

# Hydrocarbon Cooling in Eppendorf Benchtop Centrifuges

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## Executive summary

Global warming and its consequences pose one of the greatest challenges of our time. Fluorocarbons, which, until recently, had been used in cooling systems such as air-conditioners and in laboratory centrifuges and freezers, contribute to global warming when released into the atmosphere. To protect our planet for future generations, laboratory equipment also needs to switch to using more environmentally friendly, “green” coolants – hydrocarbons. As one of the very first manufacturers to do so, Eppendorf now uses hydrocarbon cooling in its new Centrifuge 5427 R. It’s the first centrifuge in our portfolio that cools with a natural refrigerant – to protect your samples – and the planet.



Centrifuge 5427 R

## Introduction

Sustainability discussions have so far focused primarily on the energy consumption of devices. But this is only one part of the story, and now the type of cooling liquid a device uses is receiving more and more scrutiny. After all, refrigerants can have a global warming potential when released into the atmosphere.

## Hydrofluorocarbons

The phaseout of ozone-depleting chlorofluorocarbon refrigerants (CFCs) began over three decades ago following international agreement on the Montreal Protocol. CFCs have, in part, been replaced by alternative compounds known as hydrofluorocarbons (HFCs) – in particular R508b, R404a, and R134a. But despite not impacting the ozone layer, HFCs still have a high global warming potential (GWP), with R134a, for example, possessing a GWP of 1,430. This means that 100 grams of this substance has the same GWP as 143 kilograms of carbon dioxide (CO<sub>2</sub>) equivalent.

## Hydrocarbons

Hydrocarbons (HCs) are recognized as green or natural coolants for use in centrifuges as well as freezers, and their GWP is more directly equivalent to CO<sub>2</sub>. The two most common HCs are propane and ethane – known as R290 and R170, respectively – and R290 is in widespread use in large commercial cooling systems. Due to their superior efficiency and performance, green cooling liquids can be used in significantly smaller quantities than classic HFCs in a similar system. Both R290 and R170 have, as a result, been identified by the US Environmental Protection Agency’s Significant New Alternatives Policy (EPA SNAP) program as substitutes for ozone-depleting substances and constitute approved coolants for use in refrigerated laboratory instruments such as centrifuges or even ultra-low-temperature freezers.

## European F-Gas regulation

In April 2014, the European Union announced a ban of all nonhydrocarbon-liquids for new cooling systems (EU\_517/2014) by 2020 for most of the commercial active cooling systems, also known as F-gas-regulation. The exact timelines depend on the type of cooling system, the type of cooling liquid, and the amount of cooling liquids within the cooling system.

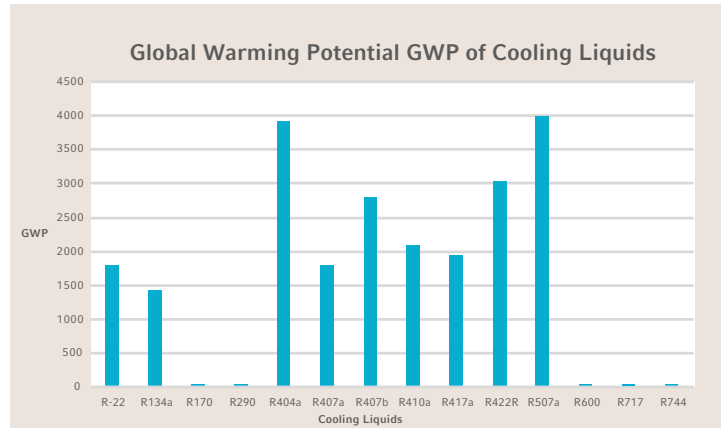
This ban is being implemented by a step-wise reduction of the annual amount of newly produced or imported non-hydrocarbon-liquids in Europe. These allocated quotas are reduced annually from 2015 (100 % reference value) on. The major reduction of HFCs down to 50 % will be achieved until 2020 by adapting newly produced cooling instruments to HCs. From 2020 to 2030, the cut-down of HFCs will be slower as new production of cooling instruments will be limited to HCs and the reduction is driven by phasing-out older instruments and therefore less servicing of these. The recovery of liquids has to result in recycling, reclaiming, or destruction in a proper way. Existing equipment with HFCs can still be used and still be serviced.

## Safety

One concern about utilizing these hydrocarbon coolants, especially propane and ethane, is safety: Both HCs are flammable gases.

So, then: Just how safe are these gases and how safe are the instruments that use them?

In short, centrifuges using HCs are as safe as any other centrifuge that uses a traditional cooling agent. Eppendorf centrifuges with hydrocarbon cooling comply with the standard IEC 61010-2-011 (the International Electrotechnical Commission's safety requirements for electrical equipment for measurement, control and laboratory use – particular requirements for laboratory refrigerating equipment). This standard includes a range of safety measures to ensure no risk exists at any time, even if a rotor were to crash.



### Global warming potential

Each greenhouse gas has a GWP value. This value reflects the climate impact of a kilogram of emissions compared with the same mass of carbon dioxide (CO<sub>2</sub>). The GWP value is calculated and published by the Intergovernmental Panel on Climate Change (IPCC) using a set time horizon. The values are updated periodically on the basis of scientific research.

The Eppendorf Centrifuge 5427R employs a special ventilation concept when switched on.

All parts that may cause sparks have also been moved to the outside of the centrifuge with no connection to the interior and therefore, potential Propane build-up areas in case of a leakage (e.g., on-off switch, power cord, etc.).

All green Eppendorf hydrocarbon centrifuges meet EPA requirements for placing clear warning text and symbols on instruments. Please contact your facility's safety officer to make sure the Eppendorf Centrifuge 5427 R is right for your lab.

## Summary

Centrifuges that use green cooling liquids (for example, R290 and R170) are future-proof instruments that actively help you reduce your lab's greenhouse gas emissions and combat the threat of global warming.

## About Eppendorf

Since 1945, the Eppendorf brand has been synonymous with customer-oriented processes and innovative products, such as laboratory devices and consumables for liquid handling, cell handling and sample handling. Today, Eppendorf and its more than 5,000 employees serve as experts and advisors, using their unique knowledge and experience to support laboratories and research institutions around the world. The foundation of the company's expertise is its focus on its customers. Eppendorf's exchange of ideas with its customers results in comprehensive solutions that in turn become industry standards. Eppendorf will continue on this path in the future, true to the standard set by the company's founders: that of sustainably improving people's living conditions.