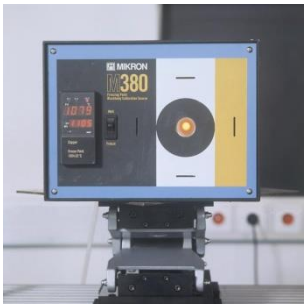
Instituto Português da Qualidade
PORTUGUESE INSTITUTE FOR QUALITY

LNM

FIELD OF ACTIVITY

Cell for realization of the Triple point of the water

Realization of the triple point of argon



Furnace with Freezing Point of copper

The Temperature Laboratory is responsible for the development of the national standards of temperature and relative humidity and has the following duties:

- The realization of the International Temperature Scale of 1990 (ITS90) on the fixed points between the triple point of argon (-189,3442 °C) and the freezing point of silver (961,78 °C);
- The realization too the ITS90 based on Planck radiation, with the freezing point of copper (1084,62 °C);
- To assure the traceability on Temperature measurements on the measuring interval from –190 °C to 2500 °C;
- Calibrate reference standards of secondary laboratories, accredited laboratories and industry;
- Participate and coordinate interlaboratorial comparisons;
- Technical support to the legal metrology.

SI UNIT

International System Base Unit of Temperature (*T*)

kelvin (K) defined as:

The fraction 1 / 273,16 of thermodynamic temperature of the triple point of water

Derived unit of the International System of the temperature quantity (*t*):

degree Celsius (°C) defined by the equation:

$t = T - T_0$, where T_0 = 273,15 K is the ice point. The unit of Celsius temperature unity is by definition equal in magnitude to the kelvin.

The unit of Relative Humidity quantity (U_W) with respect to water:

Symbol (%) defined as follows:

The ratio of the actual vapour pressure (e) to the saturation vapour pressure (e_W) over a plane liquid water surface at the same temperature t (°C), expressed as percentage. This is commonly understood when the term "X percent relative humidity" is used.

$$U_W = \frac{e}{e_W} \times 100$$

TRACEABILITY

The traceability to SI units is achieved through the realization of the Fixed Point of EIT90 and appropriate resistance standards.

AVAILABLE SERVICES

Calibration

EQUIPMENT	RANGE	UNCERTAINTY
Contact Thermometry Thermometers Temperature Sensors Standard Platinum Resistance Thermometers Comparison at stirred liquid bath	-75 °C to 0 °C	0,01 °C
	0°C to 20 °C	0,005 °C
	20 °C to 50 °C	0,007 °C
	50 °C to 100 °C	0,010 °C
	100 °C to 200 °C	0,020 °C
	300 ° C to 450 °C	0,035 °C
Contact Thermometry Thermometers Temperature Sensors Noble -metal thermocouples Type S and R Comparison at heat pipe	0 °C to 300 °C	0,4 °C
	300 °C to 600 °C	0,5 °C
	600 ° C to 900 °C	0,7 °C
	900 °C to 1050 °C	1,0 °C
Contact Thermometry Liquid-in-glass thermometers Comparison at stirred liquid bath	-40 °C to 0 °C	0,01 °C
	0 °C to 50 °C	0,005 °C
	50 °C to 100 °C	0,01 °C
	100 ºC to 200 °C	0,01 °C
	200 °C to 300 °C	0,1 °C
	300 °C to 450 °C	0,2 °C
Non-contact Temperature Radiation thermometers Optical pyrometers	Ponto de Gelo	0,5 °C
	30 °C to 500 °C	0,5 °C
	500 °C to 1600 °C	0,1 %
	1600 °C to 2500 °C	0,2 %
Measuring instruments of relative humidity	10 % to 90 %	2 %
Platinum Resistance Thermometers	Liquid nitrogen boiling point ≈ 77 K (-196 °C) (by comparison)	$5 \cdot 10^{-3}$ °C
	83,8058 K (argon triple point) to 273,16 K (water triple point)	$2 \cdot 10^{-3}$ °C
	-38,8344 °C (mercury triple point) to 29,7646 °C (gallium melting point)	$1 \cdot 10^{-3}$ °C
	0 °C to 29,7646 °C (gallium melting point)	$1 \cdot 10^{-3}$ °C
	0 °C a 156,5985 °C (indium freeze point)	$3 \cdot 10^{-3}$ °C
	0 °C a 231,929 °C (tin freeze point)	$3 \cdot 10^{-3}$ °C
	0 °C a 419,527 °C (zinc freeze point)	$5 \cdot 10^{-3}$ °C
	0 °C a 660,323 °C (aluminium freeze point)	$1 \cdot 10^{-2}$ °C
	0 °C a 961,78 °C (silver freeze point)	$5 \cdot 10^{-2}$ °C
Noble metal thermocouples	231,929 °C (tin freeze point)	0,4 °C
	419,527 °C (zinc freeze point)	0,4 °C
	660,323 °C (aluminium freeze point)	0,4 °C
	961,78 °C (silver freeze point)	0,4 °C
Optical pyrometers	Copper freeze point (1084,62 °C)	0,5 °C

CMC - BIPM

Metrological Control

EQUIPMENT	TESTS	LEGISLATION
Measuring Instruments and Temperature recorders used for the control of ultra-frozen food in transport and store houses.	Pattern Approval	Law n.º 1129/2009, 1st october

CONTACT

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