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CERT. 528.01 CALIBRATION

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CALIBRATION REPORT FOR DIGITAL THERMOMETER

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 THIS CALIBRATION MEETS THE REQUIREMENTS OF ISO/IEC 17025, ANSI/NCSL Z540-1-1994, (WHICH SUPERCEDED AND REPLACED MIL-STD 45662A), AND THE ISO-9000 AND QS-9000 SERIES OF QUALITY STANDARDS.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

WASHINGTON STATE PATROL
811 EAST ROANOKE
SEATTLE, WA 98102

PURCHASE ORDER NUMBER: NOT AVAILABLE

SUBMITTED BY: WASHINGTON STATE PATROL

INSTRUMENT INFORMATION

DATE RECEIVED FOR CALIBRATION: 09-17-2009 DATE REPORT ISSUED: 09-18-2009

DIGITAL THERMOMETER MODEL NUMBER: 4300

SERIAL NUMBER: 091801 INSCRIPTION: GUTH LABS INC.

ENGINEERING UNITS: degrees Celsius RANGE: 29.5/38.5C DIVISIONS: .01 °C

IMMERSION: APPROX. 6 INCHES

ACCURACY TOLERANCE: +/- 0.025C PER MANUFACTURER'S MANUAL

RESULTS OF PHYSICAL EXAMINATION

THIS INSTRUMENT WAS RECEIVED IN OPERABLE CONDITION, UNLESS OTHERWISE NOTED.

NOTE: UUT was received with a low battery. A new 9 volt battery was installed prior to calibration.

CALIBRATION PROCEDURE USED: ICL Procedure 04, which is drawn from ASTM E 77, E 220 and E 563

RESULTS OF CALIBRATION

'AS FOUND'

TEST TEMP	READING	CORRECTION	ACCEPT LIMIT* (+ or -)	P/M/F	UNCERTAINTY
33.00°C	33.01°C	-0.01°C	0.021°C	PASS	0.014°C
34.00°C	34.00°C	0.00°C	0.021°C	PASS	0.014°C
35.00°C	35.00°C	0.00°C	0.021°C	PASS	0.014°C

NO ADJUSTMENTS WERE MADE TO THIS INSTRUMENT.

'AS LEFT'

TEST TEMP	READING	CORRECTION	ACCEPT LIMIT* (+ or -)	P/M/F	UNCERTAINTY
33.00°C	33.01°C	-0.01°C	0.021°C	PASS	0.014°C
34.00°C	34.00°C	0.00°C	0.021°C	PASS	0.014°C
35.00°C	35.00°C	0.00°C	0.021°C	PASS	0.014°C

*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

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 0.01°C, 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.

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 CORRECT OPERATION OF DIGITAL ELECTRONIC THERMOMETERS IS DEPENDENT ON ALL COMPONENTS FUNCTIONING PROPERLY. CORRECT TEMPERATURE INDICATION MAY BE IMPEDED BY PHYSICAL DAMAGE TO THE PROBE OR CABLE ASSEMBLY, CONTAMINATION OF ELECTRICAL CONTACTS WITH WATER, OIL, OR OTHER MATERIAL, OR BY LESS OBVIOUS CAUSES SUCH AS LOW BATTERY LEVEL OR FAILURE OF INTERNAL COMPONENTS. ACCORDINGLY, ICL CALIBRATION LABORATORIES, INC. REPRESENTS THAT THE VALUES INDICATED ABOVE WERE THOSE OBSERVED DURING THE PERFORMANCE OF THIS TEST HOWEVER CANNOT BE RESPONSIBLE FOR INACCURATE READINGS WHICH MAY BE EXPERIENCED IN FUTURE USES DUE TO CONDITIONS WHICH ARE BEYOND OUR CONTROL.

THIS CALIBRATION WAS PERFORMED BY: J. JEFF KELLY

THE CALIBRATION PERFORMED AND DOCUMENTED BY THIS REPORT OF TEST IS A LIMITED CALIBRATION AND ACCORDINGLY, LIMITATIONS OF USE ARE IMPOSED AS FOLLOWS:

THIS INSTRUMENT CAN BE USED WITH CONFIDENCE ONLY WITHIN THE RANGE BRACKETED BY THE TEST POINTS AND/OR IMMEDIATELY AROUND THE TEST POINTS.

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
33.00°C	Water bath	022	PolyScience	5628-15 PRT 0541	237	Hart Scientific	06/01/10
34.00°C	Water bath	022	PolyScience	5628-15 PRT 0541	237	Hart Scientific	06/01/10
35.00°C	Water bath	022	PolyScience	5628-15 PRT 0541	237	Hart Scientific	06/01/10

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, A.S.C.P. ACCREDITED TECHNOLOGIST This document prepared by LORI PARR and reviewed by KAREN DOMINGUEZ

DATE REPORT ISSUED: 09-18-2009 RECALIBRATION DATE SPECIFIED BY CLIENT: September 18, 2010

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.