

MSL Proficiency Test MSL-PT-T01-2019

Infrared Thermometry

Technical Protocol

1. Introduction

The purpose of this proficiency test is to verify the calibration capabilities of the participating laboratories in the field of infrared thermometry in the temperature range $-20\text{ }^{\circ}\text{C}$ to $500\text{ }^{\circ}\text{C}$ (or part thereof). The artefact to be calibrated is an infrared thermometer operating over the wavelength range $8\text{--}14\text{ }\mu\text{m}$. 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: Fluke 561 infrared (IR) thermometer, serial number: 44000035WS

On receipt, unpack and inspect the artefact for any damage. Report any damage immediately to MSL. Once measurements are completed, repack the artefact 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 dismantle the thermometer or attempt any maintenance or rectification. The only setting that should be changed, if necessary, is the emissivity, which should be set to HI (0.95).

Calibrate the IR thermometer. Ensure that the emissivity is set to HI (0.95) and that the measurement-distance-to-target-size ratio is set appropriately. Please provide corrections to the IR thermometer's readings for at least six of the following nominal temperatures, ensuring that the chosen points span the range of your measurement capabilities:

$-20\text{ }^{\circ}\text{C}$, $-10\text{ }^{\circ}\text{C}$, $10\text{ }^{\circ}\text{C}$, $50\text{ }^{\circ}\text{C}$, $90\text{ }^{\circ}\text{C}$, $140\text{ }^{\circ}\text{C}$, $200\text{ }^{\circ}\text{C}$, $250\text{ }^{\circ}\text{C}$, $300\text{ }^{\circ}\text{C}$, $350\text{ }^{\circ}\text{C}$, $400\text{ }^{\circ}\text{C}$, $450\text{ }^{\circ}\text{C}$, $500\text{ }^{\circ}\text{C}$.

The corrections should be given with respect to the expected readings for the given measurement conditions. MSL Technical Guide 22 (<https://measurement.govt.nz/resources>) and the accompanying Excel spreadsheet contain useful information.

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 is scheduled to start in February 2019. 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_{LAB} = participating laboratory's expanded uncertainty,

U_{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

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Infrared Thermometry

RESULTS SHEET

Fluke 561 Infrared Thermometer
Serial Number: 44000035WS

Laboratory Name: Ambient Temperature (°C):
 Testing Officer: Fluke 561 Emissivity Setting:
 Report Number: Measurement Distance (mm):
 Calibration Date: Diameter of target (mm):
 Ref. Thermometer Type: Emissivity of Target:
 Ref. Thermometer Emissivity Setting (if IR):

Nominal Temp. ⁽¹⁾ (°C)	Reference Reading T_{ref} (°C)	Expected Reading ⁽²⁾ T_{exp} (°C)	Fluke 561 Reading T_{DUT} (°C)	Correction $T_{exp} - T_{DUT}$ (°C)	Reported ⁽³⁾ Uncertainty (°C)
-20					
-10					
10					
50					
90					
140					
200					
250					
300					
350					
400					
450					
500					

Notes:

1. Fill out the table for at least six of these nominal temperatures, spanning the range of your measurement capabilities. Leave all other rows blank.
2. The expected reading may be calculated using information in MSL Technical Guide 22, and ideally should be within a few °C of the nominal temperature in the first column of the table.
3. The reported uncertainty should include all components appropriate for this calibration and must be reported at the 95 % confidence level.