

## MSL Proficiency Test MSL-PT-T02-2023

### Direct-Reading Platinum Resistance Thermometer

#### Technical Protocol

##### 1. Introduction

The purpose of this proficiency test is to verify the calibration capabilities of the participating laboratories in the field of contact thermometry in the temperature range  $-80\text{ }^{\circ}\text{C}$  to  $500\text{ }^{\circ}\text{C}$  (or part thereof). The artefact to be calibrated consists of a semi-standard platinum resistance thermometer connected to a digital readout device (together referred to as the thermometer). The thermometer will be initially calibrated by MSL, then sent to each participating laboratory. Between measurements at each laboratory, the thermometer will be returned to MSL for a stability and damage check before being dispatched to the next participant. Finally, the thermometer will be recalibrated by MSL to determine any possible drift.

##### 2. Equipment and handling

Artefact:

- Isotech 935-14-95H semi-standard platinum resistance thermometer; serial number: 301570/1; sheath length: 480 mm; sheath diameter: 6 mm; handle length: 120 mm; handle diameter: 19 mm.
- Isotech milliK precision thermometer digital readout device; serial number: 401105-3.

On receipt, unpack and inspect the equipment for any damage. Report any damage immediately to MSL. Once measurements are completed, repack the equipment in the original packaging and return by courier to:

Peter Saunders  
Measurement Standards Laboratory  
Callaghan Innovation  
69 Gracefield Road  
Lower Hutt 5010

##### 3. Measurements to be carried out

**Please do NOT adjust any of the thermometer's settings, dismantle the thermometer, or attempt any maintenance or rectification.**

Connect the probe to channel 1 of the milliK and calibrate the thermometer using the reference equipment in your laboratory. Please provide corrections to the thermometer's readings and uncertainties for at least six (preferably more) of the following nominal temperatures, ensuring that the chosen points span the range of your measurement capabilities:

$-80\text{ }^{\circ}\text{C}$ ,  $-40\text{ }^{\circ}\text{C}$ ,  $-20\text{ }^{\circ}\text{C}$ ,  $-10\text{ }^{\circ}\text{C}$ ,  $10\text{ }^{\circ}\text{C}$ ,  $40\text{ }^{\circ}\text{C}$ ,  $70\text{ }^{\circ}\text{C}$ ,  $110\text{ }^{\circ}\text{C}$ ,  $150\text{ }^{\circ}\text{C}$ ,  $200\text{ }^{\circ}\text{C}$ ,  $250\text{ }^{\circ}\text{C}$ ,  $300\text{ }^{\circ}\text{C}$ ,  $350\text{ }^{\circ}\text{C}$ ,  $400\text{ }^{\circ}\text{C}$ ,  $450\text{ }^{\circ}\text{C}$ ,  $500\text{ }^{\circ}\text{C}$ .

In addition to the above points, please also carry out an ice-point measurement of the thermometer.

#### 4. Documents to be submitted

Within one week of completion of the measurements, participating laboratories are required to submit their results to MSL in the form of a calibration certificate as routinely reported to customers. Your results should also be reported in the attached results sheet and submitted to MSL (these documents can be sent by email – see *Contact Information* below).

Uncertainties should be calculated using your usual method, which should be consistent with the method in the ISO *Guide to the Expression of Uncertainty in Measurement*. Uncertainties must be reported as expanded uncertainties at the 95 % level of confidence.

**Note:** *It is acceptable for the purposes of this proficiency test to report an uncertainty below that on your Scope of Accreditation or to report results at points outside the range of the measurand on your Scope of Accreditation.*

#### 5. Further information

##### *Schedule*

The comparison will start in February 2023. Each laboratory will be assigned two weeks to complete the calibration plus one week to submit the results.

##### *Analysis*

Results from all participating laboratories will be compared to the reference values measured at MSL. The results will be reported as a table of normalised error ( $E_n$ ) values, which are given by

$$E_n = \frac{\text{LAB} - \text{REF}}{\sqrt{U_{\text{LAB}}^2 + U_{\text{REF}}^2}},$$

where:

LAB = participating laboratory's correction,

REF = reference laboratory's correction,

$U_{\text{LAB}}$  = participating laboratory's expanded uncertainty,

$U_{\text{REF}}$  = reference laboratory's expanded uncertainty.

##### *Reporting*

Your laboratory will receive a customised interim report comparing your results with the most recent reference laboratory's calibration results, including a normalised error analysis and feedback on your submitted calibration certificate. The interim report will be available within two weeks of your results being submitted to MSL.

A draft final report will be compiled once all participating laboratories have completed their calibrations. This report will identify results only by the laboratory number and the same report will be issued to all participants. Laboratories will be given two weeks to comment on the draft final report, after which a final report will be issued.

*Contact information*

Peter Saunders  
Measurement Standards Laboratory  
Tel: 04 931 3143  
Email: [peter.saunders@measurement.govt.nz](mailto:peter.saunders@measurement.govt.nz)

Hamish Edgar  
Measurement Standards Laboratory  
Tel: 04 931 3493  
Email: [hamish.edgar@measurement.govt.nz](mailto:hamish.edgar@measurement.govt.nz)

**MSL Proficiency Test MSL-PT-T02-2023  
Direct-Reading Platinum Resistance Thermometer**

**RESULTS SHEET**

Isotech 935-14-95H semi-standard platinum resistance thermometer; serial number: 301570/1  
Isotech milliK precision thermometer digital readout device; serial number: 401105-3

Laboratory Name:

Calibration Date:

Testing Officer:

Ambient Temperature (°C):

Report Number:

DUT Immersion Depth (mm):

Nominal <sup>(1)</sup> Temp. (°C)	Reference Reading $T_{ref}$ (°C)	milliK Reading $T_{DUT}$ (°C)	Correction $T_{ref} - T_{DUT}$ (°C)	Reported <sup>(2)</sup> Uncertainty (°C)
-80				
-40				
-20				
-10				
10				
40				
70				
110				
150				
200				
250				
300				
350				
400				
450				
500				
Ice point	0.000			

Notes:

- Fill out the table for at least six of these nominal temperatures, spanning the range of your measurement capabilities. Additionally, carry out an ice-point measurement. Leave all other rows blank.
- The reported uncertainty should include all components appropriate for this calibration and must be reported at the 95 % confidence level.