

Fumehood Performance Test Report

6' Protector ECHO ASHRAE 110 TEST

Prepared For

Labconco Corporation

Prepared By

AccuTec

Services, Inc.
www.atsiusa.com

Report Date: 02-12-2015

Project No.: 142327

Table of Contents

<u>Title</u>	<u>Section</u>
Report Summary	1
Airflow Velocity Data	2
Airflow Visualization	3
Trace Gas Data	4
Certificates of Calibration	5

1.0 Introduction

- 1.1 This report documents the work performed by AccuTec Services, Inc. for the Labconco Corporation, at the Labconco Manufacturing Plant located in Kansas City, MO.
- 1.2 The scope of the project is to test the as manufactured performance of the 6' Protector ECHO Labconco Laboratory Fume Hood. The Protector ECHO series fume hoods are ductless bench top fume hood equipped with chemical filters.
- 1.3 The fume hood was tested in accordance with the ASHRAE-110 "Method of Testing Performance of Laboratory Fume Hoods": testing protocol; to establish an "As Manufactured" rating for the equipment.
- 1.4 A canopy exhaust connection was used to capture and remove all tracer gas passing through the chemical filters. The canopy exhaust connection measured 750 CFM. This canopy was present throughout the testing process.
 - 1.3.1 ASHRAE 110 testing protocol includes the following tests, utilizing the standard tracer gas sulfur hexafluoride.
 - 1.3.1.1 Breathing zone left, center, right
 - 1.3.1.2 Walk-By
 - 1.3.1.3 Sash Movement Effect
 - 1.3.1.4 Perimeter Scan
 - 1.3.2 A mannequin, with a breathing zone 3" from the sash, is used to simulate lab personnel working in the hood.
 - 1.3.3 Velocity measurements are taken in the center of no greater than 1ft² areas in the opening plane of the fume hood.
 - 1.3.4 Large and small scale visible smoke pattern testing.

2.0 Summary

- 2.1 All test methods were performed in accordance with the guidelines established by the ASHRAE-110 "Method of Testing Performance of Laboratory Fume Hoods"
- 2.2 The Fume Hood airflow was balanced to within the design intake face velocity range and tested at 66 FPM.
- 2.3 Large and small scale smoke sources were used in the work area as well as around the front sash opening to confirm acceptable visible containment and airflow patterns.



- 2.3.1 Airflow velocity data is located in Section 2 of this report.
- 2.3.2 Airflow visualization data is located in section 3 of this report
- 2.3.3 Trace gas test data is located in section 4 of this report.
- 2.3.4 Certificates of calibration are located in section 5 of this report

3.0 Fume Hood Ratings

- 3.1 The 6' Protector ECHO ductless fume hood passed the acceptance criteria of no greater than AM-0.05 as listed in the specifications. The actual rating is shown in the table below.

IPA NIH Fume Hood Test	
Fume Hood SN	140997697B
Rating	AM-0.000



4.0 Abbreviations

- 4.1 The following abbreviations may have been used throughout this report and are represented here for reference.

SME	Sash Movement Effect	AM	As Manufactured
FPM	Feet per minute	Sec.	Seconds
Cal.	Calibration	L/m	Liters per minute
ppm.	Parts Per Million	No.	Number

5.0 Standards Utilized

- 5.1 The following calibrated field equipment was used in the execution of this work. Current certificates of calibration are provided in Section 5 of this report.

Device	Model	Serial No.
TSI Anemometer	966	P07460054
BIOS Flow Meter	Definer 220	119896
USON	200700	2000513

6.0 References

- 5.1 ANSI/ASHRAE 110-1995 "Method of Testing Performance of Laboratory Fume Hoods"
- 5.2 Testing Protocol for ERLAB Ductless Fume Hood, Prepared by Exposure Control Technologies, Inc.

Airflow Velocity Test Report

Project: Labconco
 Location: Labconco Test Lab
 Manufacturer: Labconco
 Unit ID: 182610002

Model: Protector ECHO
 Serial No.: 140997697B
 Type: Ductless Fume Hood

Position of Sash (Percent Open)			100%
Average Airflow Face Velocity (fpm)			64
Highest Airflow Face Velocity (fpm)			72
Lowest Airflow Face Velocity (fpm)			58

16" Actual Sash Height
62.25" Actual Sash Width
16" Design Sash Height
62.25" Design Sash Width
Vertical Sash Configuration
60 fpm Design Airflow Face Velocity

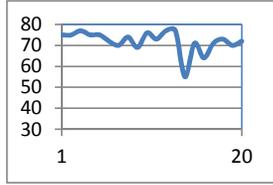
Notes: Tested with a canopy exhaust connection, 750 CFM.

Acceptance Criteria: X Has Been Met Has Not Been Met

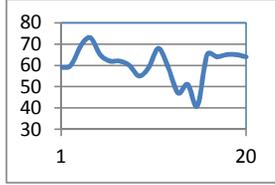
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Technician: CLF Test Date: 19-Jan-15

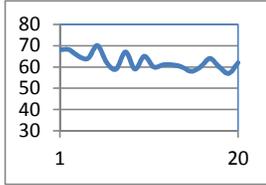
Airflow Velocity Test Report



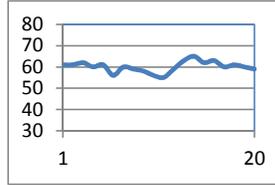
Max Velocity:	77 fpm
Min Velocity:	55 fpm
Avg Velocity:	72 fpm



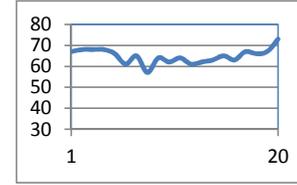
Max Velocity:	73 fpm
Min Velocity:	41 fpm
Avg Velocity:	61 fpm



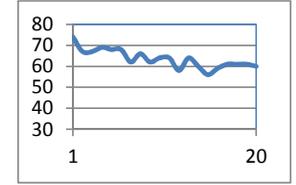
Max Velocity:	70 fpm
Min Velocity:	57 fpm
Avg Velocity:	63 fpm



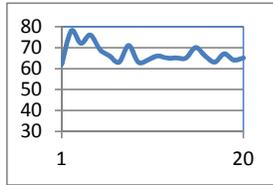
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Min Velocity:	55 fpm
Avg Velocity:	60 fpm



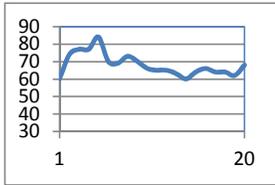
Max Velocity:	73 fpm
Min Velocity:	57 fpm
Avg Velocity:	65 fpm



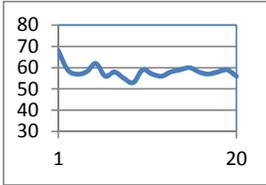
Max Velocity:	74 fpm
Min Velocity:	56 fpm
Avg Velocity:	64 fpm



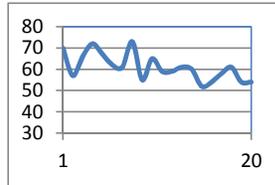
Max Velocity:	78 fpm
Min Velocity:	62 fpm
Avg Velocity:	67 fpm



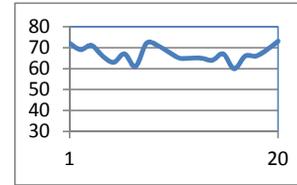
Max Velocity:	84 fpm
Min Velocity:	60 fpm
Avg Velocity:	68 fpm



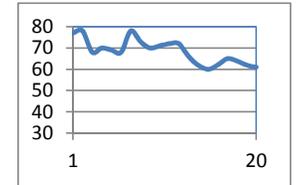
Max Velocity:	68 fpm
Min Velocity:	53 fpm
Avg Velocity:	58 fpm



Max Velocity:	73 fpm
Min Velocity:	52 fpm
Avg Velocity:	61 fpm



Max Velocity:	73 fpm
Min Velocity:	60 fpm
Avg Velocity:	67 fpm



Max Velocity:	78 fpm
Min Velocity:	60 fpm
Avg Velocity:	68 fpm

Total:

Avg Velocity:	64 fpm
Max Velocity:	72 fpm
Min Velocity:	58 fpm

Airflow Visualization Test Report (Local)

Project: Labconco
 Location: Labconco Test Lab
 Manufacturer: Labconco
 Unit ID: 182610002

Model: Protector ECHO
 Serial No.: 140997697B
 Type: Ductless Fume Hood

Challenge: Local Large Volume

<u>16"</u>	Sash Height	Narrative: _____
<u>62.25"</u>	Sash Width	_____
<u>Vertical</u>	Sash Configuration	_____
<u>Smoke Pen</u>	Challenge Medium	_____

Airfoil Test: Pass Fail

Sash Perimeter Test: Pass Fail

Sash Bottom Test: Pass Fail

Work Surface Test: Pass Fail

Hood Cavity Test: Pass Fail

Sash Closed Perimeter/Interior Test: Pass Fail

Acceptance Criteria: Has Been Met Has Not Been Met

Notes: _____

Technician: CLF

Test Date: 19-Jan-15

Airflow Visualization Test Report (Large Volume)

Project: Labconco
Location: Labconco Test Lab
Manufacturer: Labconco
Unit ID: 182610002

Model: Protector ECHO
Serial No.: 140997697B
Type: Ductless Fume Hood

Challenge: Local Large Volume

<u>16"</u>	Sash Height	Narrative: _____ _____ _____ _____ _____
<u>62.25"</u>	Sash Width	
<u>Vertical</u>	Sash Configuration	
<u>Glycol Fogger</u>	Challenge Medium	

Airfoil Test: Pass Fail

Sash Perimeter Test: Pass Fail

Sash Bottom Test: Pass Fail

Work Surface Test: Pass Fail

Hood Cavity Test: Pass Fail

Sash Closed Perimeter/Interior Test: Pass Fail

Acceptance Criteria: Has Been Met Has Not Been Met

Notes: _____

Technician: CLF Test Date: 19-Jan-15

Tracer Gas Containment Test Report

Project: Labconco
 Location: Labconco Test Lab
 Manufacturer: Labconco
 Unit ID: 182610002

Model: Protector ECHO
 Serial No.: 140997697B
 Type: Ductless Fume Hood

	Left	Center	Right
Average Concentration:	<u>0.000</u>	<u>0.000</u>	<u>0.000</u>
Peak Concentration:	<u>0.000</u>	<u>0.000</u>	<u>0.000</u>

Static Mode Performance Rating: AM- 0.000

		Notes:
<u>16"</u>	Sash Height	<u></u>
<u>62.25"</u>	Sash Width	<u></u>
<u>Vertical</u>	Sash Configuration	<u></u>
<u>5.98 L/m</u>	Tracer Gas Release Rate	<u></u>
		<u></u>
		<u></u>
		<u></u>

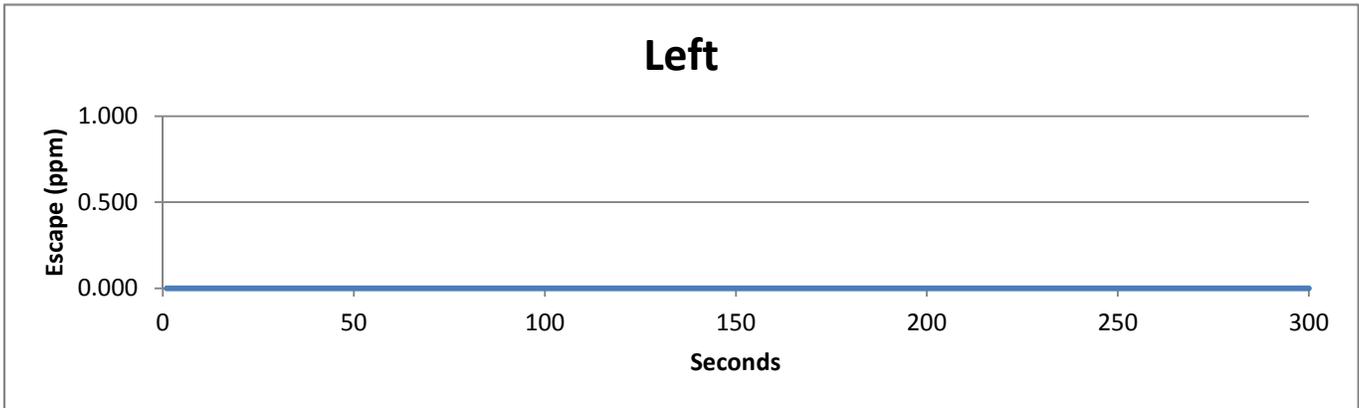
Acceptance Criteria: X Has Been Met Has Not Been Met

Notes:

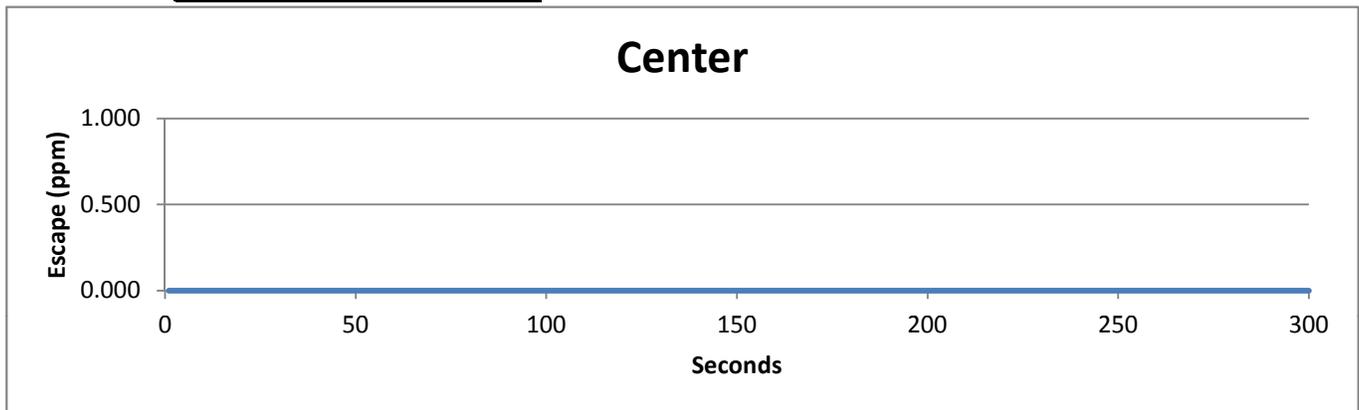
Standards Utilized: USON 200700 Cal. Due Date: 13-Mar-15

Technician: CLF Test Date: 19-Jan-15

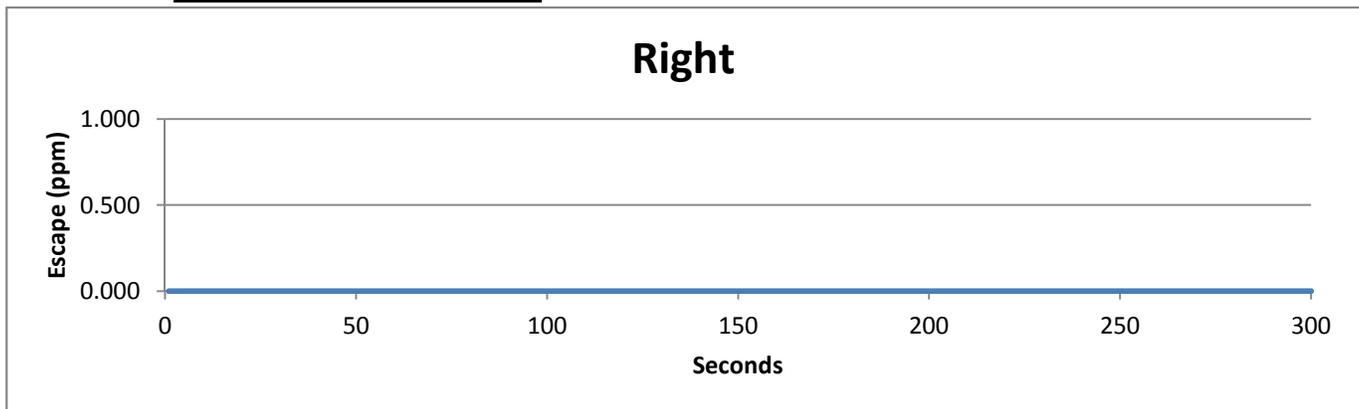
Tracer Gas Containment Test Report



Average:	0.000	ppm
Peak:	0.000	ppm



Average:	0.000	ppm
Peak:	0.000	ppm



Average:	0.000	ppm
Peak:	0.000	ppm

Tracer Gas Containment Report
Sash Movement Effect Report

Project: Labconco
 Location: Labconco Test Lab
 Manufacturer: Labconco
 Unit ID: 182610002

Model: Protector ECHO
 Serial No.: 140997697B
 Type: Ductless Fume Hood

Tracer Gas Concentration (ppm)				
Time Span	Data Set No.	Cycle 1 Open	Cycle 2 Open	Cycle 3 Open
0-45 Secs	1	0.000	0.000	0.002
1-46 Secs	2	0.000	0.000	0.002
2-47 Secs	3	0.000	0.000	0.002
3-48 Secs	4	0.000	0.000	0.002
4-49 Secs	5	0.000	0.000	0.002
5-50 Secs	6	0.000	0.000	0.002
6-51 Secs	7	0.000	0.000	0.002
7-52 Secs	8	0.000	0.000	0.002
8-53 Secs	9	0.000	0.000	0.002
9-54 Secs	10	0.000	0.000	0.003
10-55 Secs	11	0.000	0.000	0.003
11-56 Secs	12	0.000	0.000	0.003
12-57 Secs	13	0.000	0.000	0.003
13-58 Secs	14	0.000	0.000	0.003
14-59 Secs	15	0.000	0.000	0.003
15-60 Secs	16	0.000	0.000	0.003
Total		0.000	0.000	0.039
Average		0.000	0.000	0.002
SME-AM		0.002		

16" Sash Height
62.25" Sash Width
Vertical Sash Configuration
5.98 L/m Tracer Gas Release Rate

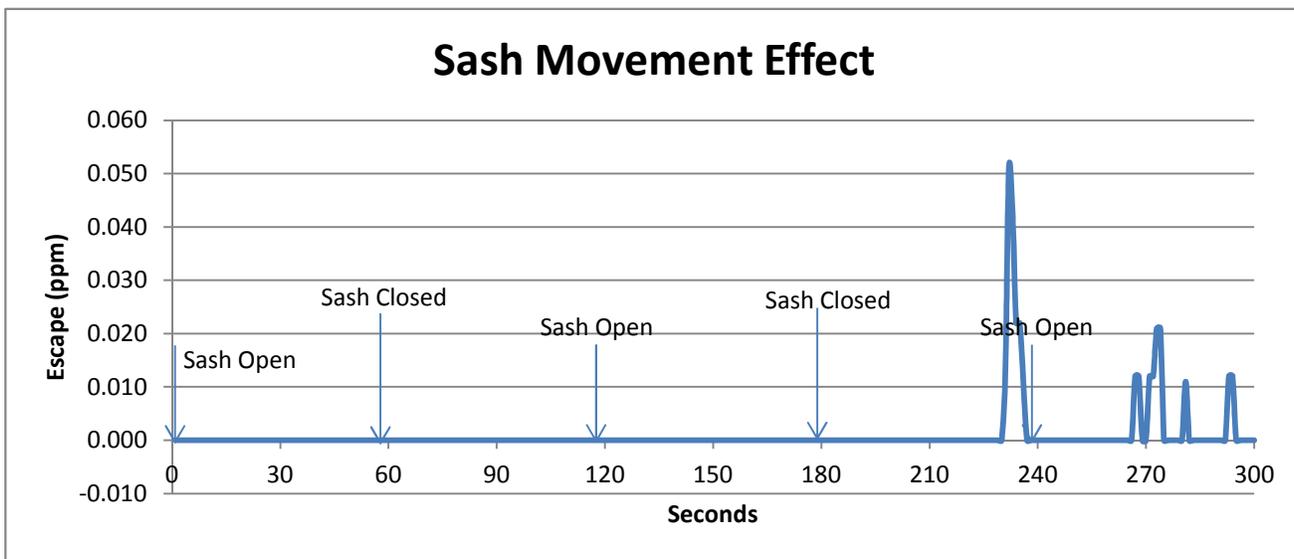
Notes: _____

Acceptance Criteria: X Has Been Met Has Not Been Met

Standards Utilized: USON 200700 Cal. Due Date: 13-Mar-15

Technician: CLF Test Date: 19-Jan-15

Tracer Gas Containment Report Sash Movement Effect



Narrative:

Notes: Spike detected during second closing. No known cause of detection events towards end of test. Levels returned to zero.

**Tracer Gas Containment Report
 Perimeter Scan**

Project: Labconco
 Location: Labconco Test Lab
 Manufacturer: Labconco
 Unit ID: 182610002

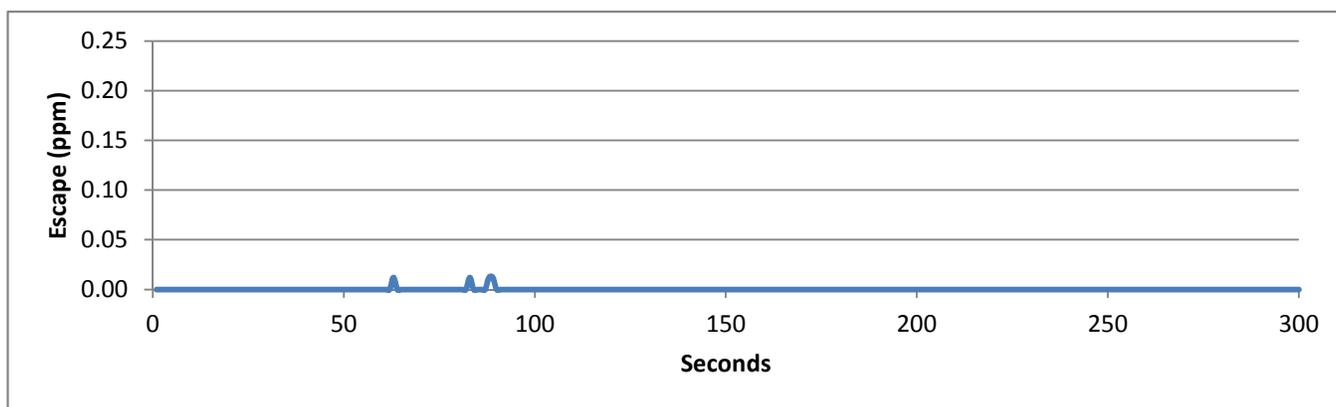
Model: Protector ECHO
 Serial No.: 140997697B
 Type: Ductless Fume Hood

Location and Concentration of Leakage:

Indicate location of leaks and concentration below

<u>28"</u>	Sash Height	Notes: _____ _____ _____ _____
<u>62.25"</u>	Sash Width	
<u>Vertical</u>	Sash Configuration	
<u>5.98 L/m</u>	Tracer Gas Release Rate	

Perimeter Scan Graph



Acceptance Criteria: Has Been Met Has Not Been Met

Standards Utilized: USON 200700 Cal. Due Date: 13-MAR-15

Technician: CLF Test Date: 25-Jul-12



Calibration Certificate

Certificate No.	5052989	Sold to:	AccuTec Services Inc. - Lee's Summit
Product	Definer 220 Medium Flow		320 NW Capital Drive
Serial No.	119896		Lee's Summit, MO 64086
Cal. Date	12-Jan-2015		USA

All calibrations are performed at Mesa Laboratories, Inc., 10 Park Place, Butler, NJ, 07405, an ISO 17025:2005 accredited laboratory through NVLAP of NIST. This report shall not be reproduced except in full without the written approval of the laboratory. Results only relate to the items calibrated. This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

As Received Calibration Data

Technician Lilianna Malinowska
 Lab. Pressure 759 mmHg
 Lab. Temperature 22.5 °C

Instrument Reading	Lab Standard Reading	Deviation	Allowable Deviation	As Received
103.19 sccm	100.765 sccm	2.41 % %	1.00%	Out of Tolerance
1023.4 sccm	1000.5 sccm	2.29 % %	1.00%	Out of Tolerance
5119.6 sccm	5001.35 sccm	2.36 % %	1.00%	Out of Tolerance
17.4 °C	22.5 °C	-5.1 °C	±0.8°C	Out of Tolerance
758 mmHg	759 mmHg	-1.0 mmHg	±3.5mmHg	In Tolerance

Mesa Laboratoires Standards Used

Description	Standard Serial Number	Calibration Date	Calibration Due Date
ML-800-24	117991	22-Apr-2014	22-Apr-2015
Precision Thermometer	305460	9-Sep-2014	9-Sep-2015
Precision Barometer	2981392	24-Jun-2014	24-Jun-2015

Mesa Laboratories Inc. 10 Park Place Butler, NJ 07405 USA
 (973) 492-8400 FAX (973) 492-8270 www.mesalabs.com Symbol "MLAB" on the NASDAQ



MesaLabs



NVLAP Lab Code 200661-0

As Shipped Calibration Data

Certificate No. 5052989

Technician Lilianna Malinowska

Lab. Pressure 759 mmHg

Lab. Temperature 22.6 °C

Instrument Reading	Lab Standard Reading	Deviation	Allowable Deviation	As Shipped
102.19 sccm	101.755 sccm	0.43 %%	1.00%	In Tolerance
1004.5 sccm	1000.7 sccm	0.38 %%	1.00%	In Tolerance
5028.4 sccm	5001.45 sccm	0.54 %%	1.00%	In Tolerance
22.6 °C	22.6 °C	-	±0.8°C	In Tolerance
759 mmHg	759 mmHg	-	±3.5mmHg	In Tolerance

Mesa Laboratories Standards Used

Description	Standard Serial Number	Calibration Date	Calibration Due Date
ML-800-24	100439	8-May-2014	8-May-2015
Precision Thermometer	305460	9-Sep-2014	9-Sep-2015
Precision Barometer	2981392	24-Jun-2014	24-Jun-2015

Calibration Notes

The expanded uncertainty of flow, temperature, and pressure measurements all have a coverage factor of $k = 2$ for a confidence interval of approximately 95%.

Flow testing is in accordance with our test number PR18-13 with an expanded uncertainty of 0.18% using high-purity nitrogen or filtered laboratory air. Flow readings in sccm are performed at STP of 21.1°C and 760 mmHg.

Pressure testing is in accordance with our test number PR18-11 with an expanded uncertainty of 0.16 mmHg.

Temperature testing is in accordance with our test number PR18-12 with an expanded uncertainty of 0.04 °C.

Traceability to the International System of Units (SI) is verified by accreditation to ISO/IEC 17025 by NVLAP under NVLAP Code 200661-0.

Technician Notes:

David W. Wilson, Chief Metrologist

MODEL 200 CERTIFICATE OF CALIBRATION

Certificate Number: 200-9518	Customer Order No:
Customer: Labconco Corporation	Service report No 004768
Model Number: 200700	Serial Number : 2000513

CALIBRATION PROCEDURE

- The instrument was switched on for a period of 30 minutes prior to calibration.
- The instrument was calibrated at the CALIBRATION point to give a correct display.
- The calibration was carried out using the following devices that are traceable to national standards.

1. DEVICES USED

Temperature Indicator Ai 0767	Ambient temperature during calibration 21.8 °C
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2. CALIBRATION POINT & SINTER TYPE FITTED AT CALIBRATION

Cal @ 1x10 ⁻⁶ ml/s H <input checked="" type="checkbox"/>	Cal @ 1x10 ⁻⁶ ml/s M <input type="checkbox"/>	Cal @ 1x10 ⁻⁵ ml/s L <input type="checkbox"/>
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3. SF₆ STANDARD LEAK SERIAL NUMBERS & RESULTS

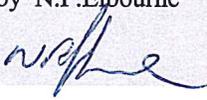
SF ₆ Applied Sample ml/s (ppm)	Standard Leak (Serial Number)	Pre Adjustment Value* (ppm)	Post Adjustment Value* (ppm)
0.01± 0.01+ <u>1</u> digit	1.0 x 10 ⁻⁸ (Ai1128)	0.00	0.01
0.10± 0.01+ <u>1</u> digit	1.0 x 10 ⁻⁷ (Ai1130)	0.02	0.10
1.0± 0.1 + <u>1</u> digit	1.0 x 10 ⁻⁶ (Ai1129)	0.39	1.00
10.0± 1.0 + <u>1</u> digit	1.0 x 10 ⁻⁵ (Ai1131)	3.10	9.39

Terms used, H, M, L Sinter type, ml/s milli-litres per second, Std standard, N/A - Not Applicable, SF₆ - Sulphur Hexafluoride, PPM - part per million.

* Indication relative to atmospheric concentration

4. APPROVAL

Pre-adjustment Calibration Passed Failed Refer to service report for
 Post-adjustment Calibration Passed Failed failure information.

Calibrated by N.P.Elbourne 	Date of Calibration 13th March 2014
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Western Way
Bury St. Edmunds
Suffolk, IP33 3SP, United Kingdom
tel +44 (0)1284 760606 fax +44 (0)1284 763049
www.uson.com

Consignment Certificate for The Carriage of Dangerous Goods and Use of Transportable Pressure
Equipment Regulations 2009 (CDG 2009) (as amended 2011)

Name and address of the Consignor: USON LTD
WESTERN WAY
BURY ST. EDMUNDS
SUFFOLK
IP33 3SP
UK

Telephone Number of the Consignor +44(0)1284 760606

Name and address of the Consignee: Labconco Corporation
2700E
88th Terrace
Kansas City
Mo 64132
USA

Nuclide Ni-63

Physical and Chemical Form Solid Electro-deposited source contained inside a source capsule.

United Nations Class Number 7

Shipping Name UN2911 RADIOACTIVE MATERIAL EXCEPTED
PACKAGE INSTRUMENT

Activity (MBq) 370

Type of Package EXCEPTED

Transport Index (TI) NOT APPLICABLE

DECLARATION:

I hereby declare that the contents of this consignment are fully and accurately described above by the labeled in all respects in the proper conditions for transport by road according to the applicable international and national proper shipping name and are classified, packed, marked and government regulations.

Signed on behalf of Uson Ltd


.....

Name (print) N.P. ELBOURNE Date 24 MARCH 2014

UNIVERSITY OF EAST ANGLIA

The Ionising Radiations Regulations 1999

RADIOACTIVE SOURCE - CERTIFICATE OF TEST FOR LEAKAGE

SOURCE IDENTIFICATION NUMBER: 028706	
Instrument Serial No: 2000513	Instrument part no: 200700

Reason for test: Re-wipe

Nuclide: Ni-63

Date of wipe: 13 MARCH 2014

Physical form of source: Electrodeposited foil

Wipe performed by: N. P. ELBOURNE

Activity: 370 mBq

Signature: **DETAILS OF TEST**

Method used: The source is wiped with a glass fibre disc moistened with a methanol/water mixture. The disc is counted with a liquid scintillation counter and the activity is compared with that of a standardised reference solution of Ni-63 of known activity. This procedure follows method 5.3.1 of International Standard ISO 9978:1992 (Radiation Protection - Sealed Radioactive Sources - Leakage Test Methods).

Counter used: Hidex 300 SL

Activity of standard reference solution: 231 ± 8 Bq

Counting period: 60s

Background count: 38 CPM

Reference count: 9944 CPM

Sample count (1): 206 cpm Repeat (2): 191 cpm

Estimated activity of sample: 3 Bq

- Notes: (i) The limit of detection is less than 1 Bq. Samples for which the estimated activity is less than this amount are recorded as "< 1 Bq".
- (ii) The approval criteria of ISO 9978:1992 (para 5.3.3) are used. These state that if the activity detected does not exceed 200 Bq the source is considered to be leaktight.

STATEMENT OF TEST RESULT

This is to certify that the radioactive source described above has been tested for leakage in accordance with the requirements of section 27(3) of the Ionising Radiations Regulations 1999 and that the source is leak-free.

Name: **J. G. ADAMS**Position: **SAFETY TECHNICIAN**Signed: 

Date: 13th March 2014

UNIVERSITY OF EAST ANGLIA SAFETY SERVICES, NORWICH, NR4 7TJ