

Customer: NanoCool, LLC
Document Type: Qualification Report
Product: 2-85201
Document Date: 11 February 2011
Document Number: QMOC -004-11 rev. 00

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Qualification Report For the 2-85201 NanoCool Shipping System

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Purpose

This report outlines testing for the qualification of the 2-85201 NanoCool shipping system. Systems were tested against the ISTA-7D Summer forty-eight hour profile (Chart 1) and drop tested against a modified ISTA 3A drop procedure.

Summary

Testing was conducted using the 2-85201 NanoCool shipping systems. Four 2-85201 systems were tested against the ISTA-7D Summer forty-eight hour profile (Chart 1) and three systems were drop tested against a modified ISTA 3A drop procedure (Chart 2). The systems tested against ISTA-7D summer had a product temperature range from 2.2 to 6.7°C over forty-eight hours. The systems drop tested passed with no significant damage to the outer box, VIPs, or cooler engine.

Chart 1 - ISTA-7D 48 Hour Summer Profile

Temperature °C	Summer	
	Hours	Elapsed Time
22	4	4
35	2	6
30	36	42
35	6	48

Thermal Test Procedures

Testing was conducted using one 60mL Nalgene bottle as a placebo product. All placebo products contain deionized water. A single 60mL Nalgene bottle was probed with a thermocouple to monitor the product temperature during testing.

Prepare for testing:

- Precondition the 60mL Nalgene bottles at 3-5°C for 24 hours
- Prepare TIS (test information sheets), assign logger and chamber
- Prepare NanoCool shipping systems according to TIS sheet
- Obtain appropriate coolers for testing
- Assign coolers to boxes, documenting cooler numbers and box numbers on TIS

When coolers, boxes, products and chambers are prepared start hook-up procedures.

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Hook-Up Procedure

- Open box and remove cooler
- Place cooler upside down, dome up, and activate
- Obtain 60mL Nalgene bottle
- Tape the assigned thermocouple to the broadest side of the triangle with the thermocouple end on the marked line (30mm from the base of the triangle) with the rest of the thermocouple running up the long side of the triangle.
- Insert the triangle into the chipboard box ensuring that the thermocouple is facing the product, and then insert the product base first
- Place probed bottle in the payload cavity with the thermocouple to the center of the box
- Place cooler onto the box
- Close outer box
- Place systems in the chamber
- Ensure that boxes are not touching
- Close chamber
- Turn on logger
- Turn on chamber with correct testing profile

Down-loading and Autopsy Procedure

- Download loggers according to download procedures
- Graph experiments according to graphing procedures and information on the test information sheet
- Analyze data to determine if the units passed or failed the 2-8°C product temperature specifications at forty-eight hours.
- Chamber used for test WFB2010-#114 was: ZP0553772; Logger: EL-8173

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Drop Test Procedures

The purpose of this test is to evaluate the durability of the 2-85201 NanoCool shipping system. Three 2-85201 NanoCool shipping systems were drop tested against the ISTA-3A protocol (see Chart 2) with the addition of two 60" face one drops during the procedure. The two 60" drops on face one are to test the integrity of the NanoCool shipping system's engine.

After the completion of the ISTA test sequence, the NanoCool shipping system is opened and inspected to see if it passes the acceptance criteria (see below). If the system passes the acceptance criteria guidelines the units are inspected again after twenty-four hours.

Chart 2: Drop Sequence

ISTA 3A Drop Sequence		
Drop Number	Drop Height (in)	Orientation
1	18"	Edge 3-4
2	18"	Edge 3-6
3	18"	Edge 4-6
4	18"	Corner 3-4-6
5	18"	Corner 2-3-5
6	18"	Edge 2-3
7	18"	Edge 1-2
8	36"	Face 3
9	18"	Face 3
10	60"	Face 1 on Hazard
11	18"	Edge 3-4
12	18"	Edge 3-6
13	18"	Edge 1-5
14	18"	Corner 3-4-6
15	18"	Corner 1-2-6
16	18"	Corner 1-4-5
17	36"	Face 1
18	60"	Face 1

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Set-up

Each unit will be assembled in the following manner prior to the initiation of ISTA 3A.

- Obtain correct systems
- Ensure package component integrity prior to testing
- Remove cooler and activate if specified
- Replace cooler engine
- Close NanoCool shipping unit
- Using packing-style adhesive tape, seal the shipping units in the manner indicated by the shipping unit graphics, sealing face 2 to face 5, face 2 to face 6, and face 2 to face 3
- Number outer shipping box according to ISTA-3A drop testing procedures
- Establish 18", 36" and 60" drop testing height

Inspection and Acceptance Criteria

Visually inspect the NanoCool shipping systems for the following:

- Rips in the corrugate shipping case material
- Adhesion of the foam pad to the inside of Face 1
- Cooler engine integrity
 - Burst bladder
 - Loss of vacuum
- Integrity of the vacuum insulation panel (VIP)
 - Loss of vacuum
 - Structure maintained

Failure: loss of cooler or VIP integrity as listed above.
Document all other observations related to above criteria.

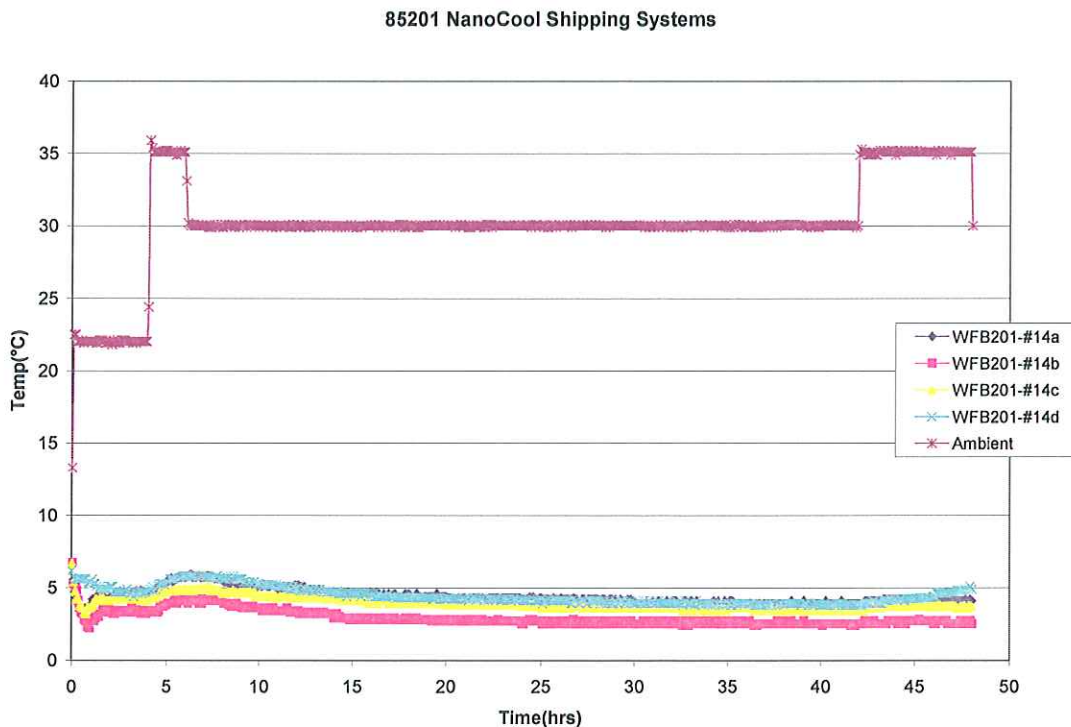
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Summary of Results

ISTA-7D 48 Hour Summer Profile

Test WFB2010-#114 tested four 2-85201 NanoCool shipping systems. The test was performed against the ISTA-7D summer forty-eight hour profile (Graph 1). One 60mL Nalgene bottle was used as a placebo product. The product temperature ranged from 2.2 to 6.7C over the forty-eight hour test and the average product temperature at forty-eight hours was 3.8C.

Graph 1: ISTA-7D Summer



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Chart 3 lists the maximum and minimum temperature recorded during testing or the first time the product temperature records below 2°C or above 8°C. The forty-eight hour end product temperature is also noted. When a reading occurs more than once, the time of the first occurrence is shown.

Chart 3: ISTA-7D Summer

Test #	Profile	Minimum temperature recorded or first time product temperature measured below 2°C		Maximum temperature recorded or first time product temperature measured above 8°C		Temp. @ 48 Hours, °C
		Temp., °C	Time, Hours	Temp., °C	Time, Hours	
WFB2010-#114a	Summer	3.4	0.67	6.7	0.00	4.1
WFB2010-#114b	Summer	2.2	0.92	6.7	0.00	2.5
WFB2010-#114c	Summer	3.2	0.75	6.7	0.00	3.7
WFB2010-#114f	Summer	3.8	32.58	6.2	0.00	4.9

ISTA-3A Drop Test

Three 2-85201 NanoCool shipping systems were tested against a modified ISTA-3A drop sequence (Chart 2). All of the systems passed when checked against the acceptance criteria outlined earlier in the report. The NanoCool cooler engines maintained vacuum and cooling properties. The units were still functioning after twenty four hours. All three insulation systems remained under vacuum and there was no significant damage to the vacuum insulation panels.

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Conclusion

The tests have shown that this system maintains 2 to 8°C when tested against the ISTA-7D forty-eight summer profile. The system also passes drop testing against the modified ISTA-3A drop sequence, which shows that the system meets NanoCool's requirements for durability. These results are reported in good faith and the customer should use their judgment as to whether the system is appropriate for their application.

Liability Restriction:

It should be noted that this report represents test results carried out by NanoCool LLC in good faith. As such we cannot be responsible for the handling and usage of the systems tested; we restrict our liability to the replacement of any components supplied which are not to agreed specification. Customers are advised to check the appropriateness of the testing parameters for their shipping conditions. As with any cool shipping system used in normal warehouse conditions some condensation will occur, we advise that the effect of this condensation on the product to be shipped is checked prior to usage.


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Final QMOC/Protocol Approval

The signatures listed below indicate that these representatives have reviewed this document and approve of the QMOC/Protocol activities and data documented herein. When all approval signatures have been obtained, the QMOC/Protocol is considered complete.

Written By

Signature:  Date: 2-11-11
Product Development/Tech Services

Approved By

Signature:  Date: 2/14/11
Operations

Signature:  Date: 2/11/11
Quality

Signature: *Email Dated 2/16/11* Date: 2/16/11
Sales

Environmental Test Chamber Register

Description	Dimensions	Model #	Serial #	Calibrated	Manufacturer	Range
Test Chamber #5 Sammi	30" x 30" x 30"	Z-Plus 16	ZP0553772	Annually	Cincinnati Sub-Zero	-20 °C to +50 °C
Register approved	Wendy White		December 2009		Name Date	

Data Logger Register

Description	Note	Model #	Serial #	Calibrated	Manufacturer	Range
Data Logger Rene	16 temp. channels, 1 pulse channel, 1 event channel	1025	EL-8173	Annually	Eltek Instruments	-200 °C to +200 °C
Register approved	Wendy White		March 2010		Name Date	