



## Friganto Product Performance Report

December 2020

### 1. Introduction

The Friganto is a wine accessory product designed to maintain wine at the ideal temperature for serving while in a decanter. The ideal serving temperature for red wine is 55-65 degrees Fahrenheit and fine red wine is best decanted before serving for the optimal flavor. Keeping wine at the ideal temperature while in a decanter can be a challenge, as some fine wines are best after 2-4 hours of decanting. Even wine that has been chilled to the perfect serving temperature will rise to room temperature while decanting and throughout the serving period.

The Friganto consists of foam bricks that are chilled in a freezer and then covered with an insulating and absorbent sleeve. The foam bricks and sleeve assembly create a cooled platform on which to place a wine decanter. The decanter is cooled as it rests on the Friganto and the wine within reaches the optimal temperature for serving. The Friganto sleeve is absorbent to contain any condensation that may develop on the decanter and the bricks.

### 2. Purpose

This document describes the experimental set up and results of Friganto performance testing. There were two key product goals that were tested:

1. The Friganto controls and maintains an ideal red wine temperature between 55-65F for a period of up to 12 hours.
2. The Friganto sleeve absorbs and controls condensation that forms on and around the decanter and bricks, minimizing cleanup.

### 3. Equipment

A Chino MC 100-0000 digital thermometer/thermocouple was used to test the temperature of the wine in the decanter.

An infrared thermometer was used to monitor the temperature of the Friganto sleeve.

A hygrometer/thermometer was used to measure the ambient humidity and temperature of the room.

Timers will be used to track when measurements are taken.

Three Friganto Assemblies were tested using three decanters and 750 mL of red wine. Three different decanters with slightly different shapes were used.

#### 4. Methods

Three Friganto assemblies were tested in three different environments, shown in Table 1.

**Table 1. Friganto number and test locations/conditions.**

<b>Friganto Number</b>	<b>Test Location</b>
Friganto #1	Indoors, ~70 degrees, 50% humidity
Friganto #2	Indoors, ~75 degrees, 50% humidity
Friganto #3	Outdoors, 65-70 degrees, 49-57% humidity

Prior to testing, the Friganto bricks were placed in a freezer and chilled for several hours until they were frozen. The three red wines were opened and poured into decanters. Each Friganto was set up with two foam bricks sitting side-by-side, placed into a sleeve. The Friganto Assemblies were set up in a staggered schedule so that the temperature readings could be taken approximately 5 minutes apart during the first hour.

Friganto #1 had a glass decanter with a flat bottom. Friganto #2 had a glass decanter with a bunt on the bottom. Friganto #3 had a glass decanter with a flat bottom.

Each decanter was filled with a full bottle (750 mL) of red wine. The temperature of the wine in the decanter was measured before it was placed on the Friganto. Then, the decanter was placed on the Friganto and the temperature of the wine was recorded every 15 minutes for the first hour and then every 30 minutes for the next four hours. The testing schedule is presented in Table 2.

Wine temperature (WT) was measured using a digital thermometer/thermocouple. The tip of the thermocouple was placed in the middle of the decanter to measure wine temperature. The wine was swirled in the decanter prior to measuring WT to mix the cooler wine on the bottom and the warmer wine on top. WT was recorded at every interval of testing for each Friganto.

Friganto temperature (FT) was measured using an infrared thermometer pointed at the Friganto sleeve next to the decanter. The fabric sleeves on each Friganto were not tight around the bricks and the bricks were not completely flat. Some areas of the sleeve made closer contact with the brick than others and this resulted in significant temperature differences across the fabric sleeve. To minimize variations, the FT measurement was made on an area of the sleeve that made close contact with the foam brick. Friganto temperature was recorded every hour.

Room temperature (RT) and humidity (H) were recorded using a hygrometer. Readings were made every hour of monitoring for each Friganto.

Condensation (C) was monitored visually and by feeling the surface of the sleeve and the surface of the table beneath it to determine of droplets or puddles formed.

**Table 2. Friganto Testing Schedule**

<b>Time (minutes) After Initial Setup</b>	<b>Measurements for Friganto #1</b>	<b>Measurements for Friganto #2</b>	<b>Measurements for Friganto #3</b>
0	Wine Temp (WT) Friganto Temp (FT) Room Temp (RT) Humidity (H)	WT, FT, RT, H	WT, FT, RT, H
15	WT	WT	WT
30	WT	WT	WT
45	WT	WT	WT
60 (1 <sup>st</sup> hour)	WT, FT, RT, H, C	WT, FT, RT, H, C	WT, FT, RT, H, C
90	WT	WT	WT
120 (2 <sup>nd</sup> hour)	WT, FT, RT, H, C	WT, FT, RT, H, C	WT, FT, RT, H, C
150	WT	WT	WT
180 (3 <sup>rd</sup> hour)	WT, FT, RT, H, C	WT, FT, RT, H, C	WT, FT, RT, H, C
210	WT	WT	WT
240 (4 <sup>th</sup> hour)	WT, FT, RT, H, C	WT, FT, RT, H, C	WT, FT, RT, H, C

## 5. Results and Discussion

The three Friganto assemblies were tested according to the schedule in Table 2 and the results of the tests are shown in Tables 3, 4, and 5. The wine temperature was plotted vs time and the charts are shown in Figures 1, 2, and 3.

### 5.1 Friganto #1

As shown in Table 3, the initial temperature of the wine cooled by Friganto #1 was 70.4F. The temperature of the wine dropped to 63F after 15 mins but that measurement was taken without mixing the wine thoroughly. The subsequent measurement at 30 mins increased to 64F after mixing the wine by swirling it in the decanter. All of the following measurements were taken with mixing the wine. The wine temperature dropped steadily and then began to level off around 49.0F between hours 3 and 4.

The room temperature of Friganto #1 was between 69.0 and 71.0 degrees throughout the testing and the percent relative humidity was 50%. The Friganto was on a laminate kitchen countertop. The Friganto temperature declined from 44.0F to 41.8F during the 4 hour testing period. No droplets or puddles of water were seen on, under, or around the Friganto #1 during testing. The sleeve became slightly damp to the touch, but was not wet or soaked with condensation.

The temperature of the wine entered the ideal range of 65-55F after the first 15 minutes and exited the ideal range after 120 minutes, becoming colder than 55F.

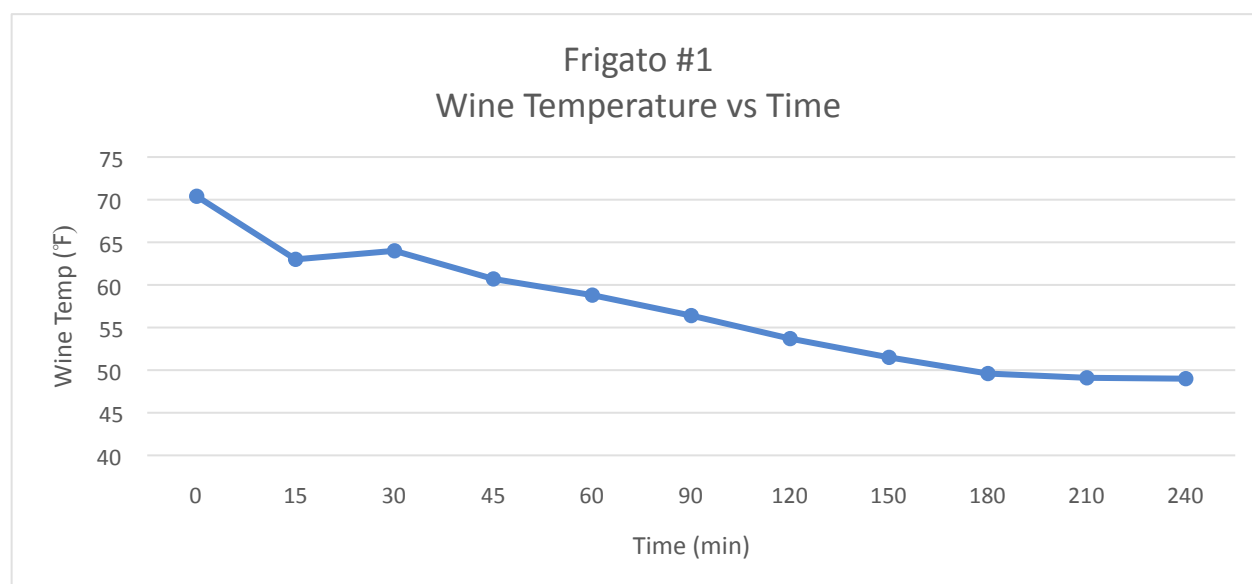
The original aim of the experiment was to test Friganto #1 for up to 12 hours, but after the first 4 hours, the experiment was stopped for practical reasons- no wine should be decanted for more than 4 hours or it begins to oxidize too much.

Although the experiment went for only 4 hours, based on the trendline of the wine temperature, the wine temperature would have settled around 49F and then steadily risen back to room temperature as the foam bricks warmed. At the end of the 4 hours, the foam bricks were still very cold and likely would have cooled the wine for several additional hours if desired.

**Table 3. Friganto #1 Test Results**

Time (min)	Wine Temp. (F)	Friganto Temp. (F)	Room Temp. (F)	Humidity (%RH)	Condensation
0	70.4	44.0	71.0	50	None
15	63.0				
30	64.0				
45	60.7				
60 (1 hr)	58.8	43.0	69.2	50	None
90	56.4				
120 (2 hr)	53.7	42.0	69.0	50	None
150	51.5				
180 (3 hr)	49.6	41.8	69.0	50	Sleeve slightly damp, no droplets on table or decanter.
210	49.1				
240 (4 hr)	49.0	41.8	69.2	50	Sleeve slightly damp, no droplets on table or decanter.

**Figure 1. Friganto #1 Wine Temperature vs Time**



## 5.2 Friganto #2

As seen in Table 3, the initial wine temperature for Friganto #2 was 69.5F. The temperature of the wine dropped slightly to 65.2F after 15 mins and then to 63.8 after 30 minutes. The wine temperature dropped steadily and then began to level off around 55-54F between hours 3 and 4.

The temperature of the wine entered the ideal range of 65-55F after the first 45 minutes and exited the ideal range after 180 minutes, becoming only slightly colder than 55F.

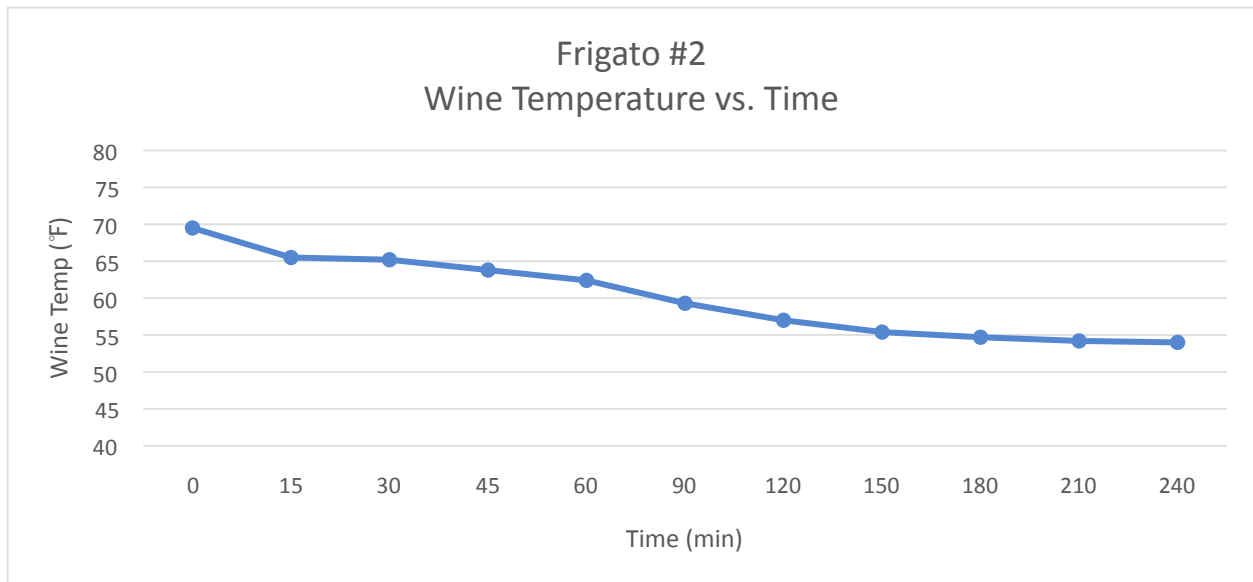
The room temperature of Friganto #2 was between 73.0 and 77.7 degrees throughout the testing. The room was heated intentionally to create a warmer environment to test the Friganto performance. The Friganto was on a desktop made of a wood composite material. The percent relative humidity was 50%.

The temperature of Friganto #2 was between 51.0F to 42.0F during the 4-hour testing period. No droplets or puddles of water were seen on, under, or around Friganto #2 during testing. The sleeve became slightly damp to the touch but was not wet or soaked with condensation.

**Table 4. Friganto #2 Test Results**

Time (min)	Wine Temp. (F)	Friganto Temp. (F)	Room Temp. (F)	Humidity (%RH)	Condensation
0	69.5	51.0	75.0	50	None visible
15	65.5				
30	65.2				
45	63.8				
60 (1 hr)	62.4	44.2	77.7	49	None visible
90	59.3				
120 (2 hr)	57.0	42.0	74.9	49	Sleeve slightly damp, no droplets on table or decanter.
150	55.4				
180 (3 hr)	54.7	42.8	73.0	50	Sleeve slightly damp, no droplets on table or decanter.
210	54.2				
240 (4 hr)	54.0	46.3	74.4	49	Sleeve slightly damp, no droplets on table or decanter.

**Figure 2. Friganto #2 Wine Temperature vs. Time**



### **5.3 Friganto #3**

Friganto #3 was outdoors on a glass table during testing. The initial temperature of the wine cooled by Friganto #3 was 70.2F. The temperature of the wine dropped steadily to 55.6F in the first 2 hours. Then the wine temperature increased slightly to 56.0F at 150 minutes, likely because of a difference in the placement of the thermocouple, and decreased again to 55.8, 54.7, and 52.0F after 180, 210, and 240 minutes respectively.

The temperature of the wine entered the ideal range of 65-55F after the first 45 minutes and exited the ideal range after 210 minutes, reaching 52.0F at the last reading. The room temperature was also dropping after 180 minutes, which was likely a factor in the wine temperature drop in the final measurements.

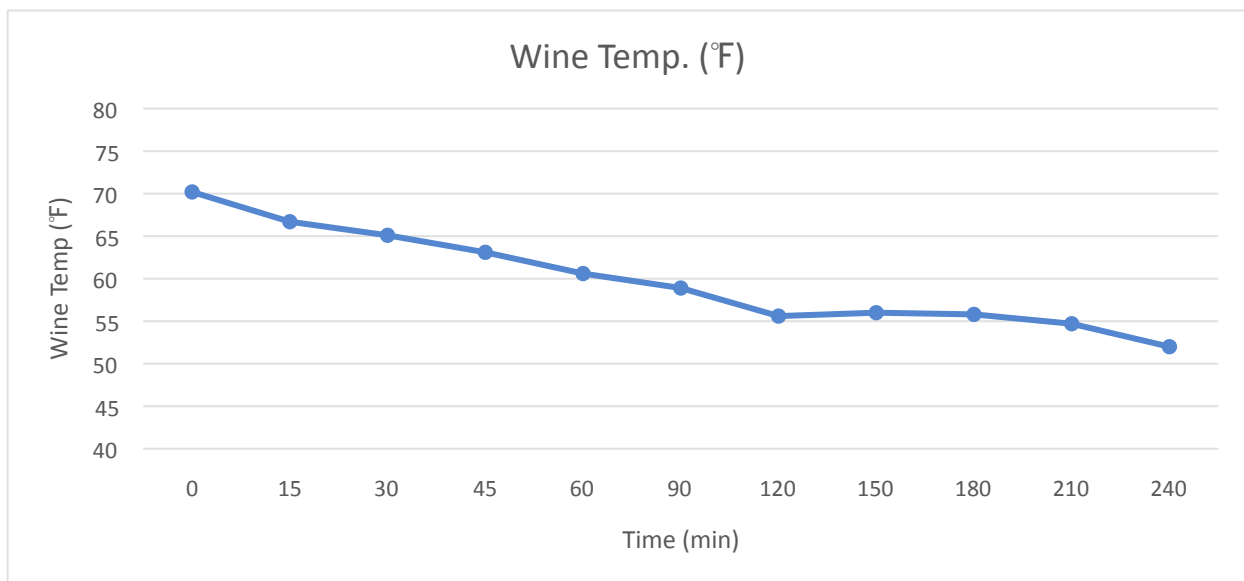
The room temperature of Friganto #3 was between 65.8 and 70.8F throughout the testing. The room temperature increased to a peak of 70.8 at hour 3 and then dropped to 66.7 at hour 4. The percent relative humidity was between 52 and 57%. The temperature of Friganto #3 was between 40.9F and 46.3F during the 4-hour testing period.

Water droplets were seen under the glass table where the Friganto was sitting. The condensation was on the underside of the glass, but there were no droplets on the top of the table touching the Friganto. Because the table was not well insulated, like the linoleum and wood surfaces used on Friganto #1 and #2, condensation formed readily where the glass was cold from the Friganto and was not absorbed by the sleeve. The sleeve was slightly damp after the first few hours like the other two Friganto Assemblies.

**Table 3. Friganto #3 Test Results**

Time (min)	Wine Temp. (F)	Friganto Temp. (F)	Room Temp. (F)	Humidity (%RH)	Condensation
0	70.2	40.9	65.8	52	None visible
15	66.7				
30	65.1				
45	63.1				
60 (1 hr)	60.6	44.2	69.5	49	None visible
90	58.9				
120 (2 hr)	55.6	46.3	70.1	50	None visible
150	56.0				
180 (3 hr)	55.8	46.3	70.8	50	Sleeve slightly damp, condensation under the glass table.
210	54.7				
240 (4 hr)	52.0	40.4	66.7	57	Sleeve slightly damp, condensation under the glass table.

**Figure 3. Friganto #3 Wine Temperature vs. Time**



#### 5.4 Differences Between the Three Friganto Assemblies

The wine temperature for the three Friganto Assemblies came into the ideal range after cooling from approximately 70F within the first 15-45 minutes. Each Friganto cooled the wine consistently, but eventually the wine temperature became colder than ideal after 120-210 minutes.

The Friganto that kept the wine in the ideal range the longest was Friganto #3 (165 minutes). Friganto #1 had the shortest period in the ideal range (105 minutes) and also reached a temperature of 49.0F which is six degrees colder than ideal. Friganto #2 was only one degree colder than ideal in the final measurement and maintained the ideal temperature for 135 minutes.

There are a few possible causes for the differences between the three Friganto wine temperatures: a) the shape of the decanter, b) decanter contact with the cooled sleeve, c) and the room temperature.

a) Decanter Shapes

The different decanter shapes meant that the bottom surface area of each decanter was different. Friganto #3's decanter had a level flat bottom with the widest diameter and therefore the most available surface area to make contact with the Friganto. Friganto #1 had a decanter with a flat bottom but it was narrower in diameter than the decanter on Friganto #3. Friganto #2 had a decanter with a bunt in the middle, which reduced the surface area available to make direct contact with the Friganto.

Based only on surface area available to contact the Friganto, Friganto #3 should have cooled the fastest and the most and Friganto #2 should have cooled the slowest and the least. Friganto #2 did cool the wine slowest and did not get as cold as the two, however, Friganto #3 cooled slower and to a lesser degree than Friganto #1.

b) Decanter Contact with Friganto

Although decanter on Friganto #3 had the most surface area to make contact with the Friganto, it was observed that the two foam bricks were not the same height and so the base of the decanter was not resting flat between the two bricks. The difference in the level of the bricks effectively reduced the amount of direct contact the decanter base made with the Friganto. The same irregularity between the two foam bricks was observed with Friganto #2. The base of the decanter was not sitting completely flat against the Friganto.

In contrast, Friganto #1 did not have a significant difference between the height of the foam bricks and the base of the decanter was resting flat across the entire Friganto. Friganto #1 cooled the fastest and reached the lowest temperature, which may be a result of this better contact with the cooled surface of the Friganto sleeve, despite having less surface area available to contact the Friganto than Friganto #3.

c) Room Temperature

Lastly, room temperature may have played a role in the performance of each Friganto. Friganto #2 was in the warmest environment (average RT 75.0F), had the highest Friganto sleeve temperatures, and cooled the wine slower and less than the other





two Friganto Assemblies. Friganto #1 and Friganto #3 were in similar environments with and average room temperatures of 69.5 and 68.6 respectively.

## **6. Conclusions**

The Friganto product was tested to determine its ability to cool wine and maintain a temperature between 55 and 65F for 4 hours. It was also tested on its ability to control condensation and moisture build up that could damage surfaces or inconvenience the user.

Based on the results of the experiments described in this report, the Friganto is able to effectively cool wine from room temperature (70F) to 55-65F for 2-3.5 hours. After about 3 hours, the wine in the experiments got colder than 55F. Friganto #1 got the wine to 49.0F after 4 hours, which is much too cold. In the other two cases, the wine got too cold by only one-three degrees.

The cooling performance and consistency was impacted by a combination of decanter shape, contact with the Friganto foam bricks, and the room temperature. Based on the experiments, it appears that the contact with the foam bricks was the most important factor- Friganto #1 had a narrower base than Friganto #3, but the foam bricks were even in height on Friganto #1 and so the decanter was making full contact with the Friganto, cooling the wine faster and to a lower temperature than the other two.

Based on the results of the experiments, the room temperature had some effect on the wine temperature and Friganto temperature, but it is likely that the product could successfully cool red wine in temperatures up to 85 degrees without a problem. If the environment were much colder than in these experiments, the wine may get too cold.

Because the experiments were stopped after 4 hours, it is not possible to say with any certainty how long the Friganto can cool wine before it begins to warm to room temperature, however it is unlikely that anyone would want or need to decant wine for more than 4 hours.

The condensation generated by the Friganto was minimal overall. Each Friganto sleeve was slightly damp to the touch because they absorbed condensation from the bricks and decanter. There were no droplets or puddles of water created from the Friganto on top of the tables during the experiments. The only droplets seen were under the glass table that Friganto #3 was on, and that was because the table was not insulated. Any glass table indoors or outdoors would likely have some condensation underneath.

In conclusion, the Friganto product successfully cools wine and maintains an ideal temperature for 2-3.5 hours and could keep the ideal wine temperature for a longer period of time if the sleeve were more insulating or other design changes were made to keep the wine from getting too cold. It successfully controls condensation and makes for simple assembly and clean up.