

Differences between True Scientific Refrigerators and True Commercial Refrigerators

There are several differences between refrigerators designed for laboratory and pharmacy (scientific) applications versus refrigerators designed for commercial use.

Differences in pharmacy/laboratory versus commercial applications

Pharmacy/laboratory (Scientific) application requirements

Research laboratories as well as pharmacies need refrigerators to maintain temperature within a narrow temperature range (stability) AND maintain that temperature range throughout the cabinet (uniformity). For researchers, any variation in environment for their samples can impact the stability, shelf life and/or quality of their product. Pharmacists need to store vaccines, drugs and therapeutics that require cold storage in a refrigerator that maintains between 2C and 8C in order to comply with regulations and manufacturer storage requirements. In most scientific and pharmacy cases, there are not large quantities of product loaded into a refrigerator at one time and the product that is loaded into a scientific refrigerator in most cases is already refrigerated or even frozen. For these reasons, there is not a need for quick cooling of warm product. The key performance parameters for a refrigerator for pharmacy and laboratory applications is temperature stability and uniformity.

Commercial Application Requirements

The cooling requirements are much different for commercial applications. For most commercial applications, the need is to get product cold as quickly as possible which requires delivering a high level of cold air into the cabinet as quickly as possible. An extreme case would be loading several cases of bottled water at room temperature into a glass door refrigerator and needing all that water to cool quickly. Other application needs include units that need to operate in higher ambient temperature conditions and frequent door openings that exist in many commercial kitchens. Temperature stability and uniformity requirements are not as strict. The key for commercial refrigerators is to get product cold fast but not freeze the product.

Refrigeration System

Sizing

The refrigeration system in a commercial model will be different than a similar sized scientific model as both commercial and scientific models' refrigeration system are optimized for their intended application.

Evaporator Fan

In most commercial refrigerators, the evaporator fan that circulates air inside the cabinet runs only when the refrigeration system (Compressor) is on. For scientific refrigerators, the evaporator fan remains on at all times, except when the door is opened, so that air can be circulated continuously and therefore providing a uniform air temperature throughout the cabinet.

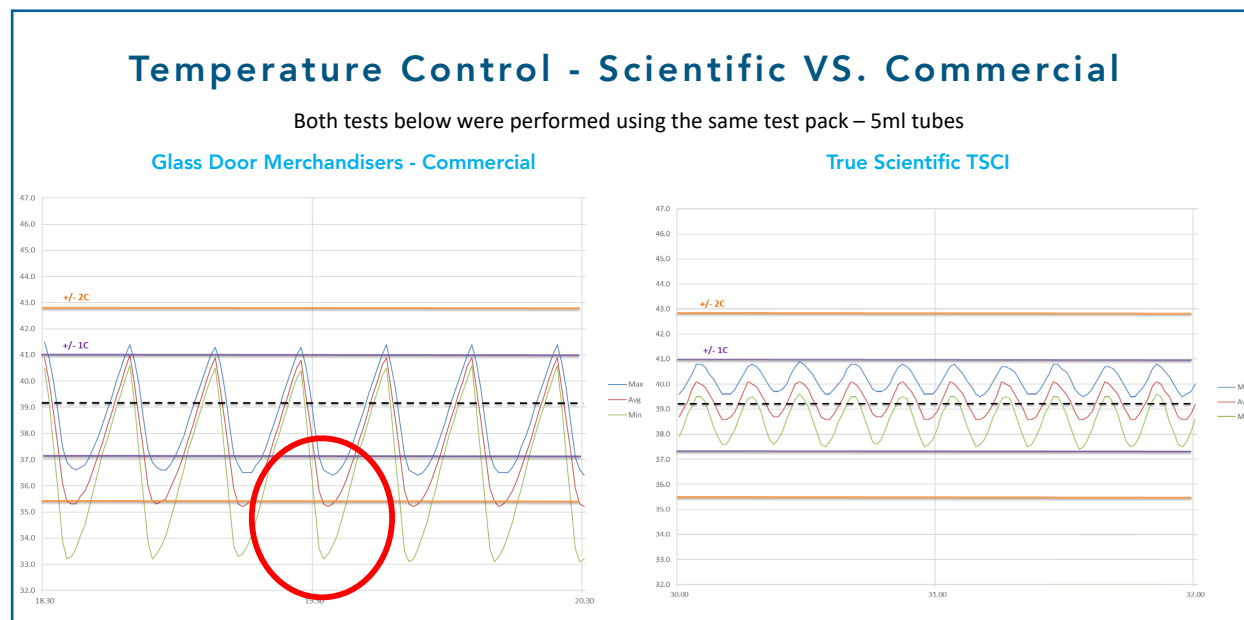
Refrigeration System

Temperature Differential

Refrigerators work like any other cooling system. The refrigerator's digital control has a "cut-in" temperature setting and a "cut-out" temperature setting. The refrigerator turns on when the air temperature in the cabinet reaches the "cut-in" setting and turns off when the air temperature in the cabinet reaches "cut-out" setting. The difference between the high and low temperature settings is called the differential. The compressor is sized taking into account the size of the cabinet AND the differential, so the compressor runs at its designed run time and optimal compressor cycles per hour to maximize the life of the refrigeration system in the refrigerator.

For Commercial refrigerators, the differential is usually 3 to 4 degrees Celsius. For scientific refrigerators the typical differential is around 2 degrees C (+/- 1C from set point). The tighter differential in a scientific refrigerator allows for a tighter temperature range within the cabinet.

NOTE: It is not recommended to alter the differential as it will alter the amount of time the compressor runs which will impact the life of the compressor.



Energy Usage

Since the fan runs at all times in a scientific refrigerator, except when the door is opened, the energy usage is typically higher compared to a similarly sized commercial refrigerator. However, the ambient temperature and amount of door openings will significantly impact energy consumption.

Construction

Shelving

True commercial refrigerators are typically supplied with wire shelving as compared to scientific refrigerators which are supplied with perforated sheet metal shelving which is better suited for smaller containers and packages typically stored in laboratory and pharmacy applications.

Alarms

Alarms are not typically provided with True commercial refrigerators.

True Scientific refrigerators have the following alarms:

High and Low Temperature alarms – factory setting is 7°C and 2°C

Door ajar alarm – Factory setting is 60 seconds

Power failure – Alarm sounds as soon as power is lost.

Sensor failure – There are several sensors within a scientific cabinet. If any sensor fails to send signal to the control, the control will go into alarm.

NOTE: True Scientific controls have a battery backup. In the event of a power failure, the control display and alarm buzzers will continue to operate and go into alarm state.

Perforated Sheet Metal Shelving



Other features not included in True commercial refrigerators –

The following features are not included in True commercial refrigerators but are available with scientific refrigerators:

Temperature Probe Access Port

There is a 3/8-inch diameter temperature probe access port in every True Scientific unit which is located in the back of the unit.

Simulated Product Temperature Monitoring

Inside a scientific refrigerator is a temperature probe that is immersed in a 2 oz. bottle of glycol and is mounted on the cabinet side wall. The temperature from this probe is what is displayed on the control. It is intended to simulate the product temperature in the refrigerator. The air temperature varies by as much as 2 degrees as determined by the control differential. However, the product temperature does not vary nearly as much and is typically close to the average temperature of the cabinet. A user may see only a 0.1 to 0.3 temperature change of the simulated product temperature even though the air temperature fluctuates around 2 degrees. The temperature reading on the simulated product temperature probe controls the temperature alarms.

Temperature Probe Access Port



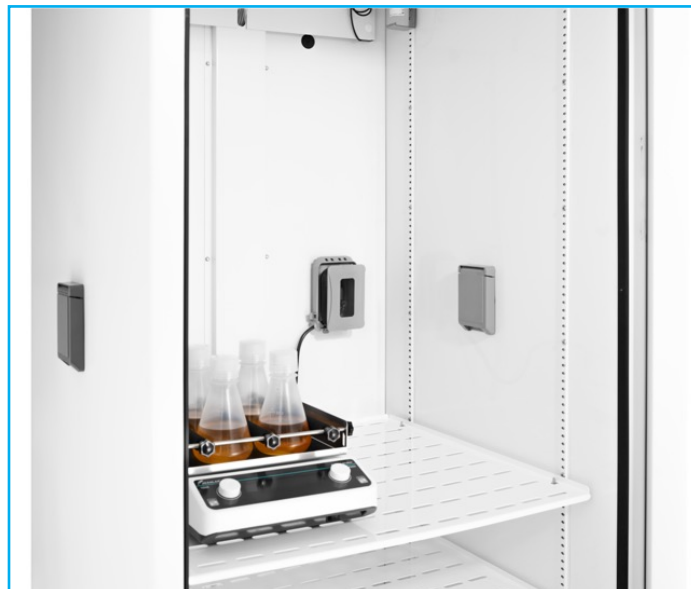
Simulated Product Temperature Monitoring





Internal Duplex Outlet

Chromatography units are supplied with a 12 A max GFI internal duplex outlet that can be used to operate electrical products placed inside the refrigerator. In some scientific applications, it is preferred to keep product mixed or suspended while they are inside the refrigerator. The internal outlet allows a unit to be operated inside the cabinet and not comprising the door seal.



Selecting a scientific refrigerator for scientific and pharmacy applications is highly recommended since they have features not available in a commercial unit and are designed to meet the temperature stability and uniformity that laboratories and pharmacies require.