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CALIBRATION REPORT FOR THERMOMETER

Report No. U173259 Page 1 of 2 SO: 123456

THE INSTRUMENT DESCRIBED BELOW WAS EXAMINED AND TESTED IN ICL'S ISO/IEC 17025 ACCREDITED CALIBRATION LABORATORY, USING NIST TRACEABLE REFERENCE STANDARDS, IN ACCORDANCE WITH ICL'S ISO/IEC 17025 CALIBRATION PROCEDURE REFERENCED BELOW. THIS CALIBRATION MEETS THE REQUIREMENTS OF ISO/IEC 17025, ANSI/NCSL Z540-1-1994, (WHICH SUPERCEDED AND REPLACED MIL-STD 45662A), AND THE ISO-9000 AND QS-9000 SERIES OF QUALITY STANDARDS.

CUSTOMER INFORMATION

SAMPLE CUSTOMER
 STREET ADDRESS
 CITY, STATE ZIP

PURCHASE ORDER NUMBER: NOT AVAILABLE

SUBMITTED BY: SAMPLE COMPANY

DATES

DATE REPORT ISSUED: 05-16-2011

INSTRUMENT INFORMATION

THERMOMETER ASTM 12F INSCRIPTION: LSW

MODEL: 10012F-C RANGE: -5/215F DIVISIONS: .5 °F IMMERSION: TOTAL

ENGINEERING UNITS: degrees Fahrenheit

SERIAL NUMBER: XXXX

ACCURACY TOLERANCE (maximum scale error permitted by ASTM E 1): +/- 0.25F

RESULTS OF PHYSICAL EXAMINATION

THIS INSTRUMENT WAS EXAMINED UNDER A POLARIZED LENS AND STRAINS IN THE GLASS, IF ANY, WERE JUDGED TO BE MINIMAL AND OF NO DETRIMENT TO THE FUNCTION OF THE INSTRUMENT.

THE CAPILLARY OF THIS THERMOMETER WAS EXAMINED UNDER MAGNIFICATION WITH RESULTS AS FOLLOWS: NO FOREIGN MATERIAL, MOISTURE, OR OTHER EVIDENCE OF CONTAMINATION WERE DISCOVERED. NO DISCERNABLE CAPILLARY IRREGULARITIES WERE NOTED.

IT WAS DETERMINED THAT THIS INSTRUMENT IS IN GOOD WORKING ORDER AND IS THEREFORE SUITABLE FOR CALIBRATION.

CALIBRATION PROCEDURE USED: ICL Procedure 01, which is based upon ASTM E 77, NBS Monograph 150 & NIST SP 250-23

RESULTS OF CALIBRATION

NOTE: The indications of this instrument cannot be adjusted or modified by ordinary means; accordingly, the readings given in the table below should be considered, in effect, to be both 'As Found' and 'As Left' readings.

TEST TEMP	READING	CORRECTION	ACCEPT LIMIT* (+ or -)	P/M/F	UNCERTAINTY
-4.00°F	-4.00°F	0.00°F	0.246°F	PASS	0.12°F
15.00°F	14.95°F	+0.05°F	0.246°F	PASS	0.12°F
32.00°F	31.95°F	+0.05°F	0.246°F	PASS	0.12°F
60.00°F	59.90°F	+0.10°F	0.246°F	PASS	0.12°F
85.00°F	84.85°F	+0.15°F	0.246°F	PASS	0.12°F
110.00°F	109.95°F	+0.05°F	0.246°F	PASS	0.12°F
135.00°F	134.95°F	+0.05°F	0.246°F	PASS	0.12°F
160.00°F	160.00°F	0.00°F	0.246°F	PASS	0.12°F
185.00°F	184.95°F	+0.05°F	0.246°F	PASS	0.12°F
210.00°F	209.90°F	+0.10°F	0.246°F	PASS	0.12°F

*ACCEPT LIMIT(s) The acceptance limit(s) shown above represent a statistical evaluation of the instrument's tolerance relative to the uncertainty of the measurement. If required, the acceptance limit is set to a value smaller than the tolerance. The difference between the tolerance and the acceptance limit is the 'guard band'. The guard band is imposed to reduce the probability of a false acceptance (PFA), or a false failure, to 2% or less.

P/M/F Accordingly, there are three possible calibration outcomes:

1. PASS The calibration result falls within the interval described by the test point + or - (the tolerance MINUS the guard band).
2. MARG** (marginal) The calibration result is 'borderline', or indeterminate; it is therefore statistically and metrologically imprudent to declare that the instrument is definitively either 'in-tolerance' or 'out-of-tolerance'.
3. FAIL The calibration result falls outside the interval described by the test point + or - (the tolerance PLUS the guard band).

The methodology and equations used for determination of guard bands and acceptance limits comply with the requirements of ANSI/NCSL Z540.3

The above readings were made under magnification and resolved to one tenth of one scale division.



THE TEST POINTS LISTED IN THE ABOVE TABLE ARE THOSE SPECIFIED IN ASTM E 1 (CURRENT REVISION).

Unless otherwise stated, the thermometer was permitted to stabilize for a minimum of 5 minutes at each test temperature prior to reading.

Our best measurement capabilities are: at Liquid Nitrogen (approximately -196C), +/- 0.0062C; from -80 to 0C, +/- 0.0089C; at 0C, +/- 0.0039C; at 0.01C (TPW), +/- 0.0019C; from 0.01 to 100C, +/- 0.0085C; from 100 to 200C, +/- 0.0094C; from 200 to 300C, +/- 0.0098C; from 300 to 420C, +/- 0.014C; from 420 to 500C, +/- 0.034C; from 500 to 700C, +/- 0.26C; from 700 to 1000C, +/- 0.86C. These uncertainties have been calculated utilizing the methods recommended in NIST Technical Note 1297 and the ANSI-NCSL document Z-540-2 entitled 'Guide to the Expression of Uncertainty in Measurement'. A coverage factor of 2 sigma (k = 2) has been applied to the standard uncertainty in order to express the expanded uncertainty at (approximately) a 95% confidence level.

THE UNCERTAINTIES PRESENTED ABOVE IN THE 'RESULTS' TABLE ARE LARGER THAN OUR BEST MEASUREMENT CAPABILITIES, AS THE RESOLUTION OF THIS INSTRUMENT, ESTIMATED TO BE 0.05°F, AND OTHER CONTRIBUTIONS HAVE BEEN FACTORED INTO THE CALCULATION.

THE EXPANDED UNCERTAINTIES (K = 2) REPORTED HERE DO NOT CONTAIN ESTIMATES FOR (1) ANY EFFECTS THAT MAY BE INTRODUCED BY TRANSPORTATION OF THE INSTRUMENT BETWEEN ICL AND THE USER'S LABORATORY, (2) DRIFT OF THE INSTRUMENT, (3) HYSTERESIS OF THE INSTRUMENT, OR (4) ANY MEASUREMENT UNCERTAINTIES INTRODUCED BY THE USER.

FOR A DISCUSSION OF ACCURACIES ATTAINABLE WITH THERMOMETERS SUCH AS THIS INSTRUMENT SEE NIST SPECIAL PUBLICATION 250-23, NIST PUBLICATION IR-5341, ASTM E 1 AND ASTM E 77.

LABORATORY ENVIRONMENTAL CONDITIONS: TEMPERATURE: 23°C +/- 2°C RELATIVE HUMIDITY: BETWEEN 40% AND 65%

ALL TEMPERATURES GIVEN IN THIS REPORT ARE THOSE DEFINED BY THE INTERNATIONAL TEMPERATURE SCALE OF 1990 (ITS-90)

** IMPORTANT NOTE: THE READINGS AND CORRECTIONS NOTED ABOVE APPLY FOR THE CONDITION OF IMMERSION INDICATED PROVIDED THE ICE POINT READING, TAKEN AFTER EXPOSURE FOR NOT FEWER THAN THREE DAYS TO A TEMPERATURE OF ABOUT 23 DEGREES CELSIUS (73F), IS 31.95°F.

THIS CALIBRATION WAS PERFORMED BY: J. JEFF KELLY

THE CALIBRATION PERFORMED AND DOCUMENTED BY THIS CALIBRATION REPORT IS A FULL SCALE CALIBRATION AND NO LIMITATIONS OF USE ARE IMPOSED ON THIS INSTRUMENT.

TRACEABILITY INFORMATION

This calibration is traceable to NIST through an unbroken chain of comparisons. The reference standard is used to calibrate the transfer standard, which in turn is used to calibrate the client's instrument. Each step in the chain is fully documented, and measurement uncertainty at each step has been calculated.

Our NIST primary reference thermometer from -196 to 420C is a Rosemount model 162CE 25.5 Ohm SPRT, serial no. 5206, calibrated by NIST on April 1, 2009. NIST GMP-11 recommends a 36 month calibration cycle for SPRTs. PRT transfer standards and ASTM liquid-in-glass transfer standards are calibrated annually against this SPRT, per NIST GMP-11 recommendations.

Our primary reference thermometer for temperatures from 500 to 1000C is a Hart Scientific model 5624 PRT sensor, serial #0105, calibrated by Hart Scientific. PRT and noble metal thermocouple transfer standards are calibrated annually against this reference sensor, per NIST GMP-11 recommendations.

Test Point	Comparator	MTE#	Manufacturer	Transfer Standard	MTE#	Manufacturer	Next Due
-4.00°F	7341 alc bath	238	Hart Scientific	5628-15 PRT 1755 306	306	Hart Scientific	06/01/11
15.00°F	7341 alc bath	238	Hart Scientific	5628-15 PRT 1755 306	306	Hart Scientific	06/01/11
32.00°F	7341 alc bath	238	Hart Scientific	5628-15 PRT 1755 306	306	Hart Scientific	06/01/11
60.00°F	7341 alc bath	238	Hart Scientific	5628-15 PRT 1755 306	306	Hart Scientific	06/01/11
85.00°F	Water bath	022	PolyScience	5628-15 PRT 1100 290	290	Hart Scientific	06/01/11
110.00°F	Water bath	022	PolyScience	5628-15 PRT 1100 290	290	Hart Scientific	06/01/11
135.00°F	Water bath	022	PolyScience	5628-15 PRT 1100 290	290	Hart Scientific	06/01/11
160.00°F	6331 water bath	242	Hart Scientific	5628-15 PRT 1755 306	306	Hart Scientific	06/01/11
185.00°F	6331 water bath	242	Hart Scientific	5628-15 PRT 1755 306	306	Hart Scientific	06/01/11
210.00°F	6022 oil bath	003	Hart Scientific	5628-12 PRT 0523 228	228	Hart Scientific	10/07/11

ICL CALIBRATION LABORATORIES, INC.

An ISO/IEC 17025 & ANSI/NCSL Z-540-1 accredited laboratory - American Association for Laboratory Accreditation Certificate #526.01

J. Jeff Kelly, Technical Director
Deborah M. Weber, Quality Deputy

This document prepared by LORI PARR and reviewed by KAREN MANGOLD

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RECALIBRATION DATE SPECIFIED BY CLIENT: May 16, 2012

NIST GMP-11 (Mar '03), 'Good Measurement Practice for Assignment and Adjustment of Calibration Intervals for Standards' states that, 'Temperature standards are dynamic with use. Shock, contamination and other factors can cause drift from accepted values'. Table 4 of GMP-11 recommends recalibration of liquid-in-glass thermometers, standard thermistors and PRTs at 12 month intervals. Liquid-in-glass thermometers used for 'Temperature Critical Parameters' should be recalibrated at 6 month intervals. NIST GMP-11 is available for download in Adobe .pdf format on our website at www.icllabs.com Follow the link for 'Downloads'.

The API 'Manual of Petroleum Measurement Standards', Chapter 7, June, 2001, specifies a 12 month recalibration interval for liquid-in-glass thermometers (see section 8.3) and for portable electronic thermometers (PETs). See section 8.2

The user should be aware that any number of factors may cause this instrument to drift out of calibration before the specified calibration interval has expired.

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This calibration report applies only to the item calibrated. This calibration report shall not be used to claim product endorsement by the A2LA.