

Competitive Calibration Certificate Breakdown

Introduction

At Transcat, we believe in calibrating items properly, and in documenting our calibrations as accurately as possible. We are also passionate about metrology in general, and we occasionally get a chance to review competitive calibration certificates. While reviewing certs may sound like as much fun as having a root canal, this is what we do and, believe it or not, we're glad to do it. Really!

Most often, the certs we review are done well. Sometimes, though, we find examples of calibration results that seem to make no sense whatsoever. This is one such example. Below, you will find the actual cert (we removed the item, competitor and customer information) and what Transcat's experts have determined about the individual results.

In this case, there are almost too many inconsistencies to list. Perhaps it will help you to think of it as a "Where's Waldo" game. Have fun!

The authors.

Acct #:
Customer:
Shipper #:
Address:
Contact:
PO #:

Manufacturer: Hewlett Packard
Model: 3458A
Description: DMM
Serial Number:
Asset Number:
Barcode:

As Received	As Returned	Action Taken	Cal Date:	10/19/2012
In Tolerance X	In Tolerance X	Full Calibration X	Due Date:	10/19/2013
Out of Tolerance	Out of Tolerance	Special Calibration	Temperature:	73.00 deg. F
Malfunctioning	Malfunctioning	Oper. Verification	Humidity:	34.00 %
Operational	Operational	Adjusted	Baro. Press.:	
Damaged	N/A	Repaired	Procedure:	DCN 50317
N/A		Charted	Reference:	manufacturer's manual
		Returned As Is		

Incoming Remarks:

Technical Remarks:

Calibration Standards Utilized

Cert. #	Manufacturer	Model #	Description	Cal Date	Due Date
2145610001	Hewlett Packard	3325B	Synthesized Function Genera	03/25/2012	03/25/2013
2243600003	Fluke	5700A	Multifunction Calibrator	07/25/2012	10/25/2012
2268260002	Hewlett Packard	3458A	DMM	08/22/2012	11/22/2012

Customer Instrumentation Includes

ID	Description
001	Extended Reading Memory

Standards Used

Asset #	Description	Cal Date	Due Date
01186	Fluke 742A-10k 10 kOhm Resistance Standard	11/08/2012	11/30/2013
01187	Fluke 742A-1 1 Ohm Standard Air Resistor	01/03/2013	01/31/2014
5354	Fluke 5790A AC Measurement Standard	05/03/2013	02/28/2014
5372	Fluke 5725A Amplifier	07/10/2013	10/10/2013
5373	Fluke 5720A Calibrator	07/10/2013	10/10/2013
5379	FLUKE 732B DC Reference Standard	05/01/2013	11/01/2013
5388	Otto Wolf 0.01 Abs. Ohm 10 mOhm Shunt	03/14/2013	09/30/2013
5501	FLUKE 8508A Reference Multimeter	07/15/2013	10/15/2013
562000	FLUKE 742A-1 1 Ohm Standard Air Resistor	03/06/2013	03/31/2014
8910	Transcat 3601 1 GOhm Standard Resistor	02/03/2013	02/28/2014
Dewk4	FLUKE 2626-H Hygro-Thermometer, Probe	11/30/2012	11/30/2013
L1147	Agilent 33250A Function Generator	12/05/2012	12/31/2013

The above identified unit was calibrated on-site at your facility located at 9115 Hague Road, Indianapolis, IN, 46250

This report applies only to the item(s) identified above and shall not be reproduced, except in full, without the written approval of Dynamic Technology, Inc. This unit has been calibrated utilizing standards with a Test Uncertainty Ratio (TUR) of greater than 4:1 approximating a 95 % confidence level with a coverage factor of k=2 unless otherwise stated above or as stated on the Report of Calibration. The calibration was performed using references traceable to the SI through NIST or other recognized national laboratory, accepted fundamental or natural physical constants, ratio type of calibration, or by comparison to consensus standards. Dynamic Technology's calibration program is in compliance with:

ISO/IEC 17025:2005, ANSI/NCSL Z540-1:1994, ANSI/NCSL Z540.3:2006, MIL STD 45662A, QD-4000:2011.

Dynamic Technology warrants all material and labor performed for ninety (90) days unless covered under a separate policy.

* Any number of factors may cause the calibrated item to drift out of tolerance before the interval has expired.

Report of Calibration

Manufacturer: Hewlett Packard
Model: 3458A
Description: DMM
Serial Number:

Account Number:
Technician:
Cal. Date:
ID:

Parameter	Range	Tolerance	Nominal	Low Limit	As Found	High Limit	As Left	U *
DC Voltage Offset -								
	100 mV	± 0.00106 mV	Short	-0.00106 mV	-0.00030 mV	0.00106 mV	-0.00030 mV	6 nV
	1 V	± 0.00000106 V	Short	-0.00000106 V	-0.00000031 V	0.00000106 V	-0.00000031 V	6 nV
	10 V	± 0.0000023 V	Short	-0.00000230 V	-0.0000003 V	0.00000230 V	-0.0000003 V	60 nV
	100 V	± 0.000036 V	Short	-0.00003600 V	0.000023 V	0.00003600 V	0.000023 V	0.6 µV
	1000 V	± 0.00010 V	Short	-0.00010000 V	0.00003 V	0.00010000 V	0.00003 V	6 µV
DC Voltage Gain -								
	100 mV	± 0.00212 mV	100 mV	99.99788 mV	99.99967 mV	100.00212 mV	99.99967 mV	0.98 µV
	1 V	± 0.00000998 V	1 V	0.99999002 V	1.00000047 V	1.00000998 V	1.00000047 V	6.24 µV
	10 V	± 0.00001110 V	1 V	0.99998890 V	0.99999920 V	1.00001110 V	0.99999920 V	5.89 µV
	10 V	± 0.00001110 V	-1 V	-1.0000111 V	-0.9999987 V	-0.9999889 V	-0.9999987 V	5.89 µV
	10 V	± 0.0000892 V	10 V	9.9999108 V	9.9999921 V	10.0000892 V	9.9999921 V	53.7 µV
	10 V	± 0.0000892 V	-10 V	-10.0000892 V	-9.9999891 V	-9.9999108 V	-9.9999891 V	53.7 µV
	100 V	± 0.001114 V	100 V	99.998886 V	99.999975 V	100.001114 V	99.999975 V	785.2 µV
	1000 V	± 0.02396 V	1000 V	999.97604 V	1000.00384 V	1000.02396 V	1000.00384 V	7.624 mV
AC Voltage -								
	100 mV	± 0.0250 mV	100mV @ 1kHz	99.97500 mV	100.00410 mV	100.02500 mV	100.00410 mV	10.62 µV
	1 V	± 0.000250 V	1 V @ 1 kHz	0.9997500 V	1.0000120 V	1.0002500 V	1.0000120 V	106.2 µV
	10 V	± 0.00096 V	1 V @ 1 kHz	0.999040 V	1.000860 V	1.000960 V	1.000860 V	314.1 µV
	10 V	± 0.01338 V	10 V @ 20 Hz	9.986620 V	10.001830 V	10.013380 V	10.001830 V	1.293 mV
	10 V	± 0.00250 V	10 V @ 1 kHz	9.997500 V	10.001390 V	10.002500 V	10.001390 V	1.063 mV
	10 V	± 0.00272 V	10 V @ 20 kHz	9.997280 V	9.999440 V	10.002720 V	9.999440 V	1.871 mV
	10 V	± 0.05372 V	10V @ 100kHz	9.946280 V	9.988100 V	10.053720 V	9.988100 V	9.492 mV
	10 V	± 0.55450 V	10 V @ 1 MHz	9.445500 V	9.962220 V	10.554500 V	9.962220 V	116.651 mV
	100 V	± 0.0364 V	100 V @ 1 kHz	99.96360 V	100.01580 V	100.03640 V	100.01580 V	25.635 mV
	1000 V	± 0.544 V	700 V @ 1 kHz	699.4560 V	700.1310 V	700.5440 V	700.1310 V	348.04 mV
DC Current Offset -								
	100 µA	± 0.00095 µA	Open	-0.00095 µA	0.00001 µA	0.00095 µA	0.00001 µA	6 nA
	1 mA	± 0.0000065 A	Open	-0.0000065 mA	0.0000048 mA	0.0000065 mA	0.0000048 mA	60 nA
	10 mA	± 0.000065 A	Open	-0.000065 mA	0.000046 mA	0.000065 mA	0.000046 mA	0.6 nA
	100 mA	± 0.00065 A	Open	-0.00065 mA	0.00044 mA	0.00065 mA	0.00044 mA	6 nA
	1 A	± 0.0000115 A	Open	-0.0000115 A	0.0000041 A	0.0000115 A	0.0000041 A	60 nA
DC Current Gain -								
	100 µA	± 0.00356 µA	100 µA	99.99644 µA	100.00333 µA	100.00356 µA	100.00333 µA	3.233 nA
	1 mA	± 0.0000323 A	1 mA	0.9999677 mA	1.0000224 mA	1.0000323 mA	1.0000224 mA	28.86 nA
	10 mA	± 0.000323 A	10 mA	9.999677 mA	10.000291 mA	10.000323 mA	10.000291 mA	288.7 nA
	100 mA	± 0.00489 A	100 mA	99.99511 mA	100.00118 mA	100.00489 mA	100.00118 mA	4.619 µA
	1 A	± 0.0001349 A	1 A	0.9998651 A	1.0000859 A	1.0001349 A	1.0000859 A	132.80 µA

WHITE PAPER:
Competitive Calibration Certificate Breakdown

No indication of 3458 internal temperatures which is critical information during use of the 3458.



Report of Calibration

Manufacturer: Hewlett Packard
Model: 3458A
Description: DMM
Serial Number:

Account Number:
Technician:
Cal. Date:
ID:

Parameter	Range	Tolerance	Nominal	Low Limit	As Found	High Limit	As Left	U *
DC Voltage Offset -								
	100 mV	± 0.00106 mV	Short	-0.00106 mV	-0.00030 mV	0.00106 mV	-0.00030 mV	6 nV
	1 V	± 0.0000106 V	Short	-0.0000106 V	-0.0000031 V	0.0000106 V	-0.0000031 V	6 nV
	10 V	± 0.0000023 V	Short	-0.0000230 V	-0.0000003 V	0.0000230 V	-0.0000003 V	60 nV
	100 V	± 0.000036 V	Short	-0.00003600 V	0.000023 V	0.00003600 V	0.000023 V	0.6 µV
	1000 V	± 0.00010 V	Short	-0.00010000 V	0.00003 V	0.00010000 V	0.00003 V	6 µV

Report of Calibration

Manufacturer: Hewlett Packard
Model: 3458A
Description: DMM
Serial Number:

Account Number:

Their best 0V scope value is 40 nV which is difficult to prove. Ours is 59 nV and we spent a lot of time proving this in our electrical standards lab which has exceptional environmental stability. Doubtful they could achieve close to this in a customer's facility much less 6 nV.

Parameter	Range	Tolerance	Nominal	Low Limit	As Found	High Limit	As Left	U *
DC Voltage Offset -								
	100 mV	± 0.00106 mV	Short	-0.00106 mV	-0.00030 mV	0.00106 mV	-0.00030 mV	6 nV
	1 V	± 0.0000106 V	Short	-0.0000106 V	-0.0000031 V	0.0000106 V	-0.0000031 V	6 nV
	10 V	± 0.0000023 V	Short	-0.0000230 V	-0.0000003 V	0.0000230 V	-0.0000003 V	60 nV
	100 V	± 0.000036 V	Short	-0.00003600 V	0.000023 V	0.00003600 V	0.000023 V	0.6 µV
	1000 V	± 0.00010 V	Short	-0.00010000 V	0.00003 V	0.00010000 V	0.00003 V	6 µV



35 Vantage Point Drive
Rochester, NY 14624
800.828.1470
Transcat.com