

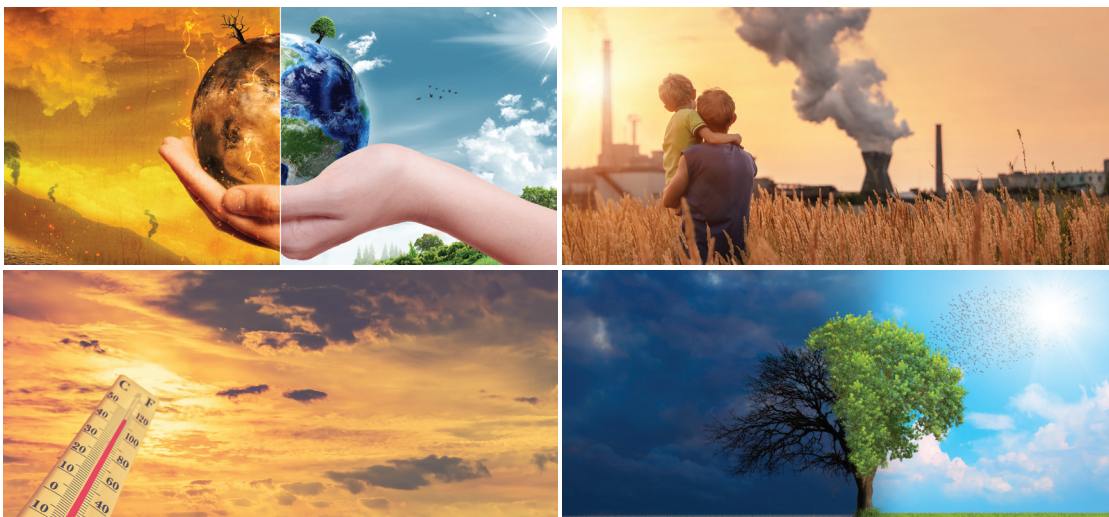
Refrigerant troubles!

Are you aware of the risks and dangers when using counterfeit or illegal refrigerants?

1. What is happening?

Let's first explain why there is an increase of counterfeit refrigerants entering the aftermarket.

In 2014 the European Commission decided to control emissions from fluorinated greenhouse gases (F-gases), including hydrofluorocarbons (HFCs). The European Union (EU) has adopted two legislative acts: the F-gas Regulation and the Mobile Air Conditioning (MAC) Directive. The aim of both acts is to enforce the use of gases with a global warming potential (GWP) lower than 150.



Effects of global warming

How does it work?

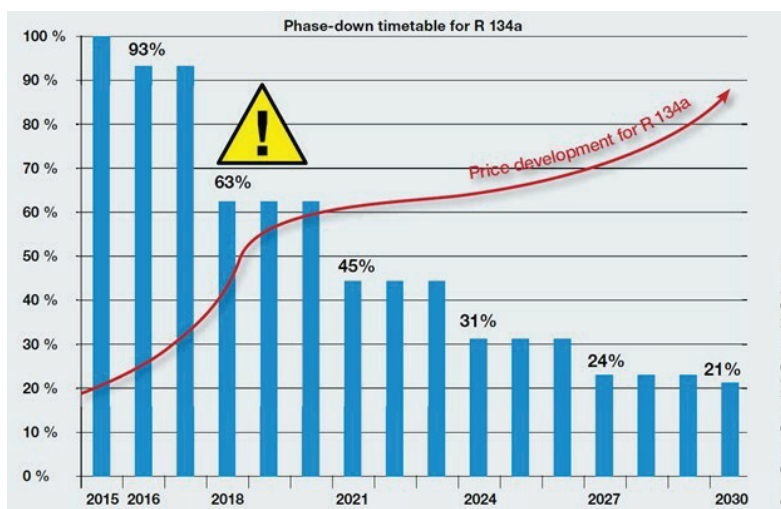
In 2015, the EU introduced the Phase Down Schedule, which will help to gradually reduce the consumption of high GWP refrigerants, like R134a. In 2030, only one fifth of the total sales volume of 2014 of high GWP HFC's, should be available on the market. R134a is an HFC that has a GWP of 1430, whereas carbon dioxide (CO2) has a GWP of one. Releasing one KG of R134a refrigerant into the atmosphere, is an equivalent of 1430 KG of CO2. Once released into the atmosphere, it will take, on average, 12 years before R134a is removed through natural processes, such as atmospheric reactions and uptake by vegetation! However, it should be noted that the concentration of R134a in the atmosphere will continue to increase for as long as it is still being used and released into the atmosphere, like when, for example, it is (accidentally) blown off into the atmosphere, instead of being recovered by using an AC refilling machine. By comparison, R1234yf will remain in the atmosphere for just 11 days!

2. Phase Down Schedule

Check for the full explanation of the Phase Down Schedule through the following link to a YouTube movie of the EPEE (European Partnership for Energy and the Environment).

<https://www.youtube.com/watch?v=ZTnw2A3EVBE>

Phase down table



Phase down timetable for R134a

Source: WAECO / EPEE

As you can see in this Phase Down timetable, only 45% of the total volume of R134a sold in 2014 is available in the market in 2023 and this will be just 31% in 2024. Because of the Phase Down Schedule, the price for R134a increased dramatically, especially in 2018, when the availability dropped from 93% to 63%, and the market panicked because of the “sudden drop” and the price skyrocketed. The result of this Phase Down timetable is that grey import or the smuggling of counterfeit and illegal refrigerants increased significantly, particularly via countries outside the EU.

3. What are counterfeit refrigerants?

Counterfeit refrigerants are defined as impure, imitation refrigerants that usually consist of blends of already forbidden refrigerants like R12 or R22, to simulate original refrigerants. As already mentioned, they are impure, hazardous and usually sold in disposable cylinders at discounted prices. Trade in counterfeit refrigerants is on the rise and that brings a variety of consequences, varying from poor performance, costly damage to machines and equipment, but most importantly, serious safety hazards resulting in explosions and possible loss of human life.

4. Disposable cylinders

Counterfeit refrigerants are usually offered in disposable cylinders, due to their relatively low price and lack of traceability. However, the use of disposable cylinders has been forbidden in the EU since 2007! Despite also being forbidden, “Do It Yourself” cans are becoming more and more popular in Europe.



5. What are the dangers of using counterfeit refrigerants?



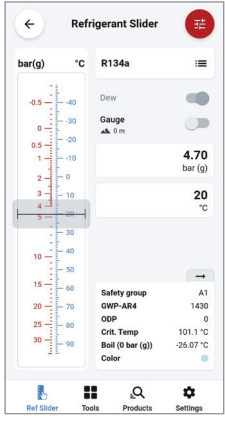
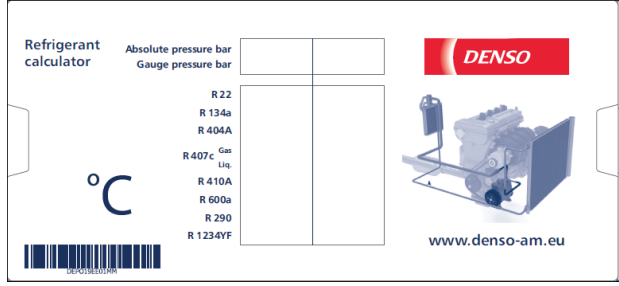
1. AC system freezing: Low-quality refrigerants with excessive moisture can possibly damage the internal system by freezing into ice crystals and blocking refrigerant flow in expansion valves and evaporator tubes.
2. Corrosion and acid formation: Excessive moisture in a refrigerant can create highly corrosive acids by reacting with lubrication oil that can harm the AC compressor.
3. Sludge formation: Acid content in the system can cause the formation of sludge that can create blockages in expansion valves and capillary tubes. The sludge can also disturb heat transfer in heat-exchangers and affect AC system performance.
4. System breakdown: Counterfeit refrigerants may contain chemicals/substances which are not compatible with the vehicle's AC system and can cause damage leading to AC system failures.

6. How to avoid counterfeit or illegal refrigerants

- Source refrigerants from reliable and reputable sources that are verified suppliers and manufacturers.
- Avoid disposable cylinders at all costs.
- Verify the source and authenticity of the refrigerant.
- Only buy refrigerants supplied in environmentally friendly refillable, re-usable cylinders with traceability.

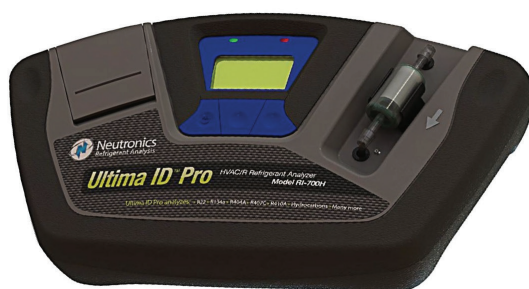
7. How to check for counterfeit refrigerants?

Although it will only give an indication, one relatively simple test is to check the relation between the temperature and pressure of the refrigerant in the cylinder or vehicle. By using the Danfoss refrigerant slider App, or the DENSO refrigerant slider, it is very simple to check if the relation between temperature and pressure is correct.

<p>20°C = approximately 4,7 Bar</p> 	<p>20°C = approximately 8,0 Bar</p> 
<p>20°C = 4,7 bar pressure ✔</p>	<p>20°C = 8 bar pressure ✘</p>
	
<p>Danfoss refrigerant slider App</p>	<p>DENSO refrigerant slider</p>

More precise method

Using a gas analyser.



Analyser

Refrigerant measured	R134a & R1234yf
Accuracy	±1%
Refrigerant % displayed	R1234yf-R134a-R22-HC-Air

Using an analyser will give a more accurate outcome of what is inside the (disposable) refrigerant cylinder but take into account that the analyser is not able to detect all types of counterfeit refrigerants.

Cheaper alternative

Using gas identifiers. Identifiers only indicates Pass or Fail.



R134a identifier

Measuring Range	90-100% for R134a
Accuracy	±3%
Resolution	Pass/Fail at ≥ 95% Pure R134a



R1234yf identifier

Measuring Range	90-100% for R1234yf
Accuracy	±3%
Resolution	Pass/Fail at ≥ 95% Pure R1234yf

8. Examples of risks/dangers when using counterfeit refrigerants

What are the most common blends inside the disposable cylinders?

Refrigerant type	Refrigerant type	GWP	Oil type*	Risks
R12	Chlorofluorocarbons (CFC)	10900	MO / AB	Lubrication
R22	Chlorodifluoromethane (HCFC)	1810	MO / AB	Lubrication
R40	Chloromethane (HCC)	13	Unknown	Explosive
R142b	Chlorodifluoromethane (HCFC)	2310	MO / AB	Lubrication / Highly Flammable
R600	Butane (HC)	4	MO / AB / PAO	Lubrication / Explosive
R290	Propane (HC)	3	MO / AB	Lubrication / Explosive


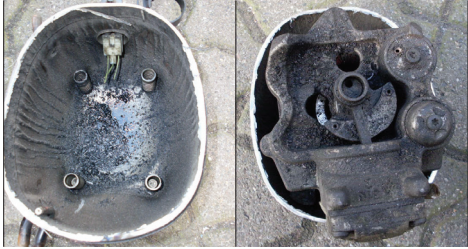
***Oil types**


AB = AlkylBenzene
MO = Mineral Oil

POE = PolyolEsterOil
PAG = PolyalkeneGlycol

PAO = Polyalphaolefin

Risks/dangers per refrigerant type

Refrigerant type	Risk/danger	Result
R12 R22 R142b	Compressor seizure, due to lack of lubrication. PAG or POE oil do not mix with R12, R22 and R142b.	Compressor failure, due to lubrication problems 
R40	Flammable, explosive.	Compressor of refilling machine is completely destroyed  Source Waeco

Refrigerant type	Risk/danger	Result
R40 R600 R290a	Flammable, explosive.	<p>Refilling machine caught fire, when flammable, explosive refrigerant was recovered.</p>  <p>Source Waeco</p>

9. Conclusion

Forewarned is forearmed. Is the cheap price of counterfeit refrigerant really worth the risks? Compared with the other, much bigger hazards, it is a minor thing, but still important to emphasize. We then talk about warranty. If we find traces of counterfeit refrigerants in a DENSO compressor or it has failed because of the use of counterfeit refrigerants, the warranty will be void. Another important reason to stay away from counterfeit and illegal refrigerants.

Interesting links

Below some links to interesting websites with more detailed information about the topics discussed in this bulletin.

<https://www.wilhelmsen.com/ships-service/refrigeration-solutions/how-to-avoid-counterfeit-and-illegal-refrigerants/>

<https://www.renewableinstitute.org/risks-inherent-in-the-use-of-counterfeit-refrigerants/>

<https://www.acr-news.com/now-bock-warns-of-methyl-chloride-in-fake-refrigerants>

<https://www.stopillegalcooling.eu/>

<https://eia-international.org/news/we-expose-illegal-refrigerant-trade-in-europe-the-biggest-eco-crime-no-ones-heard-of/>

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