

Thermometry, Spain, CEM (Centro Español de Metrología), INTA (Instituto Nacional de Técnica Aeroespacial)

Calibration or Measurement Services			Measurand Level or Range			Measurement Conditions/Independent variables		Expanded Uncertainty					Comments	NMI Service Identifier	NMI Service Provider
Quantity	Instrument or artifact	Instrument Type or Method	Minimum value	Maximum value	units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?			
Temperature	Argon point for SPRT	Comparison with a cell	-189.3442	-189.3442	°C	Ambient temperature	(23 ± 1) °C	1.3	mK	2	95%	No	Approved on 18 May 2004	1	CEM
Temperature	Indium point	Comparison with a cell	156.5985	156.5985	°C	Ambient temperature	(23 ± 1) °C	1.1	mK	2	95%	No	Approved on 18 May 2004	5	CEM
Temperature	Tin point	Comparison with a cell	231.928	231.928	°C	Ambient temperature	(23 ± 1) °C	0.9	mK	2	95%	No	Approved on 18 May 2004	6	CEM
Temperature	Aluminium point	Comparison with a cell	660.323	660.323	°C	Ambient temperature	(23 ± 1) °C	4.0	mK	2	95%	No	Approved on 18 May 2004	8	CEM
Temperature	Mercury point	Comparison with a cell	-38.8344	-38.8344	°C	Ambient temperature	(23 ± 1) °C	0.3	mK	2	95%	No	Approved on 17 January 2013	2	CEM
Temperature	Gallium point	Comparison with a cell	29.7646	29.7646	°C	Ambient temperature	(23 ± 1) °C	0.3	mK	2	95%	No	Approved on 17 January 2013	4	CEM
Temperature	Zinc point	Comparison with a cell	419.527	419.527	°C	Ambient temperature	(23 ± 1) °C	1.2	mK	2	95%	No	Approved on 17 January 2013	7	CEM
Temperature	Silver point	Comparison with a cell	961.78	961.78	°C	Ambient temperature	(23 ± 1) °C	11	mK	2	95%	No	Approved on 17 January 2013	9	CEM
Temperature	Long stem SPRT	Calibration at the triple point of Mercury	-38.8344	-38.8344	°C	Ambient temperature	(23 ± 1) °C	0.5	mK	2	95%	No	Approved on 18 May 2004	11	CEM
Temperature	Long stem SPRT	Calibration at the freezing point of Zinc	419.527	419.527	°C	Ambient temperature	(23 ± 1) °C	1.5	mK	2	95%	No	Approved on 17 January 2013	16	CEM
Temperature	Long stem SPRT and HT SPRT	Calibration at the freezing point of Aluminium	660.323	660.323	°C	Ambient temperature	(23 ± 1) °C	9.0	mK	2	95%	No	Approved on 18 May 2004	17	CEM
Temperature	Long stem HT SPRT	Calibration at the freezing point of Silver	961.78	961.78	°C	Ambient temperature	(23 ± 1) °C	18	mK	2	95%	No	Approved on 18 May 2004	18	CEM
Temperature	Radiation thermometers	Calibration at the freezing point of Copper	961.78	2200	°C	Wavelength	650 nm and 950 nm	1 to 4	K	2	95%	No	Approved on 18 May 2004	26	CEM
						Ambient temperature	(23 ± 1) °C								
						Humidity	< 60 %								
Humidity	Dew-point hygrometer	Measurement against humidity generator	-75	< -70	°C	Ambient temperature	(23 ± 1) °C	0.15	°C	2	95%	No	Approved on 03 November 2009	50	INTA
Humidity	Dew-point hygrometer	Measurement against humidity generator	-70	< -60	°C	Ambient temperature	(23 ± 1) °C	0.10	°C	2	95%	No	Approved on 03 November 2009	51	INTA

Thermometry, Spain, CEM (Centro Español de Metrología), INTA (Instituto Nacional de Técnica Aeroespacial)

Calibration or Measurement Services			Measurand Level or Range			Measurement Conditions/Independent variables		Expanded Uncertainty					Comments	NMI Service Identifier	NMI Service Provider
Quantity	Instrument or artifact	Instrument Type or Method	Minimum value	Maximum value	units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?			
Humidity	Dew-point hygrometer	Measurement against humidity generator	-60	< -10	°C	Ambient temperature	(23 ± 1) °C	0.05	°C	2	95%	No	Approved on 03 November 2009	52	INTA
Humidity	Dew-point hygrometer	Measurement against humidity generator	-10	60	°C	Test chamber temperature	0 °C to 100 °C	0.05	°C	2	95%	No	Approved on 03 November 2009	53	INTA
Humidity	Dew-point hygrometer	Measurement against humidity generator	> 60	70	°C	Test chamber temperature	0 °C to 100 °C	0.10	°C	2	95%	No	Approved on 03 November 2009	54	INTA
Humidity	Dew-point hygrometer	Measurement against humidity generator	> 70	75	°C	Test chamber temperature	0 °C to 100 °C	0.15	°C	2	95%	No	Approved on 03 November 2009	55	INTA
Humidity	Dew-point hygrometer	Measurement against humidity generator	0	95	°C	Continuous gas flow	maximum 5 l/min	0.05	°C	2	95%	No	Approved on 03 November 2009	61	INTA
						Atmospheric pressure	(1000 ± 50) hPa								
						Ambient temperature	(23 ± 1) °C								
Temperature	Platinum Resistance Thermometers	Comparison	-80	0	°C	Liquid bath	alcohol bath	0.02	°C	2	95%	No	Approved on 03 November 2009	28	CEM
Temperature	Platinum Resistance Thermometers	Comparison	0	90	°C	Liquid bath	water bath	0.01	°C	2	95%	No	Approved on 03 November 2009	29	CEM
Temperature	Platinum Resistance Thermometers	Comparison	90	250	°C	Liquid bath	oil bath	0.02	°C	2	95%	No	Approved on 03 November 2009	30	CEM
Temperature	Noble-metal thermocouples type S or R	Tin point	231.928	231.928	°C	Ambient temperature	(23 ± 1) °C	0.21	°C	2	95%	No	Approved on 03 November 2009	31	CEM
Temperature	Noble-metal thermocouples type S or R	Zinc point	419.519	419.519	°C	Ambient temperature	(23 ± 1) °C	0.20	°C	2	95%	No	Approved on 03 November 2009	32	CEM
Temperature	Noble-metal thermocouples type S or R	Aluminium point	660.323	660.323	°C	Ambient temperature	(23 ± 1) °C	0.22	°C	2	95%	No	Approved on 03 November 2009	33	CEM

Thermometry, Spain, CEM (Centro Español de Metrología), INTA (Instituto Nacional de Técnica Aeroespacial)

Calibration or Measurement Services			Measurand Level or Range			Measurement Conditions/Independent variables		Expanded Uncertainty					Comments	NMI Service Identifier	NMI Service Provider
Quantity	Instrument or artifact	Instrument Type or Method	Minimum value	Maximum value	units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?			
Temperature	Noble-metal thermocouples type S or R	Silver point	961.78	961.78	°C	Ambient temperature	(23 ± 1) °C	0.25	°C	2	95%	No	Approved on 03 November 2009	34	CEM
Temperature	Noble-metal thermocouples type S or R	Copper point	1084.62	1084.62	°C	Ambient temperature	(23 ± 1) °C	0.34	°C	2	95%	No	Approved on 03 November 2009	35	CEM
Temperature	Noble-metal thermocouples type Pt/Pd	Tin point	231.928	231.928	°C	Ambient temperature	(23 ± 1) °C	0.28	°C	2	95%	No	Approved on 03 November 2009	36	CEM
Temperature	Noble-metal thermocouples type Pt/Pd	Zinc point	419.519	419.519	°C	Ambient temperature	(23 ± 1) °C	0.21	°C	2	95%	No	Approved on 03 November 2009	37	CEM
Temperature	Noble-metal thermocouples type Pt/Pd	Aluminium point	660.323	660.323	°C	Ambient temperature	(23 ± 1) °C	0.14	°C	2	95%	No	Approved on 03 November 2009	38	CEM
Temperature	Noble-metal thermocouples type Pt/Pd	Silver point	961.78	961.78	°C	Ambient temperature	(23 ± 1) °C	0.10	°C	2	95%	No	Approved on 03 November 2009	39	CEM
Temperature	Noble-metal thermocouples type Pt/Pd	Copper point	1084.62	1084.62	°C	Ambient temperature	(23 ± 1) °C	0.19	°C	2	95%	No	Approved on 03 November 2009	40	CEM
Temperature	Noble-metal thermocouples type Au/Pt	Tin point	231.928	231.928	°C	Ambient temperature	(23 ± 1) °C	0.16	°C	2	95%	No	Approved on 03 November 2009	36b	CEM
Temperature	Noble-metal thermocouples type Au/Pt	Zinc point	419.519	419.519	°C	Ambient temperature	(23 ± 1) °C	0.12	°C	2	95%	No	Approved on 03 November 2009	37b	CEM
Temperature	Noble-metal thermocouples type Au/Pt	Aluminium point	660.323	660.323	°C	Ambient temperature	(23 ± 1) °C	0.10	°C	2	95%	No	Approved on 03 November 2009	38b	CEM
Temperature	Noble-metal thermocouples type Au/Pt	Silver point	961.78	961.78	°C	Ambient temperature	(23 ± 1) °C	0.10	°C	2	95%	No	Approved on 03 November 2009	39b	CEM
Temperature	Noble-metal thermocouples type S or R	Calibration at fixed points	0	961.78	°C	Ambient temperature	(23 ± 1) °C	0.40	°C	2	95%	No	Approved on 03 November 2009	41	CEM
Temperature	Noble-metal thermocouples type S or R	Calibration at fixed points	961.78	1084.62	°C	Ambient temperature	(23 ± 1) °C	0.41	°C	2	95%	No	Approved on 03 November 2009	42	CEM
Temperature	Noble-metal thermocouples type Pt/Pd or Au/Pt	Calibration at fixed points	0	961.78	°C	Ambient temperature	(23 ± 1) °C	0.21	°C	2	95%	No	Approved on 03 November 2009	43	CEM

Thermometry, Spain, CEM (Centro Español de Metrología), INTA (Instituto Nacional de Técnica Aeroespacial)

Calibration or Measurement Services			Measurand Level or Range			Measurement Conditions/Independent variables		Expanded Uncertainty					Comments	NMI Service Identifier	NMI Service Provider
Quantity	Instrument or artifact	Instrument Type or Method	Minimum value	Maximum value	units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?			
Temperature	Noble-metal thermocouples type Pt/Pd	Calibration at fixed points	961.78	1084.62	°C	Ambient temperature	(23 ± 1) °C	0.24	°C	2	95%	No	Approved on 03 November 2009	44	CEM
Temperature	Noble-metal thermocouples type Au/Pt	Calibration at fixed points	0	961.78	°C	Ambient temperature	(23 ± 1) °C	0.16	°C	2	95%	No	Approved on 03 November 2009	44b	CEM
Temperature	Liquid-in-glass thermometers	Comparison	-80	-60	°C	Liquid bath	alcohol bath	0.06	°C	2	95%	No	Approved on 03 November 2009	45	CEM
Temperature	Liquid-in-glass thermometers	Comparison	-60	0	°C	Liquid bath	alcohol bath	0.02	°C	2	95%	No	Approved on 03 November 2009	46	CEM
Temperature	Liquid-in-glass thermometers	Comparison	0	90	°C	Liquid bath	water bath	0.01	°C	2	95%	No	Approved on 03 November 2009	47	CEM
Temperature	Liquid-in-glass thermometers	Comparison	90	200	°C	Liquid bath	oil bath	0.02	°C	2	95%	No	Approved on 03 November 2009	48	CEM
Temperature	Liquid-in-glass thermometers	Comparison	200	250	°C	Liquid bath	oil bath	0.04	°C	2	95%	No	Approved on 03 November 2009	49	CEM
Temperature	Temperature Sensors with Display Unit	Comparison	-80	0	°C	Liquid bath	alcohol bath	0.02	°C	2	95%	No	Approved on 03 November 2009	71	CEM
Temperature	Temperature Sensors with Display Unit	Comparison	0	90	°C	Liquid bath	water bath	0.01	°C	2	95%	No	Approved on 03 November 2009	72	CEM
Temperature	Temperature Sensors with Display Unit	Comparison	90	250	°C	Liquid bath	oil bath	0.02	°C	2	95%	No	Approved on 03 November 2009	73	CEM
Temperature	Water triple point cell	Direct comparison	0.01	0.01	°C	Ambient temperature	(23 ± 1) °C	0.12	mK	2	95%	No	Approved on 20 January 2010	3	CEM
Temperature	Long stem SPRT	Calibration at water triple point	0.01	0.01	°C	Ambient temperature	(23 ± 1) °C	0.5	mK	2	95%	No	Approved on 20 January 2010	12	CEM
Temperature	Long stem SPRT	Calibration at the triple point of Argon	-189.3442	-189.3442	°C	Ambient temperature	(23 ± 1) °C	1.5	mK	2	95%	No	Approved on 20 May 2010	10	CEM
Temperature	Long stem SPRT	Calibration at the melting point of Gallium	29.7646	29.7646	°C	Ambient temperature	(23 ± 1) °C	0.5	mK	2	95%	No	Approved on 20 May 2010	13	CEM
Temperature	Long stem SPRT	Calibration at the freezing point of Indium	156.5985	156.5985	°C	Ambient temperature	(23 ± 1) °C	1.3	mK	2	95%	No	Approved on 20 May 2010	14	CEM
Temperature	Long stem SPRT	Calibration at the freezing point of Tin	231.928	231.928	°C	Ambient temperature	(23 ± 1) °C	1.3	mK	2	95%	No	Approved on 20 May 2010	15	CEM

Thermometry, Spain, CEM (Centro Español de Metrología), INTA (Instituto Nacional de Técnica Aeroespacial)

Calibration or Measurement Services			Measurand Level or Range			Measurement Conditions/Independent variables		Expanded Uncertainty					Comments	NMI Service Identifier	NMI Service Provider
Quantity	Instrument or artifact	Instrument Type or Method	Minimum value	Maximum value	units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?			
Temperature	Radiation thermometers	Comparison with blackbody	50	200	°C	Emissivity	1	0.4	°C	2	95%	No	Oil bath blackbody Approved on 06 January 2012	66	CEM
Temperature	Radiation thermometers	Comparison with blackbody	600	950	°C	Emissivity	1	0.5	°C	2	95%	No	Sodium blackbody Approved on 06 January 2012	68	CEM
Temperature	Long-stem SPRTs	Calibration at fixed points	-189.3442	0.01	°C	Ambient temperature	(23 ± 1) °C	2 (Ar to Hg), 1.4 (Hg to Water)	mK	2	95%	No	Approved on 17 January 2013	19	CEM
Temperature	Long-stem SPRTs	Calibration at fixed points	-38.8344	29.7646	°C	Ambient temperature	(23 ± 1) °C	1.4	mK	2	95%	No	Approved on 17 January 2013	20	CEM
Temperature	Long-stem SPRTs	Calibration at fixed points	0.01	29.7646	°C	Ambient temperature	(23 ± 1) °C	1.4	mK	2	95%	No	Approved on 17 January 2013	21	CEM
Temperature	Long-stem SPRTs	Calibration at fixed points	0.01	156.5985	°C	Ambient temperature	(23 ± 1) °C	1.9	mK	2	95%	No	Approved on 17 January 2013	22	CEM
Temperature	Long-stem SPRTs	Calibration at fixed points	0.01	231.928	°C	Ambient temperature	(23 ± 1) °C	2.0 (Water to In), 1.9 (In to Sn)	mK	2	95%	No	Approved on 17 January 2013	23	CEM
Temperature	Long-stem SPRTs	Calibration at fixed points	0.01	419.527	°C	Ambient temperature	(23 ± 1) °C	1.9 (Water to Sn), 2.0 (Sn to Zn)	mK	2	95%	No	Approved on 17 January 2013	24	CEM
Temperature	Long-stem SPRTs and HTSPRTs	Calibration at fixed points	0.01	660.323	°C	Ambient temperature	(23 ± 1) °C	4.7 (Water to Sn), 5.5 (Sn to Zn), 9.1 (Zn to Al)	mK	2	95%	No	Approved on 17 January 2013	25	CEM
Temperature	Long-stem HTSPRTs	Calibration at fixed points	0.01	961.78	°C	Ambient temperature	(23 ± 1) °C	6.1 (Water to Sn), 7.1 (Sn to Zn), 9.1 (Zn to Al), 18.0 (Al to Ag)	mK	2	95%	No	Approved on 17 January 2013	26	CEM
Temperature	Radiation thermometers	Comparison with blackbody	250	600	°C	Emissivity	1	0.5	°C	2	95%	No	Approved on 06 September 2013	67	CEM
						Caesium blackbody									
						Wavelength	0.8 µm to 1.6 µm								
Temperature	Visual optical pyrometer	Comparison with standard lamp	800	1400	°C	Wavelength	0.65 µm	5.1	°C	2	95%	No	Approved on 06 September 2013	69	CEM



Thermometry, Spain, CEM (Centro Español de Metrología), INTA (Instituto Nacional de Técnica Aeroespacial)

Calibration or Measurement Services			Measurand Level or Range			Measurement Conditions/Independent variables		Expanded Uncertainty					Comments	NMI Service Identifier	NMI Service Provider
Quantity	Instrument or artifact	Instrument Type or Method	Minimum value	Maximum value	units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?			
						Standard lamp									
Temperature	Visual optical pyrometer	Comparison with standard lamp	1400	2200	°C	Wavelength	0.65 μm	5.1 to 13.2	°C	2	95%	No	Approved on 06 September 2013	70	CEM
						Standard lamp									