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### 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 °C 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	Ice point	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 $\approx 77$ 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 melt point)	$1 \cdot 10^{-3}$ °C	
	0 °C to 29,7646 °C (gallium melt point)	$1 \cdot 10^{-3}$ °C	
	0 °C to 156,5985 °C (indium freeze point)	$3 \cdot 10^{-3}$ °C	
	0 °C to 231,929 °C (tin freeze point)	$3 \cdot 10^{-3}$ °C	
	0 °C to 419,527 °C (zinc freeze point)	$5 \cdot 10^{-3}$ °C	
	0 °C to 660,323 °C (aluminium freeze point)	$1 \cdot 10^{-2}$ °C	
	0 °C to 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	

## 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, 1 <sup>st</sup> october