

R134a refrigerant for air conditioning systems: Rising costs, declining availability, unclear regulations

Air-conditioning systems in older vehicles are usually fitted with the refrigerant R134a.

Its use was banned for new passenger cars registered for the first time from 1 January 2017. Regulation (EU) 2024/573 further restricts the use of R134a in order to reduce fluorinated greenhouse gases in the EU.

For affected vehicle owners, this primarily means rising prices and uncertainty. This is because R134a is not only becoming increasingly expensive – garages are also increasingly unable to top up or repair systems because the refrigerant is now virtually unavailable. The use of alternative refrigerants in existing vehicle air-conditioning systems using R134a, or the conversion of such systems to use an alternative refrigerant, falls into a legal grey area.



Refrigerant refill. Source: ADAC Air Conditioning Service

It is important to bear in mind that a functioning air-conditioning system is not just a matter of comfort, but also a key safety feature. Studies show that the risk of accidents increases significantly in overheated vehicles – due to loss of concentration, exhaustion or circulatory problems. Furthermore, the air-conditioning system plays a key role in quickly demisting the vehicle's windows, thereby improving visibility and driving safety, particularly in damp weather.

Legal framework

The legal framework governing the use of fluorinated greenhouse gases in car air-conditioning systems is set out in Regulation (EU) 2024/573 and Directive 2006/40/EC, supplemented by the Chemicals and Climate Protection Ordinance (ChemKlimaschutzV). The fundamental aim is to switch to more climate-friendly refrigerants with a low global warming potential.

EU Regulation on Fluorinated Greenhouse Gases

The use of fluorinated greenhouse gases has been regulated by Regulation (EU) 2024/573 since 11 March 2024. This replaced Regulation (EU) No 517/2014, which had been in force since 2015 as the successor to Regulation (EC) No 842/2006, which came into force in 2006.

Regulation (EU) 2024/573 significantly tightens the previous phased reduction ('phase-down') of hydrofluorocarbons (HFCs) and aims for a complete phase-out by 2050. To this end, the quantity of HFCs available in the EU will be gradually reduced via a quota system, so that the availability of these climate-damaging refrigerants decreases continuously. Compared with the previous regulatory framework, the permitted quantities have been more strictly limited, exemptions have been reduced, and additional applications have been included in the quota system. The quantity of HFCs available on the market will be reduced from around 31 per cent of the reference value in 2024 to approximately 17 per cent in 2027, 9 per cent in 2030 and finally to 0 per cent in 2050. The aim is to replace the use of HFCs largely with climate-friendly alternatives and natural refrigerants. For manufacturers, importers, distributors and operators of refrigeration, air-conditioning and heat pump systems, this means an increasingly limited availability of HFCs and an accelerated transition to refrigerants with a low global warming potential.

EU Directive on emissions from passenger car air-conditioning systems

Since January 2011, EU Directive 2006/40/EC has prohibited the use of fluorinated refrigerants with a global warming potential (GWP) exceeding 150 in air-conditioning systems of new car models; since 1 January 2017, this has applied to the first registration of all new cars. This meant that tetrafluoroethane (R134a), the refrigerant previously used in vehicle air-conditioning systems, which has a GWP of around 1,430, had to be replaced. The automotive industry primarily selected the refrigerant tetrafluoropropene (1234yf), with a GWP of 4, as its successor. However, air-conditioning systems using carbon dioxide (CO₂) as a refrigerant (GWP 1) are also used in isolated cases.

Chemicals and Climate Protection Ordinance (ChemKlimaschutzV)

In addition to Directive 2006/40/EC, the Chemicals Climate Protection Ordinance (ChemKlimaschutzV) applies to vehicle air-conditioning systems. According to Section 3(3), in the case of maintenance and repair, an air-conditioning system from which a quantity of refrigerant exceeding the usual amount has leaked may only be recharged once the leaks have been rectified.

Unclear situation regarding retrofitting or the use of alternative refrigerants

The use of alternative refrigerants in existing vehicle air-conditioning systems using R134a, or the conversion of such systems to use an alternative refrigerant, remains to be conclusively clarified in terms of their legality (e.g. revocation of type approval). The particular problem lies in the fact that the availability of R134a will continue to decline in future due to regulatory requirements, yet there are as yet no legally sound and widely available alternatives for the existing vehicle fleet. This is because no authority (e.g. the Federal Motor Transport Authority (KBA)) has so far been prepared to issue a binding statement on this matter. The German Association of the Automotive Industry (VDA) is also keeping a low profile on this matter. It merely points out that R134a air-conditioning systems are not designed for other refrigerants (e.g. R1234yf). Consequently, components such as seals would need to be replaced. However, no approvals have been granted for this.

Conversion

It is true that some garages offer conversion to the newer, more climate-friendly refrigerant R1234yf – by replacing the charging ports, compressor oil and refilling the system accordingly. However, in the vast majority of cases, there is no approval for such conversions for the vehicle model in question.

So-called ‘retrofit’ solutions (e.g. ‘Solstice Retrofit’) have recently been announced, designed to convert existing R134a air-conditioning systems to the R1234yf refrigerant. These systems are currently being launched on the market. Although manufacturers report that they are collaborating with technical inspection organisations, as far as is currently known, no clear, vehicle-specific approval or legally compliant authorisation is available. Against this background, the legal classification of such solutions – particularly with regard to operating licences and liability issues – remains unclear.

Alternative refrigerants

Another problem is the search for affordable solutions for alternative refrigerants: so-called butane/propane-based refill kits are circulating on the internet – they are cheap, but dangerous. Such products, often known as R12 or HC-12a, are generally not permitted for use in vehicle air-conditioning systems and can pose a significant fire risk.

ADAC’s position: Providing clarity

The ADAC supports the EU’s aim of reducing fluorinated greenhouse gases from air-conditioning systems.

However, in order to continue to ensure the operation of older vehicle air-conditioning systems that currently use the refrigerant R134a, affordable and legally permissible solutions must be developed. This is the only way to prevent several million motorists from facing significantly rising costs, a shortage of essential refrigerants and, moreover, legal grey areas. International inconsistencies also highlight the need for clear legal regulations.

The ADAC therefore calls for swift, binding clarification by the legislator, in collaboration with testing organisations and vehicle manufacturers, with regard to the following points:

- Establishment of a clear and workable legal basis for the use of alternative refrigerants (e.g. R1234yf) in existing vehicle air-conditioning systems that are operated with R134a and have been type-approved, or for their retrofitting to use an alternative refrigerant.
- Establishment of uniform technical requirements for the retrofitting of air-conditioning systems to use alternative refrigerants (e.g. R1234yf) in existing vehicles that are operated with R134a and have been type-approved.
- Assessment and approval of international alternative refrigerants, such as hydrocarbon blends, by the competent authorities.
- Provision by vehicle manufacturers of the necessary information and technical approvals for retrofitting.
- Taking approved retrofitting solutions into account as part of the roadworthiness test (PTI).

As the recovery, recycling and reuse of R134a are also becoming increasingly important, consideration should be given in parallel to how recycled refrigerant can make a significant contribution to supplying the existing vehicle fleet.

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