



# Freon™ MO99

Refrigerant (R-438A)

## Frequently Asked Questions

### Product Performance

#### Is Freon™ MO99 flammable, due to the hydrocarbons in the blend composition?

No. Freon™ MO99 has an A1 refrigerant safety classification designating nonflammability and low toxicity under ASHRAE Standard 34. Freon™ MO99 has been proven to be a safe and reliable replacement for R-22 in existing equipment in the U.S. and around the world.

#### What is the difference in energy efficiency between R-22 and Freon™ MO99?

Energy efficiencies for R-22 and Freon™ MO99 are very similar over a range of conditions. More details can be found in the Freon™ MO99 product information bulletin.

#### What is the difference in capacity between R-22 and Freon™ MO99?

Capacity differences between R-22 and Freon™ MO99 will vary according to application. Typical capacity variation is 5-10% below R-22. Freon™ MO99 has been in use in hundreds of thousands of successful retrofits with little to no impact on equipment performance or increased energy usage. Most of the R-22 replacement refrigerants have lower capacity than R-22. Of all of the mineral oil compatible products, Freon™ MO99 has the closest performance match.

#### What is the temperature glide of Freon™ MO99?

Freon™ MO99 has a temperature glide of 7-8 °F. This is similar to other R-22 replacement refrigerants. Because all zeotropic refrigerant blends have glide, the liquid and vapor have slightly different compositions. As a result, when charging a system, Freon™ MO99 should be removed from the cylinder as a liquid.

#### Where can I find the pressure/temperature (P/T) chart for Freon™ MO99?

The Freon™ MO99 P/T chart and additional technical information is available at [freon.com](http://freon.com). In addition, there is a free mobile "PT Calculator" app for Apple® and Android® devices that contains P/T conversions and basic product information, as well as allows for easy calculation of subcooling and superheat.

#### Why does the P/T chart for Freon™ MO99 have two columns of data?

For any zeotropic blend, there is a saturated liquid temperature (bubble point) and a saturated vapor temperature (dew point). When calculating superheats, always use the saturated vapor temperature (dew point). When calculating subcooling, always use the saturated liquid temperature (bubble point).

#### Can a system running on Freon™ MO99 be topped off with more Freon™ MO99 if it leaks?

Yes. Systems running with Freon™ MO99 can be topped off repeatedly with Freon™ MO99, with no change in flammability rating or noticeable performance change. However, as when maintaining and servicing any system, refrigerant leaks should be located and repaired as soon as possible.

### Product Applications

#### Can you use Freon™ MO99 in a dry charge system?

Given the similarities between Freon™ MO99 and R-22, field charging a dry shipped unit with Freon™ MO99 is a good option for eliminating ozone depleting substances and managing the transition from R-22. OEM warranties should be considered when looking at dry ship possibilities. Even with the newer POE-based dry charge units, Freon™ MO99 is a good option, because it is fully compatible with polyol ether (POE) lubricant as well.



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### **Can Freon™ MO99 be used in systems with capillary tubes sized for R-22?**

Yes. The mass flow rate and operating pressures of Freon™ MO99 are the closest of all the mineral oil compatible replacement products and will likely perform adequately in an existing R-22 system with a capillary tube expansion device. However, for optimal results, it is recommended to replace the capillary tube with a TXV when possible.

### **Does Freon™ MO99 work in heat pumps?**

Yes. Freon™ MO99 can be used to retrofit R-22 heat pumps. Based on system testing, similar efficiency and slightly lower capacity can be expected. A slightly lower capacity may force the compressor run time to increase. When in the heat pump mode of operation, many systems use a capillary tube or fixed orifice as an expansion device, so the charge size of Freon™ MO99 will need to be optimized to obtain the proper amount of subcool/superheat. Follow retrofit guidelines available at Freon.com to ensure the system is not over- or under-charged.

### **Can Freon™ MO99 be used in flooded evaporators?**

Like any zeotropic refrigerant blend, Freon™ MO99 is not recommended for use in flooded evaporators. We advise contacting the original equipment manufacturer (OEM) for guidance on conversions from R-22 in a flooded system.

### **Can Freon™ MO99 be used in low and medium temperature refrigeration applications, in addition to air conditioning or heat pumps?**

Yes. Freon™ MO99 works well in low and medium temperature refrigeration, as well as air conditioning or heat pumps.

## **Product Availability and Cost**

### **I used to use a product called ISCEON® MO99™. Is it the same as Freon™ MO99?**

Yes. When DuPont spun off its Performance Chemicals business unit in July 2015 into a separate company called Chemours, the decision was made to simplify the number of refrigerant brand names used to identify our products. As a result, all HCFC and HFC products have been re-branded with the Freon™ brand, but continue to be produced in the same quality manufacturing facilities that the industry has come to expect from the Freon™ brand under DuPont.

### **I have heard of a product called “BMP438”. Is it the same as Freon™ MO99 (R-438A)?**

No. BMP438 is a product manufactured and imported from China that does not have an ASHRAE designation, nor is it

SNAP listed as an approved R-22 alternative by the U.S. EPA, nor is it produced to the specifications of Freon™ MO99. The name of BMP438 is believed to be used to confuse contractors and end users looking to purchase Freon™ MO99, which has an ASHRAE designation of R-438A and is SNAP listed.

### **How much does Freon™ MO99 cost?**

Please consult a Chemours authorized distributor for specific pricing. Because Freon™ MO99 is an HFC blend, and therefore not subject to phaseout like R-22, it is reasonable to expect Freon™ MO99 to be priced lower than R-22 and comparable to other R-22 replacement refrigerants. As a result, Freon™ MO99 provides a quick, low cost retrofit solution that also helps end users delay investment in new equipment.

### **Are there supply restrictions or constraints on Freon™ MO99?**

No. Freon™ MO99 is readily available nationwide for purchase through Chemours distributors. Please visit Freon.com and click on the “where to buy” button for a distributor near you.

### **Is there a phaseout plan for Freon™ MO99 in air conditioning applications?**

As of October 2016, there are no current or pending regulations to phase out Freon™ MO99 in air conditioning applications in the United States. For other countries, please consult your local Chemours authorized distributor or representative.

## **Retrofit Information**

### **Does Chemours have retrofit guidelines for converting R-22 systems?**

Yes. An “8 easy step” booklet, detailed retrofit guidelines, and a brief R-22 retrofit video are available at Freon.com under “8 Basic Steps to Retrofit from R-22”.

### **How many pounds of Freon™ MO99 need to be added during a retrofit compared to R-22?**

For most retrofits, the charge size required for Freon™ MO99 should be comparable to the charge size needed with R-22. However, there could be some slight variations depending on system design and type of expansion device. When charging an R-22 system with any replacement refrigerant, it is recommended to always start with approximately 10% lower charge of the new product, check the system superheat or subcool, and then add the remaining refrigerant until the system is running as desired.

### Can R-22 be topped off with Freon™ MO99?

No. Freon™ MO99 should not be used to top off R-22 systems. Mixing refrigerants is not recommended. R-22 should be recovered using appropriate equipment and managed according to U.S. EPA guidelines specified in Section 608 of the U.S. Clean Air Act.

### Does Chemours have a reclaim program for R-22?

In the United States, Chemours does offer an R-22 reclaim program. The recovered R-22 is a valuable asset, for use in servicing other equipment or by reclaiming back through an authorized dealer. More information is available on the Chemours website under “U.S. Refrigerant Recovery & Reclaim Program” at Freon.com. For other countries, please contact your local Chemours authorized distributor or representative regarding reclaim options.

### What happens if R-22 gets mixed into an installation of Freon™ MO99 that is not properly labeled?

Mixing refrigerants is never recommended. However, based on the similar operating conditions of Freon™ MO99 and R-22, system damage would not be expected. At the next available service opportunity, it would be advisable to recover and dispose of the mixed gas, and charge and label the system with either R-22 or Freon™ MO99.

### What seals need to be changed when converting from R-22 to Freon™ MO99?

R-22 penetrates elastomeric seals more substantially than any HFC refrigerant, such as Freon™ MO99. When R-22 is removed from a system, it off-gases and the elastomeric seals shrink and are not likely to return back to that size after charging the system with an HFC blend, leaving an opportunity for a leak. As part of a good R-22 retrofit procedure, critical elastomeric seals (seals that cannot be isolated when the system is operating) should be changed with ones that have not been used in R-22 service previously. Typically, the Schrader core and pin on the service valve should be replaced with a new one that has not been in R-22 service. For larger, more complex systems, there may be other elastomeric seals present. A brief training video can be found on Freon.com that addresses this topic.

### When retrofitting or servicing an Freon™ MO99 system, can you use the same gauges as used with R-22?

Yes. Freon™ MO99 and R-22 have very similar pressure characteristics, and, therefore, the same gauge sets can be used.

### What oils work with Freon™ MO99?

Freon™ MO99 is compatible with both traditional and synthetic lubricants: mineral oil, alkyl-benzene (AB), and polyol ester (POE).

### Can POE oil be introduced to the existing mineral oil and mixed safely?

POE and mineral oil can be safely mixed in any proportion and used with Freon™ MO99. In many R-22 systems, the conversion to Freon™ MO99 can be made with no change or addition of POE to the existing mineral oil. In cases with difficult oil return, such as systems with a liquid receiver and no oil separator, or complex line sets, a small amount (~20%) of POE added to the system can aid oil return. For Trane® 3-D® and Danfoss SM scroll compressors, a single oil change in the compressor oil sump from mineral oil to an OEM-approved POE lubricant is recommended. Multiple flushes of POE to remove all of the mineral oil are not required with Freon™ MO99. Consult detailed retrofit guidelines for additional details on system oil management and specific equipment, where a single or full oil change would be recommended. Note that this oil management guidance is not specific to Freon™ MO99 and would be necessary when using any “no oil change” HFC blend with these compressors or system configurations.

### Will using Freon™ MO99 void my equipment warranty?

Freon™ MO99 has more OEM approvals than any other mineral oil compatible R-22 retrofit refrigerant. However, not all OEMs approve R-22 retrofit refrigerants. For warranty questions, it is always recommended that the appropriate OEM be contacted. It is important to note that in many cases, where retrofit refrigerants are used to delay future investment in new equipment, the warranty of the R-22 equipment undergoing a retrofit has already expired.

## Product Comparison

### How does Freon™ MO99 performance compare to R-407C in air conditioning applications?

Freon™ MO99 and R-407C both match the performance (energy efficiency and capacity) of R-22 well and are good replacements for many air conditioning applications. The main difference is that pure HFC fluids, like R-407C, require a complete change out of mineral oil to POE lubricant for R-22/MO systems; whereas, Freon™ MO99 was specifically formulated to be used without the need for an oil change out, which saves time and money.

### Why is a complete change out from mineral oil to POE lubricant required for R-407C, but not Freon™ M099?

Freon™ M099 is a specially formulated nonflammable blend that contains small amounts of hydrocarbons. The low levels of hydrocarbon have a high solubility in mineral oil, lowering viscosity and enabling efficient oil return from cold evaporators. R-407C does not have this capability and, therefore, requires change to a fully miscible oil, such as POE, to ensure adequate oil return from the evaporator and piping to the compressor.

### What could happen if an oil change to POE was not done when using R-407C?

If R-407C is used without a full oil change to POE, there is a possibility of inadequate oil return from the system back to the compressor, which could lead to lack of mechanical lubrication, overheating, and potentially compressor failure. Additionally, even if adequate oil levels in the compressor

were maintained, oil coating and fouling of heat exchanger surfaces can lead to significantly degraded heat transfer and inadequate system capacity and poor energy efficiency. For these reasons, most major compressor manufacturers require removing >99% of the mineral oil when converting to R-407C.

### There are other “no oil change” products advertised; why is Freon™ M099 the best?

While other products have been introduced with small amounts of hydrocarbons to help with mineral oil compatibility, Freon™ M099 (R-438A) is the best overall all performance match (energy efficiency, capacity, operating pressures, and mass flow rates) to R-22 in air conditioning applications. The table below summarizes the performance of Freon™ M099 versus other replacements relative to R-22.

	R-438A	R-422D	R-422B	R-421A*	R-424A
Blend	R-32/125/134a/600/601a 8.5/45/44.2/1.7/0.6	R-125/134a/600a 65.1/31.5/3.4	R-125/134a/600a 55/42/3	R-125/134a 58/42	R-125/134a/600a/ 600/601a 50.5/47/0.9/1.0/0.6
Brand Name	Freon™ M099	Genetron® 422D Freon™ M029	NU-22B®	Choice™	RS-44 Cool50
Capacity (%)	-7	-8	-12	-12	-15
COP (%)	-2	-4	-3	-5	-1
Suction Pressure (psi)	-3	+1	-6	-7	-11
Discharge Pressure (psi)	+5	+12	-5	-7	-17
Discharge Temperature (°F)	-30	-39	-37	-36	-38
Temperature Glide (°F)	+7	+5	+6	+6	+5.5
Mass Flow (%)	+12	+32	+20	+21	+12

Performance relative to R-22; (+) is increase, (-) is decrease

Calorimeter Data at AHRI Standard 540 air conditioning conditions

45 °F Average Evaporator Temp/115 °F Average Condenser Temp/65 °F Return Gas Temp/15 °F Subcool from Average Condenser Temp

\*POE Oil Change typically recommended for “HFC Only” Blends

### For more information on Freon™ refrigerants, visit [freon.com](http://freon.com)

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