



Controlled Environment Testing Report

Client: BenchPro, Inc.

Services Conducted: Product Testing

Report ID#: BEN09272016

Project Contact: Stefan Hocom

**Project Manager: Stefan E. Hocom
CPS Certification Services, Inc.
323 Spreckels Drive, Ste. B
Aptos, CA 95003**

The final approval of this document before its release to the client is the responsibility of the following personnel at CPS Certification Services, Inc. In signing this cover sheet, these individuals acknowledge the accuracy of the data and activities reported herein:

A handwritten signature in black ink, appearing to read 'Stefan Hocom', is written over a horizontal line.

**Stefan Hocom
Project Manager**

Date: 09/27/16

Reviewed and Approved by:

A handwritten signature in black ink, appearing to read 'Stephanie Hocom', is written over a horizontal line.

**Stephanie Hocom, ASQ CQA
President**

Date: 09/27/16

1.0 Introduction

The purpose of this report is to present the data and conclusions derived by CPS Certification Services, Inc. during the testing of two (2) cleanroom tables designed and built by BenchPro, Inc. located at 23949 Tecate Mission Road, Tecate, Ca.

This testing was conducted on the date of September 27, 2016 consisted of the following:

- Airborne particle concentrations

This report includes the following:

- Test data results
- Testing diagrams¹
- Observations
- Equipment calibration documents

¹Diagrams are not to scale.

1.1 References

- ISO 14644-1 – Classification of Air Cleanliness
- ISO 14644-3 – Test Methods
- IES-RP-CC006.2 – Testing Cleanrooms

If you have any questions as to the contents of this report please contact us at (831) 662-2760.

2.0 Airborne Particle Concentration Test

2.1. Purpose

Airborne particle concentration testing is conducted to verify a products airborne particle concentration within a classified cleanroom environment.

2.2. Equipment

- 2.2.1. Met-One laser particle counter with 0.1 micron capability
- 2.2.2. Shortridge microprocessor based thermal anemometer
- 2.2.3. Shortridge microprocessor based manometer
- 2.2.4. 5' x 3' x 8' ISO class 3 test chamber with perforated raised floor

2.3. Methodology

Certification of the test chamber was conducted prior to product testing to verify ISO class 3 levels.

Results are as follows:

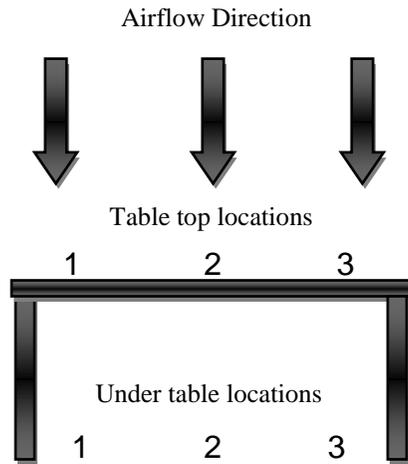
- Average ULPA filter velocity = 98 FPM (feet per minute)
- Differential pressure = 0.0989 to ambient
- ULPA filter leaks = No leaks detected at 0.1 micron
- Particle concentration level = 0 particles at 0.1 micron

Once the ISO class 3 chamber status was verified each table was assembled and micro-cleaned with 70/30 DI water/alcohol and cleanroom wipes. The tables were tested individually and all test data was recorded at the time of testing and transferred to this report. Refer to the section "Airborne Particle Count Record" for all test data.

2.3.1. Test locations (see Figure 1)

- 2.3.1.1. Testing was conducted at six (6) total sample locations for each table. Three samples from the top midline of table and three midline samples at floor level. The sample probe was placed at each location at an approximate height of 8 inches.

Figure 1 - Sample locations



2.3.2. Test Descriptions

2.3.2.1. Static Test

Table is placed alone in chamber. This test reflects the total particle contribution to chamber from table.

2.4. ISO 14644-1 Classification Comparison and Recommendation

Currently there is no standard that allows for a cleanroom table to acquire an ISO cleanroom classification or a comparable rating. It is recommended that when promoting a product as clean, that airborne particle concentration levels fall below the ISO 14644-1 particle concentration limits for the desired class.

2.4.1. ISO 14644-1:1999(E) Classification Table

ISO Class	Particle concentration limits in cubic meters (m ³)					
	0.1μ	0.2μ	0.3μ	0.5μ	1.0μ	5.0μ
ISO 1	10	2				
ISO 2	100	24	10	4		
ISO 3	1,000	237	102	35	8	
ISO 4	10,000	2,370	1,020	352	83	
ISO 5	100,000	23,700	10,200	3,520	832	29
ISO 6	1,000,000	237,000	102,000	35,200	8,320	293
ISO 7				352,000	83,200	2,930
ISO 8				3,520,000	832,000	29,300
ISO 9				35,200,000	8,320,000	293,000

2.5. Test Results

2.5.1. K Series Stainless Steel Frame and Top



2.5.1.1. Airborne Particle Count Record

Table Top Test

Product	KSN2448 (Stainless Table)						Test Location:	Table Top				
Testing Technician:	Stefan Hocom						Particle Size:	0.1 µm				
Test Date:	9/27/2016						Sample Volume:	1.0 CFM				
		Cumulative Counts/ft ³					Cumulative Counts/m ³					
						Limit:	≤100000	≤23700	≤10200	≤3520	≤832	
Location #	Time	0.1 µm	0.2 µm	0.3 µm	0.5 µm	1.0 µm	0.1 µm	0.2 µm	0.3 µm	0.5 µm	1.0 µm	
1	13:58:57	0	0	0	0	0	0	0	0	0	0	
2	14:00:10	0	0	0	0	0	0	0	0	0	0	
3	14:01:21	0	0	0	0	0	0	0	0	0	0	
95% UCL (if 2 to 9 locations)		0	0	0	0	0	0	0	0	0	0	
Remarks : Consistant with ISO class 1 particle concentrations												

Under Table Test

Airborne Particle Concentration												
Product	KSN2448 (Stainless Table)						Test Location:	Under Table				
Testing Technician:	Stefan Hocom						Particle Size:	0.1 µm				
Test Date:	9/27/2016						Sample Volume:	1.0 CFM				
		Cumulative Counts/ft ³					Cumulative Counts/m ³					
						Limit:	≤100000	≤23700	≤10200	≤3520	≤832	
Location #	Time	0.1 µm	0.2 µm	0.3 µm	0.5 µm	1.0 µm	0.1 µm	0.2 µm	0.3 µm	0.5 µm	1.0 µm	
1	14:03:21	2	0	0	0	0	71	0	0	0	0	
2	14:05:24	0	0	0	0	0	0	0	0	0	0	
3	14:06:37	2	0	0	0	0	71	0	0	0	0	
95% UCL (if 2 to 9 locations)		6	0	0	0	0	195	0	0	0	0	
Remarks : Consistant with ISO class 3 particle concentrations												

2.5.2. K Series Stainless Steel Frame with 1" Phenolic Resin Top



2.5.2.1. Airborne Particle Count Record

Table Top Test

Airborne Particle Concentration												
Product	KSY2448 (Resin Table)						Test Location:	Table Top				
Testing Technician:	Stefan Hocom						Particle Size:	0.1 µm				
Test Date:	9/27/2016						Sample Volume:	1.0 CFM				
Location #	Time	Cumulative Counts/ft ³					Cumulative Counts/m ³					
		0.1 µm	0.2 µm	0.3 µm	0.5 µm	1.0 µm	Limit: ≤100000	≤23700	≤10200	≤3520	≤832	
1	14:10:30	0	0	0	0	0	0	0	0	0	0	0
2	14:11:41	0	0	0	0	0	0	0	0	0	0	0
3	14:12:54	0	0	0	0	0	0	0	0	0	0	0
95% UCL (if 2 to 9 locations)		0	0	0	0	0	0	0	0	0	0	0
Remarks : Consistant with ISO class 1 particle concentrations												

Under Table Test

Airborne Particle Concentration												
Product	KSY2448 (Resin Table)						Test Location:	Under Table				
Testing Technician:	Stefan Hocom						Particle Size:	0.1 µm				
Test Date:	9/27/2016						Sample Volume:	1.0 CFM				
Location #	Time	Cumulative Counts/ft ³					Cumulative Counts/m ³					
		0.1 µm	0.2 µm	0.3 µm	0.5 µm	1.0 µm	Limit: ≤100000	≤23700	≤10200	≤3520	≤832	
1	14:16:41	0	0	0	0	0	0	0	0	0	0	0
2	14:17:51	4	2	1	0	0	141	71	35	0	0	0
3	14:19:05	4	0	0	0	0	141	0	0	0	0	0
95% UCL (if 2 to 9 locations)		11	5	2	0	0	391	172	86	0	0	0
Remarks : Consistant with ISO class 3 particle concentrations												

2.6. Observations

- The tables were sturdy and easy to assemble. They both cleaned up well with IPA/DI and cleanroom wipes. The quality of each table is in-line with approved cleanroom materials and fixtures.