Eppendorf's Comments on the Draft 1 Test Method

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3 DEFINITIONS

Q) Net Usable Volume

Some racking would allow using the space in front of the shelf. Therefore, this extra space should be included in net usable volume.

AA) Definition of steady state

The condition where the average temperature of all thermocouples changes less than 0.2°C from one 24-hour period or refrigeration cycle to the next. We feel that 0.2°C is too tight for ULT freezer and that 0.5°C is more reasonable. Published limits of error for type T thermocouples is 0.5°C. Due to thermocouple accuracy and an uncertainty in repeatability of thermocouples, we recommend that the temperature variation be changed from 0.2°C to 0.5°C.

4 TEST SETUP

1) Ambient Conditions
e) Lighting and f) Radiant Heat

General statement – We feel for ULF testing that lighting and radiant heat specifications would not be necessary. Typically a customer would setup the freezer closer to the wall than 1500mm.

2) Instrumentation specifications

b) Temperature Measuring Instruments

All temperature measurements according to the test method will be individual readings and thus ± 0.8°C would only apply.

5 PRE TEST CONFIGURATION

1) Test Set-up

Test Room Conditions:

a)Accessories

Comment: We feel that the ULT freezer should be tested in the standard product configuration without miscellaneous accessories because it makes it less confusing. For example, product options such as backup cooling systems do not affect the test for energy efficiency.

3) Power Supply

Comment: Some of our models have more than one variant based on voltage (115V and 208-230V). We feel that they should both be tested. ANSI/ASHRAE Standard 72-2005 (Method of Testing Commercial Refrigerators and Freezers) prescribes that the power supply shall be maintained at the rated voltage ±4.0% and rated frequency of ± 1.0%. The rated voltage ±5.0% is more realistic.

4. Loading of Un-Weighted Bare Thermocouples

a)Un-Weighted Bare Thermocouples Locations (UUT's with Shelves)

Uprights - We feel that freezer shelves should be placed evenly spaced in the standard configuration based on the inner doors. This is the configuration the customer would use most often, as it affords the optimum access to the storage volume. This is opposed to positioning the shelves in the extreme positions in freezers where customers may choose from a range of shelf locations. Thermocouple placement planes should still be located 1" above the topmost, central, and bottom shelf or bottom of the freezer if this acts as a storage plane.

Chests – Due to the inherent temperature stratification associated with ULT chest freezers, we suggest moving the 8 top temperature measuring locations from 3'' to 6'' diagonally away from the corners of each measuring plane.

6 TEST METHODOLOGY FOR ALL PRODUCTS

6.2 Door-Opening Requirements

C) For Freezers

Comment: We feel that the repeatability and reproducibility would be improved by testing products with no door openings with ambient temperature set to 24^{o}C +/-1.0^{o}C. We also feel that it would be an easier and more accurate test because it would be hard to meet the specification on velocity and time with respect to the door openings as stated in 6.2 of Draft -1.

6.5 Volume Measurements

A) Tolerances:

Volume is to be recorded to the nearest 0.1 L. We feel that ±0.5% is more reasonable based upon ULT construction methods (sheet metal and polyurethane foam insulation) and manufacturing tolerances.

B) Determination of Volume:

We feel that estimation of volume could be done by physical measurement or CAD drawing for ULT freezers. We would be able to supply the CAD drawings confidentially.

6.6 Energy Consumptions:

B) Thermocouple Temperature Measurement

Our ULT freezer will be running in the steady state for testing. Typically ULT freezers do not have a defrost cycle to remove frost or ice buildup from the evaporator.

C) Temperature Uniformity Test

A shorter measurement interval other than 3 min stated in this section will be necessary in order to capture fluctuation in conditions.

GENERAL STATEMENT

We feel that energy consumption should be done with an empty freezer with un-weighted thermocouples to reduce test method complexity and because we believe that measurements in air are suitably representative of operating conditions.

Minor items

1. Under Section 4 Test Setup, it is stated that test room air currents across the display opening shall not exceed 0.5 m/s (45ft/min). 0.5m/s is equivalent to 98.4 ft/min
2. Under Section 5 Pre-test Configuration, it is stated that both points are located 915mm +/- 15mm (36 in +/- 2in.) 915mm is equivalent to 36in, but 15mm is equivalent to 0.59in, not 2in.
3. Under Section 6.5 Volume Measurements, there is no distinction as to whether freezers have inner doors or not.