



SOUTHWEST RESEARCH INSTITUTE™

6220 Culebra Road, P.O. Drawer 28510
Institute Quality Systems
Institute Calibration Laboratory
Phone: 210-522-5215 Fax 210-522-3692

Certificate of Calibration

Submitted By: DIV20

Address: B57

Contact: KEN CHIANG

Manufacturer Model: OMEGA Type K

Description: THERMOCOUPLE

Serial No: 11117

Asset No: 011117

Procedure: TEMPERATURE GENERAL, JAN/03

Work Order: 444060485

Date Issued: Aug 24, 2004

Calibration Date: Aug 24, 2004

**Calibration Due: Feb 24, 2005

Calibration Location: Bldg. 64

Environment: Temp. 73.0°F Hum. 40 %RH

*As Found: SEE ATTACHED DATA

*As Left: SEE ATTACHED DATA

This certificate documents traceability to the National Institute of Standards and Technology (NIST) and the International System of Units (SI). The Laboratory quality system conforms to ISO/IEC 17025, 1999 and ANSI/NCSL Z540-1-1994 which are equivalent to relevant requirements of the ISO 9000-1994 series of standards. This certificate may not be reproduced, except in full, without the written approval of the Southwest Research Institute Calibration Laboratory. The results of this calibration relate only to the individual instrument described above. This certificate shall not be used to claim product endorsement by the American Association for Laboratory Accreditation (A2LA) or any agency of the U. S. Government

Uncertainty evaluation includes the item under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM). The uncertainty represents an expanded uncertainty using a coverage factor of k=2 to approximate a 95% confidence level. See Remarks or attached Calibration Report with the same Work Order number for calibration data.

*The client has sole responsibility for determination of in/out of tolerance or compliance/noncompliance. An in/out of tolerance opinion is provided for your convenience based only on the Test Instrument (TI) reading(s) and limits as reported. The reported uncertainty relates only to the results at the time of calibration and does not imply any short or long term stability of the TI.

**Calibration interval is determined by the client and does not assure the instrument will remain within tolerance until this date. Any number of factors may cause the instrument to be out of tolerance before the next calibration date.

Remarks: SEE DATA SHEET

Standards Used

| Asset | Manufacturer | Model | Description | Cal Due |
|--------|-----------------|-------|--------------|------------|
| 010813 | HART SCIENTIFIC | 5650 | THERMOCOUPLE | Mar 19, 05 |
| 010814 | HART SCIENTIFIC | 1529 | TC METER | Apr 16, 05 |

Approved by: Walt Hill
Metrology Group Leader

m:\Nona21a1.rpt Rev date 11, May 04

Measurements by: Bob Trollinger
Metrology Technician

Southwest Research Institute
 Calibration Laboratory
 Measurement Report

| | | | | | |
|---|-----------|-------|--------------|-----------|-----------|
| Work Order | 444060485 | Mfr | Omega | Tech: | bit |
| Asset No. | 011117 | Model | TYPE K | Cal Date: | 24-Aug-04 |
| Serial No. | 11117 | Type | THERMOCOUPLE | | |
| Remarks: | | | | | |
| Reading are without PASS or FAIL determination. | | | | | |
| The user must determine if the instrument meets their requirements. | | | | | |

| Function/Range | Test Point | TI Reading | Difference | +/-Uncertainty |
|----------------|------------|------------|------------|----------------|
| TEMPERATURE | °C | °C | °C | °C |
| 900 °C | 896.30 | 898.53 | 2.23 | 1.6 |
| 1000 °C | 995.61 | 997.88 | 2.27 | 1.6 |
| 1100 °C | 1094.83 | 1093.09 | -1.74 | 1.6 |
| END OF REPORT | | | | |



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Certificate of Calibration

0972-01

Submitted By: DIV20

Address: B57

Contact: KEN CHIANG

Manufacturer Model: OMEGA Type K

Description: THERMOCOUPLE

Serial No: 11117

Asset No: 011117

Procedure: TEMPERATURE GENERAL, JAN/03

Work Order: 303062800

Date Issued: Feb 7, 2005

Calibration Date: Feb 7, 2005

**Calibration Due: Aug 5, 2005

Calibration Location: Bldg. 64

Environment: Temp. 73.0°F Hum. 40 %RH

*As Found: IN TOLERANCE

*As Left: IN TOLERANCE

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Uncertainty evaluation includes the item under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM). The uncertainty represents an expanded uncertainty using a coverage factor of k=2 to approximate a 95% confidence level. See Remarks or attached Calibration Report with the same Work Order number for calibration data.

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**Calibration interval is determined by the client and does not assure the instrument will remain within tolerance until this date. Any number of factors may cause the instrument to be out of tolerance before the next calibration date.

Remarks: None

Standards Used

| Asset | Manufacturer | Model | Description | Cal Due |
|--------|-----------------|-------|--------------------------|------------|
| 009137 | HART SCIENTIFIC | 1575 | THERMOMETER | Mar 20, 05 |
| 010281 | HART SCIENTIFIC | 5628 | SPRT | Jun 24, 08 |
| 010814 | HART SCIENTIFIC | 1529 | THERMOCOUPLE THERMOMETER | Apr 16, 05 |

Approved by: Walt Hill
Metrology Group Leader

m:\a2la1.rpt Rev date 11, May 04

Measurements by: Bob Trollinger
Metrology Technician

Southwest Research Institute
Calibration Laboratory
Measurement Report

| | | | | | |
|--|-----------|-------|--------------|------------|----------|
| Work Order: | 303062800 | Mfr. | Omega | Technician | blt |
| Asset No: | 011117 | Model | Type K | Cal Date | 7-Feb-05 |
| Serial No: | 11117 | Type | Thermocouple | | |
| Remarks: Limits taken from ASTM E230-02 and are based on brand new unused thermocouples. | | | | | |
| Limited Cal - tested at 0.0 and 150 C | | | | | |

| Function/Range | Test Point | TI Read | Difference | +/-Limit | +/-Uncertainty | Found/Left |
|----------------|------------|---------|------------|----------|----------------|------------|
| | ° C | ° C | ° C | ° C | ° C | Result |
| | 0.125 | -0.03 | 0.16 | 2.2 | 0.19 | Pass |
| | 150.04 | 150.60 | -0.55 | 2.2 | 0.30 | Pass |
| END OF REPORT | | | | | | |