Certifying the Accuracy of a Thermobuffer Sensor with a BAPI Blü-Test Probe

Application Note

Overview

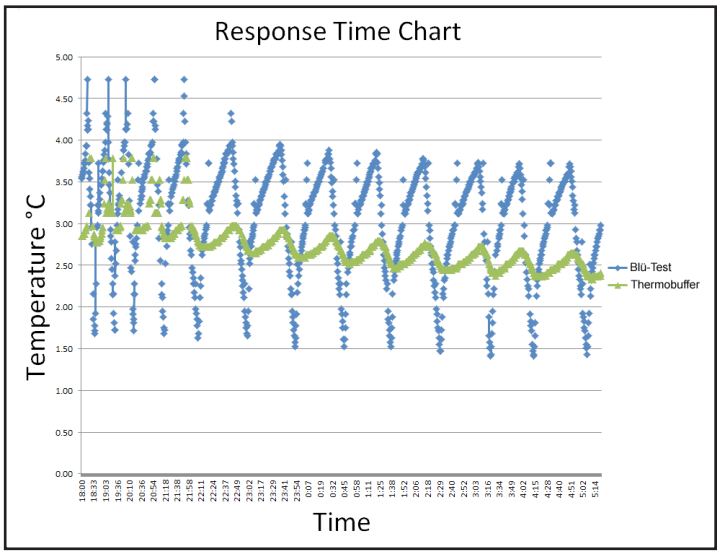
This application note describes three recommended methods to accurately certify the operation of a thermobuffer temperature sensor using a BAPI Blü-Test probe. The three methods were tested at BAPI and the results are shown below, each with an increasing level of accuracy.

A thermobuffer is a temperature sensor that is used to track the contents of a refrigerator or freezer rather than the air temperature. The sensor is enclosed in a fluid filled buffer chamber that allows for a slower reaction to abrupt temperature changes, yet maintains its accuracy during long-term temperature changes. The Blü-Test is a NIST certified handheld testing probe that communicates via Bluetooth to an Android or iOS smart phone or tablet.

Method 1:
Blü-Test Probe and Thermobuffer Separate in Refrigerator

In the first method, a BAPI Blü-Test probe is placed in a residential refrigerator in close proximity to the thermobuffer. The probe and thermobuffer are set up to log their temperature data.

This test method is the least accurate due to the large difference in thermal response time between the Blü-Test probe and the thermobuffer. This type of test will introduce an uncertainty of ±2.5°C.

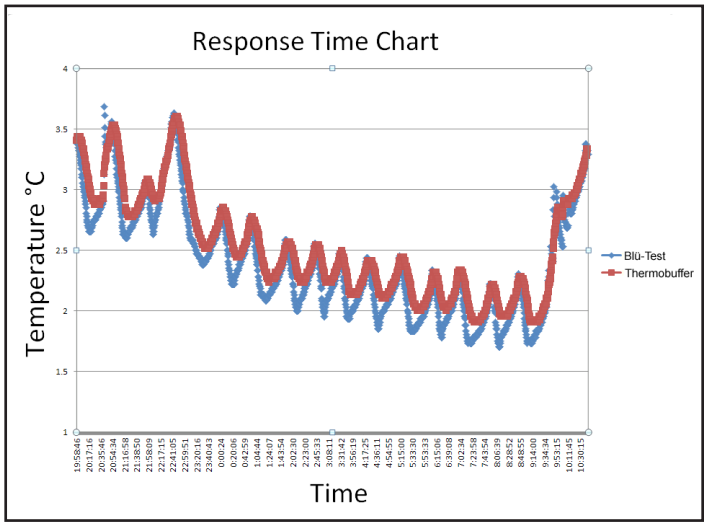


Method 1 Chart: Probe and thermobuffer separate in refrigerator (Variance of ±2.5C)

Method 2:
Blü-Test Probe and Thermobuffer Strapped Together

The second method is similar to the first, except the BAPI Blü-Test probe is strapped directly to the thermobuffer buffer chamber with a rubber band.

The thermal response time of the Blü-Test probe is slowed considerably by being in direct contact with the large thermal mass of the buffer chamber. The variance using this test method is reduced to ±0.3°C.



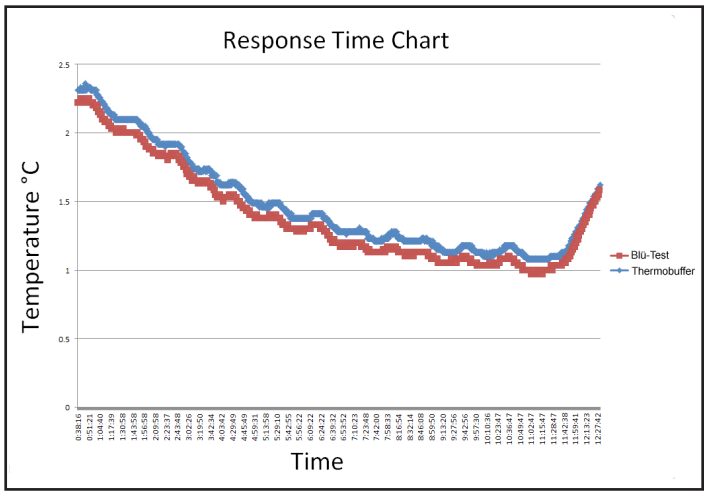
Method 2 Chart: Probe and thermobuffer strapped together (Variance of ±0.3C)

Method 3:
Blü-Test Probe and Thermobuffer Strapped Together in Water

The third method has the Blü-Test probe and thermobuffer strapped together as in Method 2, but then the probe and buffer chamber are placed together in a glass of water.

Having the probe and thermobuffer in the same glass of water further equalizes the thermal response time, thus this method produced the least amount of uncertainty at ±0.1°C.

Note: Other liquids can be used instead of water, such as glycol or glycerin. The higher the viscosity of the liquid, the slower the thermal response time will be to changes in the temperature within the refrigerator or freezer.



Method 3 Chart: Probe and thermobuffer strapped together in water (Variance of ±0.1C)

Best Practices:
Placement of the Blü-Test probe or thermobuffer near a source of incoming refrigerated air may result in temperature readings that are not representative of the average temperature inside the refrigerator. Select a location for the Blü-Test probe and the sensor that is representative of the average temperature of the refrigerator, away from above stated areas.

The temperature within a refrigerator or freezer, or a refrigerated area, is constantly changing. The time it takes for a sensor to respond to the change and reach a state of equilibrium with the new temperature will vary based on many factors, including those listed below.

- Air takes longer to reach a state of equilibrium than water;
- The magnitude of the temperature change affects the amount of time needed to reach a state of equilibrium. The greater the change in temperature, the longer the time;
- The thermal response time of BAPI thermobuffers is different, depending on the size of the buffer chamber and the type and amount of fluid within the chamber. The thermal response times of the various Blü-Test measurement probes are also different, depending on the size and configuration of the probe.

Because of the factors described above, be sure to allow the appropriate amount of time for the Blü-Test Probe and the thermobuffer to reach a state of equilibrium with your unique freezer or cooler environment when taking your certification measurements.

References
http://www.who.int/medicines/areas/quality_safety/quality_assurance/TS-calibration-final-sign-off-a.pdf
https://www.cdc.gov/vaccines/hcp/admin/storage/toolkit/toolkit-resources.pdf

Calibration Document Example

The following is an example of a typical “Certificate of Calibration” document:

CERTIFICATE OF CALIBRATION			
Certificate Number:		Date of Calibration:	
Manufacturer:	Building Automation Products Inc.	Temperature:	
Model:		Humidity:	
Serial Number:		Barometric Press.:	
Humidity:		Procedure:	
		Calibrated By:	

Reference Standards			
Equipment ID	Description	Serial Number	Calibration Due

Calibration Data					
Parameter Tested	Reference Value	Measured Value	Units	As Left Value	Status
Test 1					
Test 2					
Test 3					

Signed: _____
Calibration Technician