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Annexe au certificat d'accréditation  
Annex to the accreditation certificate  
Beilage zur Akkreditierungszertifikat

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Voorzitster van het Accreditatiebureau  
La Présidente du Bureau d'Accréditation  
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De accreditatie werd uitgereikt aan / L'accréditation est délivrée à /  
The accreditation is granted to / Die akkreditierung wurde erteilt für:

**TRESCAL nv**  
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Activiteitencentra / Sites d'activités / Sites of activities / Standorte mit aktivitäten:

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Locatie 2 - WELLIN	Rue Jean Meunier, 2 6922 Wellin
Locatie 3 - LOUVAIN-LA-NEUVE	Rue du Bosquet, 7 1348 Ottignies-Louvain-la-Neuve

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**Temperature Wommelgem**  
**Calibration and Measurement Capabilities**

Resistance thermometers					
Measured quantity, instrument or gauge	Range	expanded uncertainty (*)	Remarks	Calibration procedure	
Resistance thermometers			Fixed points		
		-38,8344 °C	0,004 °C	triple point of mercury	P1-02-T.020
		0,01 °C	0,004 °C	triple point of water	
		29,7646 °C	0,004 °C	melting point of gallium	
		156,5985 °C	0,005 °C	freeze point of indium	
		231,928 °C	0,005 °C	freeze point of tin	
		419,527 °C	0,006 °C	freeze point of zinc	
		660,323 °C	0,015 °C	freeze point of aluminum	
		-196 °C	0,025 °C	By comparison with reference standards in liquid nitrogen at atmospheric pressure	P1-02-T.004
		-100 °C to -40 °C	0,05 °C	By comparison with reference standards	
		-40 °C to 0 °C	0,025 °C		
		0 °C to 280 °C	0,015 °C		
		280 °C to 350 °C	0,04 °C		
		350 °C to 660 °C	0,04 °C		

Standard Pt resistance thermometers

Measured quantity, instrument or gauge	Range	expanded uncertainty (*)	Remarks	Calibration procedure	
Platinum resistance thermometers which meet the specifications of the ITS-90 or close to these specifications			Fixed points		
		-38,8344 °C	0,004 °C	triple point of mercury	P1-02-T.020
		0,01 °C	0,004 °C	triple point of water	
		29,7646 °C	0,004 °C	melting point of gallium	
		156,5985 °C	0,005 °C	freeze point of indium	
		231,928 °C	0,005 °C	freeze point of tin	
		419,527 °C	0,006 °C	freeze point of zinc	
		660,323 °C	0,015 °C	freeze point of aluminum	

Thermocouples

Measured quantity, instrument or gauge	Range	expanded uncertainty (*)	Remarks	Calibration procedure
Thermocouples B, R & S	0 °C to 280 °C	0,40 °C	By comparison with reference standards	P1-02-T.014
	280 °C to 660 °C	0,70 °C		
	660 °C to 1100 °C	1,7 °C		
	1100 °C to 1300 °C	2,3 °C		
Thermocouples	-196 °C	0,20 °C	By comparison with reference standards in liquid nitrogen at atmospheric pressure	P1-02-T.014
	-100 °C to 280 °C	0,20 °C	By comparison with reference standards	
	280 °C to 660 °C	0,50 °C		
	660 °C to 1100 °C	1,7 °C		
	1100 °C to 1300 °C	2,3 °C		

Self indicating thermometers

Measured quantity, instrument or gauge	Range	expanded uncertainty (*)	Remarks	Calibration procedure
Temperature indicators with resistance probe			Fixed points	P1-02-T.020
	-38,8344 °C	0,004 °C	triple point of mercury	
	0,01 °C	0,004 °C	triple point of water	
	29,7646 °C	0,004 °C	melting point of gallium	
	156,5985 °C	0,005 °C	freeze point of indium	
	231,928 °C	0,005 °C	freeze point of tin	
	419,527 °C	0,006 °C	freeze point of zinc	
	660,323 °C	0,015 °C	freeze point of aluminum	P1-02-T.001
	-196 °C	0,025 °C	By comparison with reference standards in liquid nitrogen at atmospheric pressure	
	-100 °C to -40 °C	0,025 °C	By comparison with reference standards	
	-40 °C to 0 °C	0,020 °C		
	0 °C to 280 °C	0,015 °C		
	280 °C to 350 °C	0,04 °C		
350 °C to 660 °C	0,040 °C			
Temperature indicators with thermocouple probes B, R & S	0 °C to 280 °C	0,40 °C	By comparison with reference standards	P1-02-T.001
	280 °C to 660 °C	0,70 °C		
	660 °C to 1100 °C	1,7 °C		
	1100 °C to 1300 °C	2,3 °C		
Temperature indicators with thermocouple probes	-196 °C	0,20 °C	By comparison with reference standards in liquid nitrogen at atmospheric pressure	P1-02-T.001
	-100 °C to 280 °C	0,20 °C	By comparison with reference standards	
	280 °C to 660 °C	0,50 °C		
	660 °C to 1100 °C	1,7 °C		
	1100 °C to 1300 °C	2,3 °C		

Analogue thermometers	-100 °C to 0 °C	0,60 °C	By comparison with reference standards	P1-02-T.007
	0 °C to 280 °C	0,20 °C		
Liquid in glass thermometers with a resolution of	-100 °C to 0 °C		By comparison with reference standards (totally or partially submerged) Partially submerged thermometers have a bigger CMC than mentioned	P1-02-T.005
5 °C		2,0 °C		
2 °C		0,80 °C		
1 °C		0,40 °C		
0,5 °C		0,20 °C		
0,2 °C		0,090 °C		
0,1 °C		0,060 °C		
0,05 °C		0,060 °C		
Liquid in glass thermometers with a resolution of	0 °C to 275 °C		By comparison with reference standards (totally or partially submerged) Partially submerged thermometers have a bigger CMC than mentioned	P1-02-T.005
5 °C		2,0 °C		
2 °C		0,80 °C		
1 °C		0,40 °C		
0,5 °C		0,20 °C		
0,2 °C		0,070 °C		
0,1 °C		0,050 °C		
0,05 °C		0,025 °C		
Surface temperature probes	ambient to 300 °C	$0,50 \% \times t + 0,50 \text{ °C}$	By comparison with reference standards	P1-02-T.012

#### Radiation thermometry

Measured quantity, instrument or gauge	Range	expanded uncertainty (*)	Remarks	Calibration procedure
Infrared thermometry	-17 °C to 100 °C	0,50 °C	By comparison with reference standards	P1-02-T.010
	100 °C to 200 °C	0,60 °C		
	200 °C to 400 °C	1,7 °C		
	400 °C to 600 °C	0,60%		
	600 °C to 800 °C	0,70%		

#### Temperature controlled chambers

Measured quantity, instrument or gauge	Range	expanded uncertainty (*)	Remarks	Calibration procedure
Characterisation of ovens and climatic chambers	-100 °C to -38,5 °C	1,6 °C	Using thermocouple type K	P2-02-S.040
	-38,5 °C to 230 °C	0,080 °C	Using Pt100 probes	
	230 °C to 600 °C	1,5 °C	Using thermocouple type R & S	

## Other temperature enclosures

Measured quantity, instrument or gauge	Range	expanded uncertainty (*)	Remarks	Calibration procedure
Block calibrators	-100 °C to 650 °C	0,040 °C + 0,000 05 ×  t	Full evaluation following DOC EM/CG/13 "Guidelines on the Calibration of Temperature Block Calibrators" Or calibration with known evaluation information	P1-02-T.003 P1-02-T.002

## Cold junction compensation

Measured quantity, instrument or gauge	Range	expanded uncertainty (*)	Remarks	Calibration procedure
Cold junction compensation B, R & S	0 °C	0,25 °C		P2-02-T.015
Cold junction compensation	0 °C	0,060 °C		

## Onsite calibration

Measured quantity, instrument or gauge	Range	expanded uncertainty (*)	Remarks	Calibration procedure
Temperature probe with or without readout	-100 °C to -20 °C	0,11 °C	By comparison in Block calibrators with external reference standards	P2-02-S.002
	-20 °C to 50 °C	0,09 °C		
	50 °C to 250 °C	0,16 °C		
	250 °C to 650 °C	0,22 °C		

(\*) the smallest uncertainty of measurement the laboratory can provide to its customers, expressed as the expanded uncertainty having a coverage probability of approximately 95%.

## Temperature Louvain-La-Neuve

### Calibration and Measurement Capabilities

<b>Inhouse calibrations</b>				
Measured quantity, instrument or gauge	Range	Expanded uncertainty (*)	Remarks	Calibration procedure
Platinum resistance thermometers which meet the specifications of the ITS-90 or close to these specifications	-196 °C	0,01 °C	By comparison with reference standards in liquid nitrogen at atmospheric pressure	PL-02-A.032
			Fixed points	PL-02-A.032
	-38,834 °C	0,004 °C	Triple point of mercury	
	0,010 °C	0,001 °C	Triple point of water	
	29,765 °C	0,004 °C	Melting point of gallium	
	156,594 °C	0,004 °C	Triple point of indium	
	231,928 °C	0,004 °C	Melting point of tin	
	419,527 °C	0,006 °C	Freeze point of zinc	
Temperature probes with indicators (eg: resistance probes and thermocouples)	-196 °C	0,01 °C	By comparison with reference standards in liquid nitrogen at atmospheric pressure	PL-02-A.032
	-100 °C to <-80 °C	0,022 °C	By comparison with reference standards in thermal baths or ovens	
	-80 °C to <-20 °C	0,010 °C		
	-20 °C to <300 °C	0,008 °C		
	300 °C to <450 °C	0,010 °C		
	450 °C to <660 °C	0,012 °C		
	660 °C to <1064 °C	0,80 °C		
	1064 °C to 1550 °C	1,60 °C		
	-40 °C to <120 °C	0,07 °C	By comparison with reference standards in a climatic chamber	PL-02-A.032
120 °C to 180 °C	0,18 °C			
Liquid in glass thermometers	-80 °C to <-58 °C	0,11 °C	By comparison with reference standards in thermal baths or ovens	PL-02-A.032
	-58 °C to <160 °C	0,01 °C		
	160 °C to <300 °C	0,03 °C		
	300 °C to 350 °C	0,10 °C		

Remarks:

- According to ITS-90 (International Temperature Scale of 1990)
- Expanded uncertainties are only associated to the probes and calibration means of the laboratory. Final uncertainty associated to the calibration of thermometer shall not be inferior to expanded uncertainty.

<b>Calibration and characterisation of block calibrators</b>				
<b>Measured quantity, instrument or gauge</b>	<b>Range</b>	<b>Expanded uncertainty (*)</b>	<b>Remarks</b>	<b>Calibration procedure</b>
Calibration of block calibrators	-100 °C to 650 °C	from 0,02 °C up to 0,10 °C	By comparison with a reference standard in a boring of the block calibrator	PL-02-A.032
Calibration and characterisation of block calibrators	-100 °C to 650 °C	Uncertainty determined during characterisation may vary depending on how many borings are characterised	In addition to the calibration of the block calibrator, determination of axial homogeneity along the borings and determination of temperature differences between the borings according to DOC EM/CG/13 "Guidelines on the Calibration of Temperature Block Calibrators"	PL-02-A.037

<b>Onsite calibrations</b>				
<b>Measured quantity, instrument or gauge</b>	<b>Range</b>	<b>Expanded uncertainty (*)</b>	<b>Remarks</b>	<b>Calibration procedure</b>
Temperature probe with or without readout (pyrometers excepted)	-196 °C to <232 °C	0,05 °C	By comparison with reference standards in thermal baths or ovens	PL-02-A.035
	232 °C to <420 °C	0,06 °C		
	420 °C to <660 °C	0,08 °C		
	660 °C to <1064 °C	1,00 °C		
	1064 °C to 1550 °C	1,90 °C		

Remarks:

- According to ITS-90 (International Temperature Scale of 1990)
- Expanded uncertainties are only associated to the probes of the laboratory. Final uncertainty of a thermometer calibration shall not be inferior to expanded uncertainty and shall also depend on, among others, the availability of equipment onsite, environmental conditions...

(\*) The smallest uncertainty of measurement the laboratory can provide to its customers, expressed as the expanded uncertainty having a coverage probability of approximately 95%.