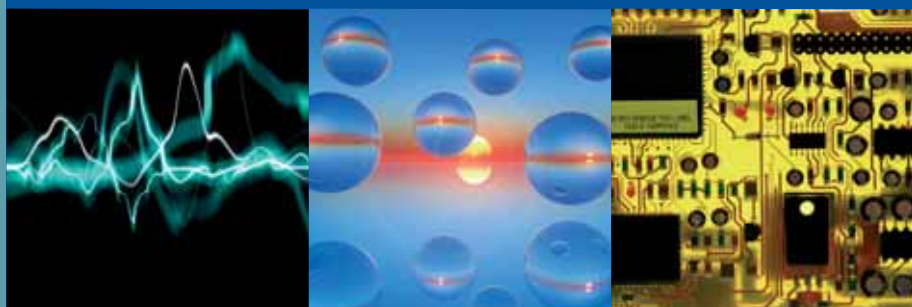


# Calorimeters





Energy efficiency is a must ...

## Application overview



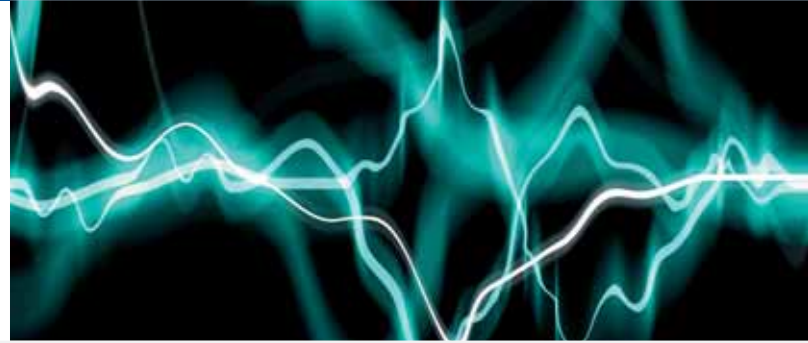
Today environmental air conditioning has become a mass commodity: the presence of an air conditioner in a home or car, something that was rather rare up until a few decades ago, has now become commonplace.

The current situation, especially during the summer, determines consumption levels that account for a significant percentage of the national electricity requirements. What is more, it must not be forgotten that the use of domestic air conditioners is mainly concentrated during the daytime hours, when the demand for electricity reaches the highest levels, exacerbating the problems associated with peak demands.

From this perspective, and considering the ever-growing focus on rational uses of energy, it becomes of fundamental importance to maximize the energy efficiency of air conditioners, making them generate the desired coolness with the lowest possible electricity consumption.



... for a better world



Since the performance of an air conditioner is highly dependent on the temperature and humidity values of both the conditioned and the external environments, the climatic chamber is an irreplaceable simulation instrument. However it is not exhaustive, because it is necessary to

measure the thermal power the conditioner is able to exchange with the outside. For this reason the calorimeter, used both for domestic and car air conditioners, is the most important instrument in both the development phase and, when necessary, the certification phase.



Outdoor room detail



Ready solutions

## Standard calorimeters for domestic air conditioners

Automobile air conditioners are highly customized on the basis of the vehicle in which they will be installed. This is true for both the geometries used and the cooling capacities delivered.

On the other hand, domestic air conditioners, even though there are numerous manufacturers on the market, share many of the same elements in their construction solutions and performances.

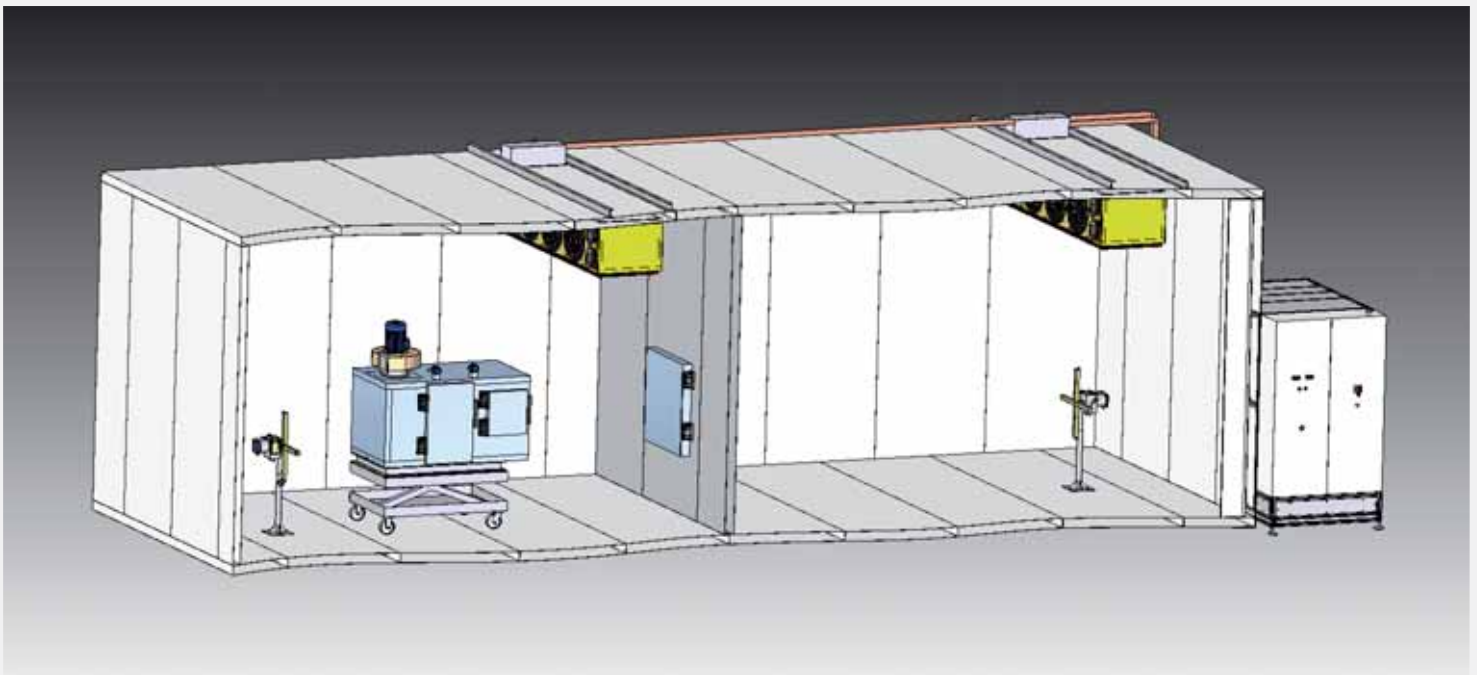
For domestic air conditioners, specific standards of reference are in use in all industrialized countries, establishing how they are to be tested and permitting a clear-cut classification on the basis of both their functioning parameters and their energy efficiency.

As a result, Angelantoni Test Technologies has decided to develop a line of standard calorimeters capable of covering practically all test and qualification needs for domestic air conditioning systems, both split and

monoblock, either functioning exclusively as air conditioners or also as heat pumps.

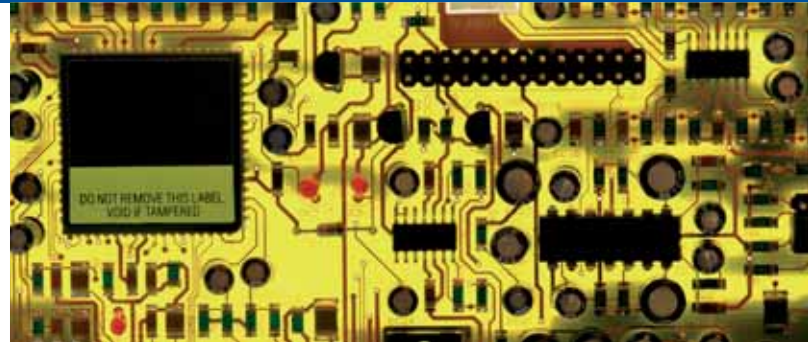
Two models are available, making it possible to work on conditioners of a maximum capacity of 12kW and 20kW, respectively. Tests can be conducted in accordance with EC standard ISO 5151-2010, keeping in mind that it is very similar to the equivalent standards used in other industrial areas.

The calorimeters come complete with a software package, the product of years of experience in the field, which simplifies the running of the tests and provides an immediate reading of the significant parameters. The software, in addition to processing the data to permit an immediate display of the testing progress, produces a report summarizing the results attained and stating the characteristics of the tested conditioner.



3D Sectional Model

## Main features



Model	CAL12 PS	CAL20 PS
Air Conditioner Thermal Power (kW)	12	20
Overall dim. (mm)	8900x3300x3160 H	12200x4100x3460 H
Indoor and outdoor rooms dim. (mm)	3700x3000x2400 H	5350x3800x2700 H
Indoor Temp. range (°C)	+10...+40	+10...+40
Outdoor Temp. range (°C)	-20...+60	-20...+60
Indoor Dewpoint range (°C)	+5...+39	+5...+39
Outdoor Dewpoint range (°C)	+5...+59	+5...+59
Max Steam Flow (Kg/h)	25	25
Code Tester Air Flow (m <sup>3</sup> /h)	4000	4000
Condensation	water condenser	water condenser
Refrigerant	R404A	R404A
Absorbed power (kW)	115	155

The basic configuration includes:

- \* no. 4 portholes for cables entry
- \* no. 2 windows (mm 450x450)
- \* no. 2 inside power plugs
- \* PC and WinKratos control S/W
- \* Code tester sensors
- \* Thermal efficiency calculus



DAS thermocouple connectors



Code tester nozzles

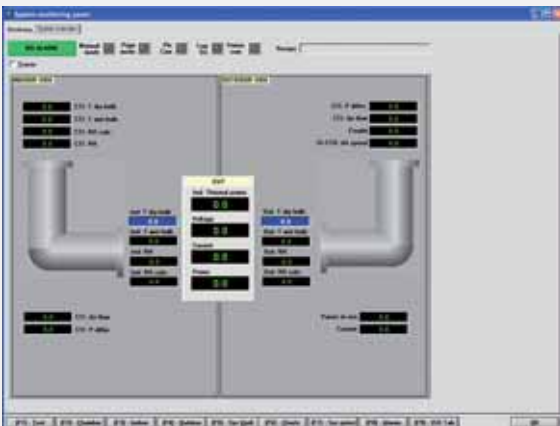


Code tester

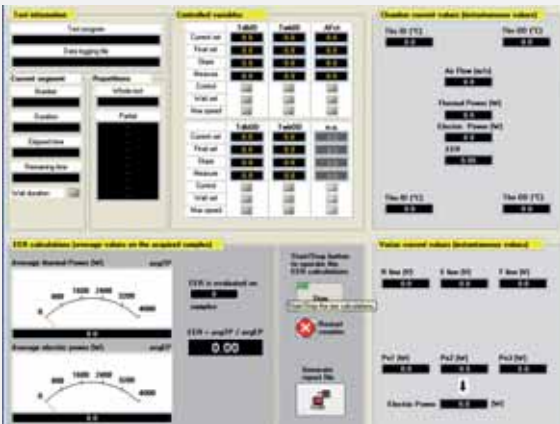


## Simple programming

## Control system overview



System monitoring panel - synoptic page



Test execution monitoring and report generation panel

WinKratos is the software developed by Angelantoni Test Technologies for the monitoring and supervision of climatic chambers and environmental testing systems. The extremely flexible and powerful structure of this package has been further perfected to afford complete integration and effectiveness of use with the calorimeter.

The machine and its functions are managed and monitored by means of a Siemens S7 controller. This controller is responsible for acquiring the chamber status (chamber measurements, DUT electrical parameters, alarms and events), for executing the tests as requested by the operator, and for the safety of the machine itself.

The interface of the control system with the outside, and therefore with the operator, takes place through two different HMI interface levels. The first is a small operating panel positioned on one of the sides of the chamber, and the second is the WinKratos software. Many of the functions are shared by both, and both are based on the same operating philosophy so that they will be homogeneous. But each has specific characteristics depending on the operating field to which it refers.

The operating panel permits the low-level configuration of many operating functions and characteristics of the chamber, the setting and changing of basic parameters, and the possibility to calibrate all the measurement channels. The various functions are subject to different password levels, making it possible to select the personnel authorized for the various operations. The WinKratos software is the advanced supervision and monitoring environment normally used for managing the system.

Through WinKratos it is possible to create test profiles (programs), launch or interrupt the execution of a test in "manual" or "program" mode, display data in table or graphic form, and generate a report showing test results. Particular attention has been paid to the immediacy, simplicity, and operating effectiveness of the interface with which the operator will be working. All functions are highly intuitive, and appropriate messages and interlock conditions on the actions performed ensure error-free tests.



## Personalized solutions

The measurement of the performance of a domestic air conditioner must be carried out in accordance with the regulations of the country where the conditioner is to operate. Almost all regulations envisage several methods of energy efficiency measurement, which are often very different from one another. Therefore, there are many types of calorimeters, each closer to one method than to another and characterized by specific construction solutions.

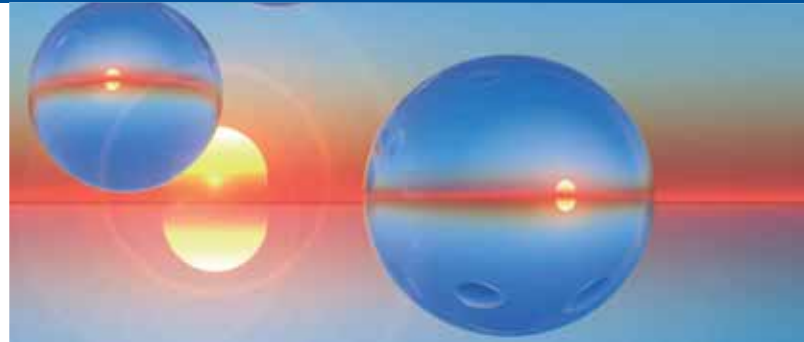
Calorimeters for domestic air conditioning systems can also be classified according to the power range to be measured, and each category is suitable for a specific performance range.

We have been operating in this sector for many years, producing numerous types of calorimeters for domestic air conditioning, from those developed in compliance with the requirements of international standards to highly-customized models, capable of assessing the performance and efficiency of the most varied air conditioning systems.

### Automotive field

The calorimeters for measuring the efficiency of automobile air conditioners make up another, very particular, category. Automobile air conditioners, characterized by geometries which depend on the car on which they are installed, very often require a calorimeter that is specifically designed and therefore highly customized. In some cases automobile manufacturers also ask for the possibility to simulate the extreme transient operating conditions to which conditioners are subjected.

The vast experience and know-how we have acquired enable us to meet these complex needs and produce test benches which are in strict compliance with the existing standards and regulations, up to prototype equipment for cutting-edge experimentation.



Balanced calorimeter



Test bench for car air conditioners



Pressure equalization device



Automotive compressor in test

**Angelantoni Test Technologies (ATT)**, a company of the Angelantoni Group, is the only company capable of offering a broad range of test solutions for a great variety of applications, thanks to the expertise and technical know-how of its worldwide teams of experts. The leading test technology brand of ATT is **ACS**, world-famous since 1952 for its design and manufacture of a comprehensive range of environmental test chambers, including high-tech test equipment such as high vacuum chambers for aerospace applications and calorimeters.

**Our core competencies and services for total customer satisfaction:**

- Training, both at our facility and at customer site
- Testing and quality checks
- Installation and start up
- Preventive maintenance
- Service
- Calibration using SIT certified instruments
- "Full risk" assistance contracts
- Extended warranties
- Existing chamber validation
- Retrofitting of older chambers, including instrumentation and new environmentally friendly refrigerants
- Exchange and sale of used chambers
- Research and development
- Production and assembly
- Market analysis and advice
- Special applications



ISO 14001



ISO 9001