controlled cooling);
- Heating elements with Kanthal metallic alloy or Kanthal Super ERs;
- Insulation with Rigid Ceramic Fibre;
- Temperature Control with Eurotherm Temperature Controllers;
- Power Control through Solid State Relays or Thyristor Units (phase angle fired).

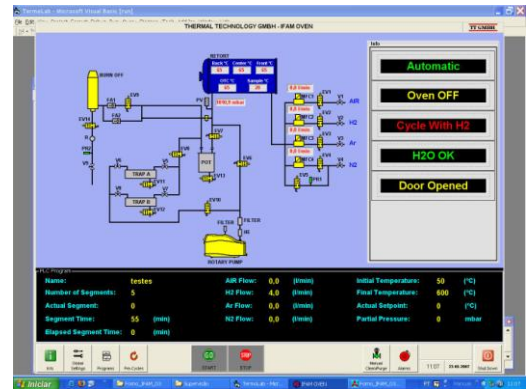


Retort Furnace for 1.450 °C, 400x400x400 mm  
Burn-off system (Works with N<sub>2</sub>, Ar e H<sub>2</sub>).  
PC Panel for process control.



### Additional features:

- Flow control with flowmeters or mass flow controllers.
- Primary vacuum (rotary pumps) or High vacuum (diffusion or turbo-molecular pumps).
- Burn-off system in the end of the gas line (for H<sub>2</sub>).
- Debinding system (condensation of the binders through traps and cold pots).
- Partial pressure control.
- Possibility to control the process via dedicated PC Panel with touch screen.



Debinding Furnace for 1.000 °C. Works with H<sub>2</sub>, N<sub>2</sub>, Ar, and Air. PC Panel for process control.

**Equipment**

The system is constituted by:

- A Retort Furnace;
- A Binder Removal Unit (Dewax unit with two traps and a cold pot)
- A Vacuum Equipment;
- A Partial Pressure Control Device;
- A Burn Off Unit;
- A Process Control Unit;
- Gas Control Accessories;

**Main Applications**

MIM Vacuum Dewaxing-Sintering

Powder Injected Molding

Sintering, annealing and tempering of ceramic/metal materials;



## GRAPHITE FURNACES

This furnace can be used for a great variety of processes, both for production and research.

### Main Applications:

- Sintering of AlN (aluminium nitride) tooling plates;
- Surface cleaning of SiC (silicon carbide) tooling plates;
- Annealing of sapphire parts.
- Sinter MIM parts of stainless steel and others metals;
- Heat treatment / annealing of metals;
- Carbonisation;
- Materials research, i.e. Boron carbide, carbon/carbon, SiC, etc.



Model G1

The applications are almost infinite as long as the work is compatible with a graphite hot zone.

### Working Conditions:

Can be easily used for a variety of high temperature processes

- Maximum temperature: 2.500 °C
- Graphite hot zone
- Vacuum or controlled atmosphere
- Accurate user-friendly controls



Graphite Heating Element

Flexible design can be customized for numerous applications.

### Standard Models:

Model	Hot Zone Diameter (mm)	Hot Zone Height (mm)	Maximum Operating Temperature (°C)	Power (kW)
G1	100	150	2.000 / 2.500	25
G2	150	200	2.000 / 2.500	40
G3	200	250	2.000 / 2.500	50
G4	200	300	2.000 / 2.500	50

**Note** – Other models can be quoted under request.

GRAPHITE FURNACES



**Model G2**  
 Graphite furnace for 2.300°C  
 Hot zone diameter: 150 mm  
 Hot zone height: 200 mm



**Model G3**  
 Graphite furnace for 2.300°C  
 Hot zone diameter: 200mm  
 Hot zone height: 250 mm

GRAPHITE FURNACES WITH DEBINDING SYSTEM



**Model G4 with Debinding System**  
 Graphite furnace for 2.200°C  
 Hot zone diameter: 200 mm  
 Hot zone height: 300 mm  
 Debinding system (condensation of the binders through trap and cold pot).



## HOT PRESS

This systems are designed for high temperature, high pressure consolidation of powder material in high vacuum, inert or reducing atmosphere.

With graphite, Kanthal wires, SiC or MoSi<sub>2</sub> heating elements, this furnaces can reach temperatures up to 2.500°C.

Standard pressures up to 50 tons.

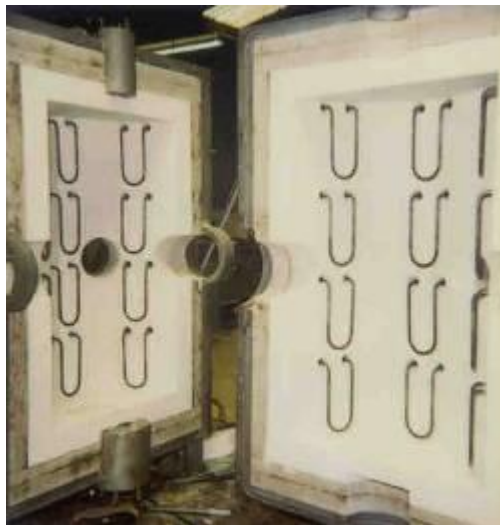
The system includes the following components:

- Furnace
- Press Frame
- Heat Zone
- Power Supply
- Hydraulic System
- Vacuum or inert gas systems (optional)

### Main Applications

- Ceramic Processing
- Metal Processing
- Powder Densification
- Powder Metal Forming
- Sintering
- HmoR Tests





## HIGH VACUUM FURNACE



High Vacuum Furnace for 1.600°C  
 Ø=40mm; HZH=70mm  
 Equipment sold to:  
 Universitat Autònoma de Barcelona - Spain

The equipment includes the following components:

- Furnace
- Lifting System (manual or electrically operated)
- Control Unit
- Gas Control Accessories
- Vacuum system

- Maximum operating temperature: 2.500 °C
- Secondary Vacuum up to  $10^{-6}$  mbar
- Atmospheres: Vacuum, Inert or Reducing

It's a cold wall furnace, with cylindrical water cooled vessel and windows for visualisation. The sample introduction in the hot zone is made by a "linear motion feedthrough", so that the sample can be quickly brought down producing a fast cooling rate.

The heating element is in tungsten wire or tungsten mesh and the protection shields are in tungsten and molybdenum.

The vacuum is achieved by a rotary pump and a diffusion or turbo molecular pump.



High Vacuum Furnace for 2.000°C  
 Ø=100mm; HZH=100mm  
 Equipment sold to:  
 Institut de Chimie de la Matière Condensée de Bordeaux  
 ICMCB - CNRS (France)

## SOLAR FURNACE WITH A FRESNEL LENS

- **Focal Distante:** 1mt
- **Maximum Temperature:** till 2.000°C



## OTHER PRODUCTS AND SERVICES

For the past 20 years of activity, Termolab has been requested by customers, to supply some components that usually are used in the construction of our equipments.

As we have a straight relationship with our suppliers, we are in the position to offer, with very competitive prices, a large range of products and services of some of the most important companies of the world.

We have created a small sector in Termolab where we intent to supply parts to better serve our customers, giving technique and engineering support to find the better solution according customers desires.

We can offer solutions and supply products from these suppliers::

**Eurotherm** ( [www.eurotherm.co.uk](http://www.eurotherm.co.uk) )

- Temperature Controllers,
- Power Controllers,

**Kanthal** ( [www.kanthal.com](http://www.kanthal.com) )

- Heating elements (Kanthal alloys, Silicon Carbide, Kanthal Super)

**Rath** ( [www.rath-group.com](http://www.rath-group.com) ) and Zircar ( [www.zircarceramics.com](http://www.zircarceramics.com) )

- Ceramic fibers for high temperatures (up to 1800 °C)

### **Other products:**

- Mass Flow Controllers,
- Vacuum pumps and gauges,
- Sensors (thermocouples, optical pyrometers, pressure transducers, etc)
- Ceramic and Quartz tubes,
- Technical graphite pieces.

## CONTACTS

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### **GPS Coordinate:**

Latitude: 40° 58' 53" N

Longitude: 8° 40' 34" W



## International References

- ESCOLA TÈCNICA SUPERIR D'ENGINYERS INDUSTRIALES – ETSEIB (Barcelona - Spain)
- UNIVERSIDAD DE CASTILLA - LA MANCHA (Ciudad Real - Spain)
- UNIVERSIDAD DE ZARAGOZA (Spain)
- UNIVERSIDAD DE SEVILLA (Spain)
- UNIVERSIDAD DE EXTREMADURA (Badajoz – Spain)
- FUNDACION ITMA (Asturias - Spain)
- FUNDACION CIDAUT (Valladolid - Spain)
- SEMPSA (Madrid – Spain)
- F.A.E. (Barcelona – Spain)
- INSTITUTO DE TECNOLOGÍA CERÂMICA - ITC (Castellón—Spain)
- CINN - Centro de Investigación en Nanomateriales y Nanotecnología (OVIEDO - Spain)
- FERROATLANTICA, S.L. (Spain)
- CENIM – Centro Nacional de Investigaciones Metalúrgicas (Spain)
- INCAR (Spain)
- AIMEN (Spain)
- INSTITUTO EDUARDO TORROJA (Spain)
- ACERINOX (Spain)
- AEROSPACE ENGINEERING EUROPE, SA (Spain)
- REFRACTÁRIOS ALFRAN (Spain)
- KERATEC, Advanced Materials (Oviedo—Spain)
- INSTITUT DE CHIMIE DE LA MATIERE CONDENSEE DE BORDEAUX - ICMCB (France)
- CENTRE DE RECHERCHE SUR LES IONS, LES MATERIAUX ET LA PHOTONIQUE – CIMAP (France)
- SPSM - ECOLE CENTRALE DE PARIS (France)
- INSTITUT DE SCIENCE DES MATERIAUX DE MULHOUSE (IS2M) - Equipe Matériaux à Porosité Contrôlée (MPC)
- LABORATOIRE PROCEDES, MATERIAUX ET ENERGIE SOLAIRE - PROMES (France)
- CENTRE EUROPÉEN DE LA CÉRAMIQUE – SPcTs (Limoges – France)
- INSTITUTE DE PHYSIQUE NUCLÉAIRE ORSAY (France)
- FRAUNHOFER INSTITUTE - IFAM (Bremen - Germany)
- FRAUNHOFER INSTITUTE - ISC (Wurzburg - Germany)
- FRAUNHOFER INSTITUTE - IKTS (Dresden - Germany)
- MAX PLANCK INSTITUTE (Stuttgart - Germany)
- MAX PLANCK INSTITUTE (Garching - Germany)
- DIFK - Deutsches Institut für Feuerfest und Keramik GmbH (Bonn - Germany)
- INM SAARBRUCKEN (Saarbrucken - Germany)
- SAARLAND UNIVERSITY (Saarbrucken - Germany)
- RWTH AACHEN UNIVERSITY (Aachen - Germany)
- UNIVERSITY OF COLOGNE (Köln - Germany)
- UNIVERSITY OF HAMBURG (Hamburg – Germany)
- UNIVERSITY OF STUTTGART (Stuttgart – Germany)
- UNIVERSITY OF ENLANGEN (Nürnberg – Germany)
- UNIVERSITY OF BONN (Bonn - Germany)
- UNIVERSITY OF PADERBORN (Paderborn - Germany)
- TU BRAUNSCHWEIG (Braunschweig - Germany)
- TU DARMSTADT (Darmstadt – Germany)
- TU BERGAKADEMIE (Freiberg - Germany)



- FH AACHEN (Aachen - Germany)
- FH MÜNSTER (Münster – Germany)
- FH JULICH (Jülich - Germany)
- FH SCHMALKALDEN (Schmalkalden - Germany)
- MONTANUNIVERSITÄT LEOBEN (Loeben - Germany)
- BIOTRONIK (Berlim – Germany)
- SIEMENS AG (Erlangen - Germany)
- LINSEIS (Germany)
- BASF (Germany)
- DLR - Koln (Germany)
- WESGO CERAMICS (Germany)
- DEGUSSA (Germany)
- RAUSHERT (Germany)
- CERAMTEC AG (Germany)
- LUFTHANSA (Germany)
- BMW (Germany)
- OSRAM GmbH (Germany)
- BAM (Berlim – Germany)
- TREIBACHER, GmbH (Germany)
- FACHBEREICH WERKSTOFFTECHNIK - FHJena (Germany)
- E.I.TEC GmbH Bayreuth (Germany)
- NEUE MATERIALIEN FÜRTH GmbH (Germany)
- TU EINDHOVEN (Neederlands)
- ALCOA (Neederlans)
- UNIVERSITY SLOVENIA (Slovinia)
- INSTITUT JOZEF STEFAN (Slovinia)
- CESARE GALDABINI SPA - (Italy)
- ENEA – (Italy)
- ARC-AUSTRIAN RESEARCH CENTER (Austria)
- TU WIEN (Austria)
- TREIBACHER INDUSTRIE AG (Austria)
- TUPACK (Austria)
- SULZER INNOTECH (Swizerland)
- PHILIPS (Belgium)
- VICTORY LIGHTING (England)
- OUTOKUMPU, RESEARCH CENTER (Finland)
- ATATURK UNIVERSITY (Turkey)
- OSMANGAZI UNIVERSITESI REKTORLUGU (Eskisehir / Turkey)
- ATOMIC RESEARCH CENTER - (Cairo – Egypt)
- DEPARTMENT OF ATOMIC ENERGY - DAE (India)
- NAVAL MATERIALS RESEARCH LABORATORY (India)
- COMSATS INSTITUTE (Pakistan)
- CENTRO DE DESENVOLVIMENTO DA TECNOLOGIA NUCLEAR - ( M.G. - Brasil )
- UNIVERSIDADE FEDERAL DE S. CARLOS - ( S. Paulo - Brasil )
- UNIVERSIDADE FEDERAL DE MINAS GERAIS (Brasil)
- BRAZILIAN AERONAUTICAL COMMISSION (Brasil)
- St. GOBAIN - ( Brasil )
- CELLARIS, Ltd (Israel)
- NUCLEAR RESEARCH CENTER - Negev (Israel)
- THERMAL TECHNOLOGY Inc. (USA)

## Portuguese References

- . INSTITUTO NACIONAL DE ENGA E TECNOLOGIA INDUSTRIAL - INETI
- . UNIVERSIDADE DE AVEIRO
- . FACULDADE DE CIÊNCIAS DA UNIVERSIDADE DE LISBOA
- . FACULDADE DE CIÊNCIAS DA UNIVERSIDADE DO PORTO
- . INSTITUTO SUPERIOR TÉCNICO
- . UNIVERSIDADE NOVA DE LISBOA (FCT)
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- . UNIVERSIDADE DO MINHO
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- . INSTITUTO SUPERIOR DE ENGENHARIA DO PORTO
- . CENTRO TECNOLÓGICO DA CERÂMICA E DO VIDRO
- . INSTITUTO POLITÉCNICO DE VIANA DO CASTELO
- . INEGI - INSTITUTO DE ENGENHARIA MECÂNICA E GESTÃO INDUSTRIAL
- . UNIVERSIDADE DA BEIRA INTERIOR
- . UNIVERSIDADE DE EVORA
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- . CONTIBRONZES, SA. (Sabugo)
- . EFACEC, SA. (Porto)
- . ARPOSI, SA. (Vale de Cambra)
- . RENAULT PORTUGUESA (Cacia)
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- . COVINA, SA. (Sacavém)
- . CMP - CIMENTOS MACEIRA E PATAIAS, SA. (Leiria)
- . CABLAUTO (Vila Nova de Famalicão)
- . CABELTE S.A. (Arcozelo)
- . MAHLE (Murte)
- . INNOVNANO (Aljustrel/Coimbra)
- . KEMET (Évora)