MSL Proficiency Test MSL-PT-H01-2019

Relative Humidity

Technical Protocol

1. Introduction

The purpose of this proficiency test is to verify the calibration capabilities of the participating laboratories in the field of relative humidity in the relative humidity range from 10 %rh to 95 %rh (or part thereof) in the temperature range 0 °C to 60 °C (or part thereof). The artefact to be calibrated is a relative humidity and temperature hygrometer. The hygrometer 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 hygrometer will be recalibrated by MSL to determine any possible drift.

2. Equipment and handling

Artefact: Vaisala HM70 Hand-held Humidity and Temperature Meter comprising an MI70 Measurement Indicator (serial number P4243370) and HMP77B RH and T probe (serial number P4630211).

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:

Jeremy Lovell-Smith
Measurement Standards Laboratory
Callaghan Innovation
69 Gracefield Road
Lower Hutt 5010

3. Measurements to be carried out

Please do NOT dismantle the hygrometer or attempt any maintenance or rectification. No settings should be changed. Do not adjust the hygrometer. Readings may be taken directly from the display or via RS232 using the Vaisala MI70 Link software (CD included).

Calibrate the hygrometer for relative humidity using at least four of the following nominal relative humidities

{10 %rh, 20 %rh, 30 %rh, 40 %rh, 50 %rh, 60 %rh, 70 %rh, 80 %rh, 90 %rh, 95 %rh}

for each of at least two nominal temperatures chosen from

0 °C, 10 °C, 15 °C, 20 °C, 25 °C, 30 °C, 40 °C, 50 °C, 60 °C,

while ensuring that the chosen points span the range of relative humidity and temperature of your measurement capabilities.

The calibration scheme should be able to account for hysteresis with at least one nominal humidity at each chosen temperature approached from a lower and from a higher nominal humidity.

Please report the laboratory reference relative humidity H_{LAB} and air temperature T_{LAB}, and the corresponding readings from the hygrometer under calibration of relative humidity H_{huc} and temperature T_{huc}. Report also the corresponding correction for relative humidity $\Delta H = H_{LAB} - H_{huc}$.

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 May 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

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

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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**Measurement
Standards Laboratory**
of New Zealand

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RESULTS SHEET (page 1)
Vaisala HM70 hygrometer:
MI70 monitor (sn P4243370) & HMP77B probe (sn P4630211).

Laboratory Name: Testing Officer:

Report Number: Calibration Date:

Ambient Temperature (°C):   Humidity Generator Type:

Ref. Hygrometer Type: Reading logged from Display or RS232 (circle)

Ref. Thermometer Type: Chamber dimensions:

Nominal[1]		Laboratory Reference Reading[2]		HUC Reading[2]		Laboratory Correction	Reported[2] Uncertainty
T	H	T_{LAB}	H_{LAB}	T_{HUC}	H_{HUC}	$\Delta H = H_{LAB} - H_{HUC}$	$U(H_{LAB})$
/°C	/%rh	/°C	/%rh	/°C	/%rh	/%rh	/%rh

Notes:
1. Fill out the table for the chosen pairs of nominal temperature and relative humidity in order of measurement, including any points repeated to account for hysteresis. Leave all other rows blank or add extra pages of results as appropriate.
2. Please report the average of at least 10 readings in each case.
3. The reported uncertainty should include all components appropriate for this calibration including hysteresis and must be reported at the 95 % confidence level.

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RESULTS SHEET (page 2)
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Report Number: Calibration Date:

Ambient Temperature (°C):   Humidity Generator Type:

Ref. Hygrometer Type: Reading logged from Display or RS232 (circle)

Ref. Thermometer Type: Chamber dimensions:

Nominal[1]		Laboratory Reference Reading[2]		HUC Reading[2]		Laboratory Correction	Reported[2] Uncertainty
T	H	T_{LAB}	H_{LAB}	T_{HUC}	H_{HUC}	$\Delta H = H_{LAB} - H_{HUC}$	$U(H_{LAB})$
/°C	/%rh	/°C	/%rh	/°C	/%rh	/%rh	/%rh