

## EMBRAPII UNIT INNOVATIVE TECHNOLOGIES IN REFRIGERATION

The Brazilian Enterprise for Industrial Research and Innovation (EMBRAPII) was created to promote industrial innovation. EMBRAPII recognizes opportunities in the integration between research institutions and industrial companies, aiming at strengthening their technological potential. EMBRAPII's mission is to support technical and research institutions in specific areas so they can develop R&D&I projects in cooperation with companies in the industrial sector.

In 2014, POLO was accredited by EMBRAPII to develop R&D&I projects in the areas of Cooling and Thermophysics. The strategic areas of the EMBRAPII unit on Innovative Refrigeration Technologies are: Emerging Technologies, Energy Efficiency and Environmental Impact, Acoustic Comfort, Reliability of Components and Cooling Systems, and Evaluation and Certification.

POLO is financially supported by EMBRAPII to develop, together with the industrial sector, innovative projects related to products and processes.

Our team is ready to work with your company. Come meet us, and schedule a tour of our facilities.



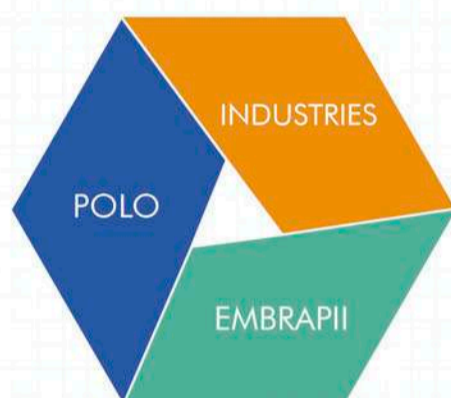
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Research Laboratories for Emerging  
Technologies in Cooling and Thermophysics

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## A WORLD LEADER IN THE GENERATION OF KNOWLEDGE IN REFRIGERATION

### INNOVATIVE TECHNOLOGIES SINCE 1982

Since 1982 the focus of the POLO Laboratories has been on research, development and innovation (R&D&I) in the areas of Cooling and Thermophysics. POLO is the product of an uninterrupted partnership of more than three decades between the Federal University of Santa Catarina (UFSC) and the industrial sector. Through excellence in teaching and research, POLO established itself as a reference for the generation of knowledge and technological development for the solution of relevant engineering problems. Today, several industrial partners interact with POLO, thanks the excellent laboratory infrastructure and tradition of high quality research and development.

In 2009, POLO was recognized as one of the INCTs (National Institutes of Science and Technology) and, in 2014, POLO became one of the EMBRAPII units (Brazilian Enterprise for Research and Industrial Innovation). These pioneering initiatives demonstrate the commitment of the Federal Government to strengthening the interaction between Brazilian research institutions and companies as a means of improving their competitiveness in the national and international markets.

### OUR TEAM

POLO's multidisciplinary team has a long-term experience in R&D&I projects, being recognized internationally by their leadership in the field of compressors and refrigeration systems. The R&D&I activities are carried out by professors, associated researchers, engineers, technicians and doctorate, masters and undergraduate students. In addition, POLO has a full team of administrative staff.

### POLO IN NUMBERS

- 130 researchers and collaborators
- 7 climatized test rooms
- 20 laboratories
- Auditorium and classrooms
- 1 machine and prototype workshop
- More than 140 master's degree theses
- More than 30 doctorate theses
- More than 750 articles in conferences and journals
- Modern computing facilities

### SERVICES

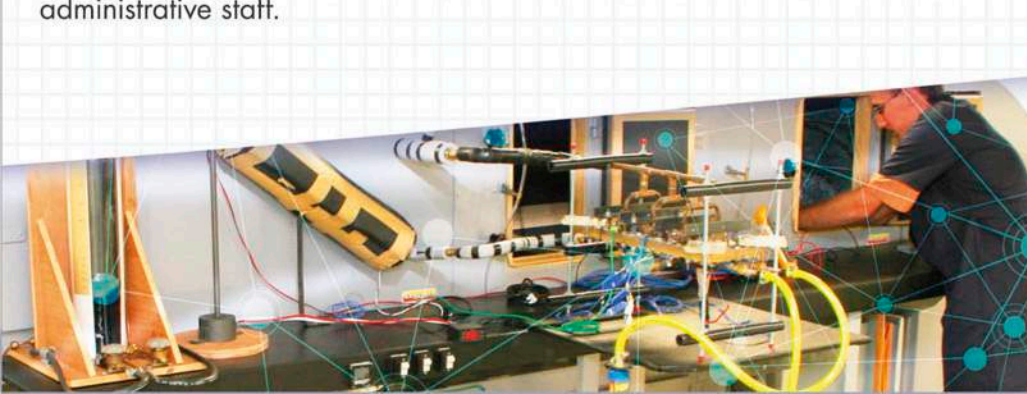
- Design of calorimeters for air conditioners
- Design of climatized rooms for refrigerators
- Development of control strategies for refrigerating systems
- Evaluation of the air leakage in the gasket region
- Heat flux measurement in refrigerator walls
- Measurement of the air velocity distribution in refrigerators
- Performance evaluation of expansion devices
- Performance evaluation of fans and air loops
- Performance evaluation of heat exchangers
- Thermal acoustic performance characterization of refrigerators
- Thermographic analyses of refrigerating systems

### LABORATORIES

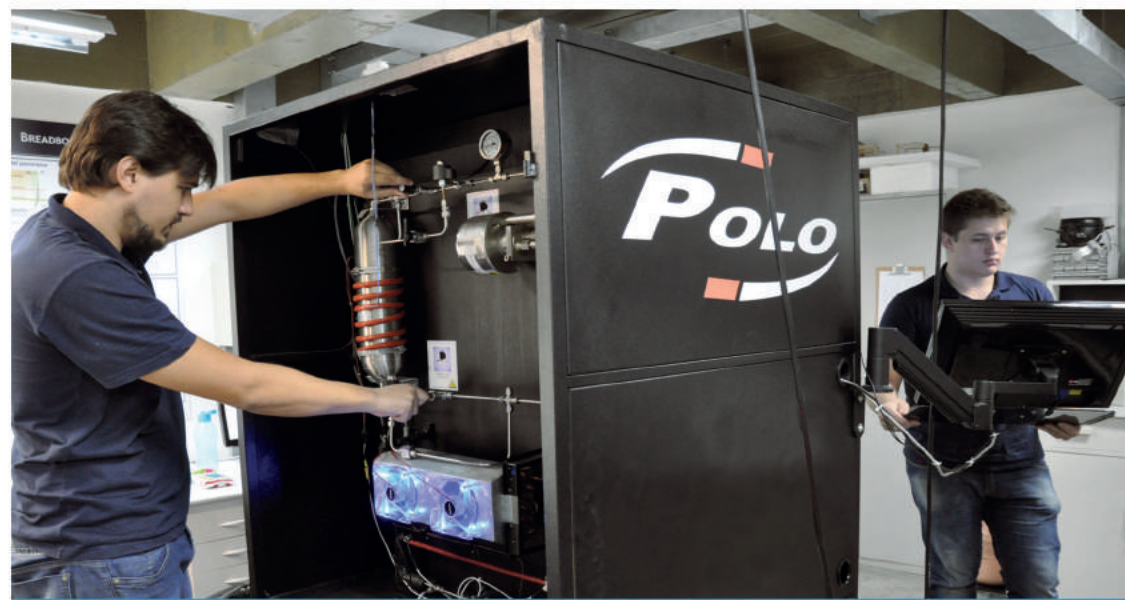
POLO has a complete laboratory infrastructure for the realization of R&D&I activities, being the only research center in Brazil to have climatized rooms built according to the ISO, ASHRAE, NBR and PrEN specifications. In addition to calorimeters and wind tunnels, POLO has several other modern pieces of equipment, such as thermographic cameras, high-speed cameras, laser-Doppler anemometers, particle image velocimeters, photoacoustic infrared spectroscopy gas monitors and other systems for characterizing thermophysical properties of fluids and solids.

The laboratories, which are distributed in a 3.000 m<sup>2</sup> floor space building, represent an investment of approximately 20 million US dollars:

- |                            |                                   |
|----------------------------|-----------------------------------|
| 1. Climatized Rooms        | 11. Household Compressors         |
| 2. CO <sub>2</sub> Systems | 12. Magnetic Refrigeration        |
| 3. Commercial Compressors  | 13. Microchannel Flow             |
| 4. Compact Systems         | 14. Motor Cooling                 |
| 5. Compressor Valves       | 15. Multiphase Flows              |
| 6. Emerging Technologies   | 16. Refrigeration Controls        |
| 7. Expansion Devices       | 17. Thermal Management            |
| 8. Fans                    | 18. Thermodynamics of Compressors |
| 9. Frost Formation         | 19. Thermodynamics of Mixtures    |
| 10. Heat Exchangers        | 20. Thermophysical Properties     |



Innovative Technologies since 1982



## WORLD REFERENCE IN RESEARCH | DEVELOPMENT | INNOVATION

### ABOUT US

Polo is a reference laboratory in the areas of refrigeration and thermophysics. Its modus operandi is strongly grounded in real industry challenges that induce scientific and technological advances of large magnitude. Such interaction strenghtens the technical staff and increases the competitiveness from both national and international contractors.

### INFRASTRUCTURE

20 laboratories - 7 climatized rooms - Sophisticated equipment - 3 wind tunnels - 6 calorimeters - 1 workshop prototypes - Auditorium and classrooms - 20 million US dollars in investments - Last generation computing resources - 5 qualified professors - 130 researchers and collaborators - Latin America's largest laboratory in cooling and thermophysics.



Research Laboratories for Emerging Technologies in Cooling and Thermophysics



### RESEARCH

In our laboratories are developed basic and applied research depending on the project



### DEVELOPMENT

We have the best team and the best equipments for the development of our projects



### INNOVATION

We conduct research on new cooling and thermophysics technology since 1982.

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WE HAVE  
**THE BEST**  
SOLUTION



## WHY CHOOSE US?

We are Latin America's largest laboratory and one of the world's largest in the areas of refrigeration and thermophysics. We are the only research center in Brazil to have climatized rooms for cooling systems testing, built in accordance to ISO, ASHRAE, NBR and PrEN specifications.

### 1 Customer service

We offer professional consulting services, working closely with customers to meet their needs, researching potential solutions and successfully achieve the goals. We go beyond the requirements of customers in order to find alternative options for improving the product concept.

### 2 Innovation and Creativity

We support innovative industrial actions by conducting research into new cooling technologies. We combine technological excellence with the solution of engineering problems to create creative solutions and overcome technological barriers.

### 3 Quality

We maintain a staff recognized for its technical competence and we follow quality standards through which we seek continuous improvement of all aspects of our operations.

### 4 Confidentiality

We ensure confidentiality in all our consulting services, unless the client declares his wish to disclose the information.

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# POLO

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LEARN ABOUT OUR  
QUALITY SERVICES  
IN REFRIGERATION



## OUR SERVICES:

- Design and performance evaluation of refrigeration cassettes
- Design, construction and calibration of calorimeters for air conditioners
- Design, construction and calibration of calorimeters for hermetic compressors
- Design, construction and calibration of climatized rooms for household refrigerators
- Development of control strategies for components and refrigerating systems
- Identification of the heat transfer paths through the walls of refrigerated compartments
- Measurement of the air infiltration rates through the gaskets of refrigerated compartments
- Measurement of the air velocity distribution inside refrigerated compartments
- Measurement of the hydrodynamic performance of fans and air loops
- Measurement of the thermal hydraulic performance of heat exchangers
- Performance characterization of expansion devices
- Performance characterization of hermetic compressors
- Thermal acoustic performance characterization of household refrigerators
- Thermographic analyses of components and refrigerating systems



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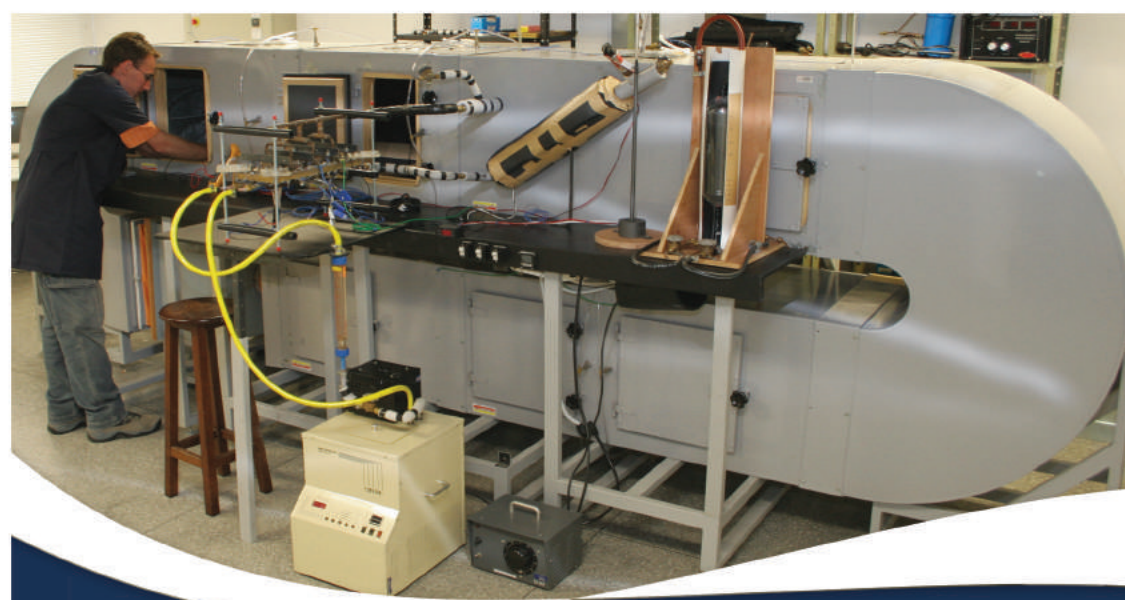


Advanced laboratories | Specialized personnel | Global reach  
Innovative technologies | Basic and applied research  
Teaching and training | World reference in cooling technologies

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### POLO IN NUMBERS:

- 20 laboratories
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- 130 researches and collaborators
- 3 wind tunnels
- 3000m<sup>2</sup> floor space building
- Auditorium and classrooms
- More than 750 articles in conferences
- Modern computing facilities



## POLO: WORLD REFERENCE IN COOLING TECHNOLOGIES

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