NVLAP®
Lab Code 105016-0

FLUKE®
Calibration

Certificate of Calibration
Fluke Park Laboratories
Temperature Laboratory

Description:	Metrology Well with Built-in Reference Readout	**Certificate Number:**	
Manufacturer:	Fluke	**Date of Calibration:**	31 Jul 2014
Model:	9173	**Date Due:**	
Serial Number:		**Temperature:**	19.0 to 27.0 °C
Status:	As-Found: New	**Relative Humidity:**	< 60 %RH
	As-Left: In Tolerance	**Pressure:**	95 to 103 kPa
Calibration:	Full	**Issue Date:**	25 Sep 2014
Procedure:	HCT300 - 3		

Customer:

PO Number:

This calibration is traceable to the SI through recognized national measurement institutes, ratiometric techniques, or natural physical constants and is in compliance with ISO17025:2005 and ANSI/NCSL Z540.1. The calibration has been completed in accordance with the Fluke Quality System document QSD 111.0. Calibration certificates without signatures are not valid. This certificate applies to only the item identified and shall not be reproduced other than in full, without the specific written approval by Fluke Corporation. This certificate shall not be used to claim product endorsement by the accreditation body.

This calibration certificate may contain data that is not covered by the Scope of Accreditation. The unaccredited test points, where applicable, are indicated by an asterisk (*), or confined to clearly marked sections. Functional tests are not accredited.

Measurement uncertainties at the time of test are given where applicable. They are calculated in accordance with the method described in the ISO Guide to the Expression of Uncertainty in Measurement. The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k such that the coverage probability corresponds to approximately 95 %.

Comments:

Approved Signatory

Certificate Number: **Date of Calibration:** 31 Jul 2014

Standards Used

Model	Description	Serial Number	Due-Date
1560	Thermometer, "Black Stack" Base Unit	B14293	NCR
1560	Thermometer, "Black Stack" Base Unit	B14294	NCR
2562-H	Precision Digital Thermometer	A09358	11-Sep-2014
2562-H	Precision Digital Thermometer	B08077	11-Apr-2015
5628	Platinum Resistance Thermometer	1503	09-Sep-2014
5628	Platinum Resistance Thermometer	1795	17-Aug-2014
1529-R	Precision Digital Thermometer	B07258	14-Sep-2014
3591	Standard Resistor Set	A45009	10-Aug-2014
5610	Thermistor Probe	A692906	16-Dec-2014
	Metrology Well Test Station	11	NCR

The instrument described herein consists of a heat source component and a thermometer readout component. This calibration pertains to both components.

The heat source component was calibrated by direct measurement of generated temperatures using the pertinent reference standards listed in the "Test Equipment" section of this report. The calibration was performed using test insert Model 917x-INST as described in the user manual. This insert is similar to insert "C" but is designed to accommodate the test PRTs and aid in the performance of the axial gradient calibration. The calibration data, internal calibration constants, and uncertainties are shown on the following page(s) of this report. The temperature accuracy test is self-explanatory. The axial differential temperature test is more complex. Due to the nature of the axial differential temperature characteristic and the influence of the test equipment on the test result, this test utilizes tolerances which do not precisely match the instrument specification. However, the unique tolerances used are intended to determine the axial differential temperature tolerance status based on the published specifications. The temperature observations were performed in both increasing and decreasing directions. The value shown for maximum hysteresis is the maximum difference between two observations of the same temperature. The nominal temperature at which the maximum difference was observed is also shown.

The thermometer readout component was calibrated by direct measurement of laboratory reference resistors listed in the "Test Equipment" section of this report. The calibration data, internal calibration constants, and uncertainties are shown on the following page(s) of this report.

The calibration uncertainties are shown at a coverage factor of 2 (k=2). All known significant sources of uncertainty have been considered. Any limitations or remarks pertaining to this instrument and/or calibration are shown below. Additionally, out of tolerance indications, if any, are identified along with the corresponding data on the data pages of this report. Calibration uncertainties have been taken into account in the determination of tolerance status using risk analysis algorithms. When using the instrument in a calibration process, it is recommended that the instrument specifications be used as the contribution of the instrument rather than the calibration uncertainties. The instrument tolerances are shown on the report at a confidence interval of 95%.

Certificate of Calibration

Model: 9173
Serial No.:
Certificate No:

As Found Data

No As Found Data Required

As Left Data

Data ID:

Calibration Constants	
TEMP 1	-1.329
TEMP 2	-2.522
TEMP 3	-4.370
GRAD 1	-0.294
GRAD 2	-0.633
GRAD 3	-0.658

Control Constants	
TEMP PBAND	6.0
TEMP INT	100.0
TEMP DER	10.0
GRAD PBAND	10.0
GRAD INT	150.0
GRAD RATIO	1.30

Settings	
FAN LIMIT	AUTO

Temperature Accuracy

Set-point °C	Actual °C	Error °C	Tolerance °C	Uncertainty	Pass/Fail
50.000	50.056	0.056	±0.200	±0.025	P
100.000	100.013	0.013	±0.200	±0.025	P
200.000	199.983	-0.017	±0.200	±0.035	P
350.000	349.998	-0.002	±0.200	±0.040	P
500.000	500.025	0.025	±0.250	±0.050	P
660.000	659.996	-0.004	±0.250	±0.065	P

Temperature Stability

Set-point °C	Observed °C (2 Sigma)	Tolerance °C	Uncertainty	Pass/Fail
50.000	0.0014	±0.0050	±0.0025	P
100.000	0.0018	±0.0050	±0.0025	P
660.000	0.0070	±0.0300	±0.0035	P

Axial Differential Temperature

Set-point °C	Target °C	Actual °C	Error °C	Tolerance °C	Uncertainty	Pass/Fail
100.000	0.000	-0.009	-0.009	±0.050	±0.035	P
350.000	0.000	-0.012	-0.012	±0.125	±0.055	P
660.000	0.000	-0.043	-0.043	±0.200	±0.090	P

Maximum Hysteresis

Set-point °C	Observed °C	Tolerance °C	Uncertainty	Pass/Fail
200.000	0.008	±0.070	±0.0070	P

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Calibration Constants	
REF 1	-0.0002
REF 2	0.0048
REF 3	-0.0007

Test Data

Nominal Ω	Actual Ω	Measured Ω	Error Ω	Calibration Tolerance Ω	Uncertainty	Pass/Fail
0	0.00000	-0.00007	-0.00007	±0.00050	±0.00013	P
25	24.997507	24.997375	-0.000132	±0.000630	±0.00014	P
100	100.00663	100.00633	-0.00030	±0.00250	±0.00052	P
200	200.0013	200.0010	-0.0003	±0.0050	±0.00084	P
400	400.006	400.006	0.000	±0.010	±0.0017	P

