



Ask the Chemist: Refrigerant Leaks in Air Conditioning and Refrigeration Systems

1. Why do refrigerant leaks occur in AC/R systems?

Refrigerant leaks can have several causes:

Structural: there may be porosity in the system piping or the welds when an installation is not carried out properly.

Use: continuous vibrations, over time, compromise the tightness of the system joints.

Corrosion: it is one of the most common causes. Corrosion is a normal phenomenon, which is accentuated by the presence of charges, for example in contact areas between different metals. The attack of acidic compounds, caused by the reaction between moisture and refrigerant/lubricant components, also creates corrosion. Let's take a closer look at this aspect: AC/R systems are characterised by a constant level of moisture, which, for the most part, is eliminated by the filter drier. However, this filter, over time, tends to lose some of its effectiveness. When moisture comes into contact with the substances generated by the natural decomposition of lubricants and refrigerants, acidity is created. And you must treat it, otherwise, acidity can attack the metal structure of the system, causing corrosion that can lead to the generation of leaks.

Therefore, the problem could be avoided by correctly installing and maintaining the systems and by taking preventive actions.

2. What are the consequences of these leaks?

The risk of micro leak development increases a lot faced with a total lack of maintenance of the systems. The consequences of these leaks lead to an inaccurate functioning of the system itself.

3. So, is the problem only related to the performance of the system?

No, it is not. It is now well known that refrigerant is one of the elements that have the greatest impact on the greenhouse effect.

Precisely for this reason, the international F-Gas regulation provides for a series of measures and deadlines aimed at the use of refrigerants with an increasingly low GWP (global warming potential). Therefore, preventing refrigerant leaks from AC/R systems is necessary for different reasons. First, it allows them to function properly and avoid additional costs due to inefficiency or expensive refills of refrigerants. Secondly, it is also a moral duty when it comes to the protection of the environment.

4. How can the problem be solved?





It depends very much on the size of the leak and whether or not it can be traced and located: leaks are not always visible. Either because they may be located in parts of the system that are not visible (pipes that pass through walls, floors, or parts drowned in insulating materials in the case of refrigerators) or simply because they are extremely small and widespread. There are two ways to solve the problem: from outside and from inside the system. If we act from outside the system, the leak must necessarily be localised and visible. We can repair it by applying a paste or liquid leak stop or by replacing the damaged part. If, on the other hand, the micro leak is not visible, it is possible to solve the problem definitively, by inserting a leak stop into the system that can trace and seal it. To conclude, I would like to stress the importance of using reliable and certified products, polymer-free, and compatible with the lubricant and refrigerant gas circulating in the system. Only in this way, they will not react to humidity and oxygen.

5. In this regard, are there any products you would like to recommend?

For external applications, I recommend FixQuick (an ultra-fast liquid leak stop that repairs leaks up to 1 mm in just 20 seconds) and External (a two-component paste leak stop that repairs leaks up to 5 mm).

For internal applications, I certainly recommend using Extreme Ultra or Extreme Ultra White (specific leak stop for refrigerators with hermetic compressor and R600, R290, and R134a refrigerants).

Extreme Ultra guarantees the repair of micro leaks up to 0.3 mm, both in rubber and metal parts of AC/R systems. It operates mechanically, without generating any chemical reaction. The product acts during the operation of the plant, permanently solving the problem. The time required for the leak to be completely sealed depends on the size and shape of the leak, but anyway we are talking about a few tens of minutes.

6. What are the benefits of using Extreme Ultra?

I recommend Extreme Ultra for different reasons. First of all, it is suitable for any type of lubricant and AC/R systems. It is also compatible with all refrigerants, including CO₂, except R717 (ammonia). Additionally, Extreme Ultra does not react to oxygen and humidity, does not ruin system components and is not dangerous for the compressor. On the contrary, it significantly reduces its noise level. Finally, it is a safe product for the operator, non-flammable, and non-irritating. Extreme Ultra White has the same properties as Extreme Ultra but is specific for repairing leaks in refrigerators with hermetic compressor and refrigerant gas R600, R290, and R134a.

7. Could the product deposit in any components of the system?

Absolutely not. Extreme Ultra does not clog the recovery stations and does not stop in the filter drier or the expansion valve. Extreme Ultra is polymer-free and, as I already said, it does not react with humidity and oxygen. Therefore, it will circulate inside the system carried by the lubricant and refrigerants, without creating any problems but ready to intervene if it will find a micro leak. For this reason, it can also be used to prevent problems.

8. There is often a lot of scepticism regarding the injection of additives in the system. What is your point of view about it?





The scepticism is understandable but only partially. Let me explain it better: as in all sectors, even in ours, some products do not meet adequate quality standards. The result? They don't solve the problem for which they were created, and they can ruin the system. That's the reason why I constantly underline the importance of always relying on trustworthy companies that offer their customers certified and innovative products.

9. How does “Extreme Ultra” differ from the previous version “Extreme”?

Extreme Ultra is the evolution of Extreme, born from our need to insert less product inside the system, guaranteeing the same level of performance. With Extreme Ultra, in fact, only 6mL of product is needed and this applies to all types of vehicles and systems up to 21 KW.

10. Do you have any advice for our readers?

My advice is to keep constant and professional maintenance of the systems, to allow them to work to their maximum capacity and within the consumption ranges declared by the manufacturers of the systems themselves. If it's too late and the damage has already been created, I recommend intervening promptly to avoid a situation where leaks get too large to be repaired. In any case, I always recommend relying on serious and reliable products, compatible with the type of system, lubricant and refrigerants used. In this regard, Extreme Ultra or Extreme Ultra White are excellent products, especially because they can be used both to prevent and solve the problem.

