

STATEMENT

Last update: September 2017

ASERCOM Statement on a Refrigerant Scenario to comply with the European F-gas Regulation

Part 1: Commercial Refrigeration

25 years ago, a small group of people had the idea to join together to address some technical issues including the link to the Montreal protocol and the CFCs phase out to prevent Ozone layer depletion. This group was assembled by *ASERCOM* and brought together a number of engineers who succeeded in harmonizing their views on a way to find replacements for CFCs and in the harmonization of standards related to declaration of performance data.

As recent studies have indicated, it seems that the Ozone layer has begun to grow back thanks to the overall industry involvement and engagement.

The latest F-gas Regulation is a recent challenge for which all members of *ASERCOM* again have agreed to jointly find solutions for drop-in, retrofit and for new installations in the HVACR sector.

The CO₂ emission reduction is a clear global environmental challenge and our industry represents 2% of it. Thanks to the new F-gas Regulation the placing on the market of F-gases (expressed in CO₂ equivalent) has to be reduced by 79% by 2030 versus the reference period of 2009 to 2012.

Among all segments concerned in our overall activities, commercial refrigeration is one of the larger contributors. The F-gas Regulation already clearly introduces a number of measures in commercial refrigeration, like some placing on the market bans of HFCs. We will concentrate on all other activities from our industry such as air conditioning, heat pumps and other applications at a later stage.

Other key aspects of the F-gas Regulation are more stringent rules for leakage control, as well as the phase down mechanism which reduces the quantity of refrigerants available to the market. In order to achieve this target, experts consider that the average GWP value of all refrigerants used by 2030 should be around 400. This average of 400 GWP takes the use of natural refrigerants already into consideration, like CO₂, ammonia or HCs, which will be important contributors.

The entire industry will have to be creative to adapt its current technologies to meet this very ambitious target. It poses a challenge to most of our current products that will be upgraded to cope with the alternative refrigerants.

For 2 years now, *ASERCOM's* refrigerant working group has been very active in multiple ways:

- building its own simulation of the phase down until 2030
- publishing a guideline on refrigerant temperature glide and its effect on the performance declaration
- revising its approach to prioritize highest potential for reducing environmental impact

Additional aspects to adapt technology have to be worked on:

- operating envelope
- refrigerants properties and lubrication aspects (solubility, miscibility and viscosity)
- material compatibility
- performance testing
- research and redesign of products
- impact on heat exchangers and system design with higher temperature glide refrigerants
- refrigerant charge size in regards to safety criteria
- safety of usage
- qualification of personnel and training
- product qualification and certification
- economic impact and availability of components

Seeing all the efforts behind qualification of refrigerants and components it is clear that too much proliferation of alternative refrigerants delays market adaptation and can also not be handled in practice by contractors and installers, let alone inflating the amount of training even further.

In addition to considering natural refrigerants which are separately covered in *ASERCOM Statements*, our engineers have jointly evaluated the currently known public test results with **new proposed synthetic refrigerant alternatives:**

The currently still dominant refrigerants in commercial refrigeration are R404A/R507A (both will not be allowed anymore in new installations as of 2020) and R134a.

For drop-in and retrofit of existing applications it is necessary to check with the respective compressor/equipment supplier for the approved refrigerants. Existing non-flammable replacement refrigerants for R404A/R507A are in the range of 2000 (e.g. R452A, R452C according to AR5) and as low as 1400 GWP (e.g. R449A, R448A) and for R134a in the range of 600 GWP (e.g. R450A, R513A).

For R404A/R507A installations, the replacement options below the 1400 GWP range fall already into a range of 300 GWP and below (e.g. R454A, R454C, R455A, R457A, R459B) and are mildly flammable (category A2L).

As a major change, the now published standard EN 378-1:2016 includes safety and environmental requirements for the use of mildly flammable refrigerants A2L and B2L. For new installations it defines and enables the use of mildly flammable refrigerants in determined charge amounts, considering the safety aspects accounting for the low burning velocity, reducing the probability and consequences of ignition risks.

All market players have to strive for a fast approach to train up for the handling of flammable refrigerants. New installations designed according to EN 378:2016 and performed by qualified technicians will be safe. Meanwhile it can still be preferable for new installations to use non-flammable refrigerants.

The international and publicly available compressor test data of these alternative refrigerants show higher compressor discharge temperatures than R404A. They also have a significant temperature glide, so systems must be designed accordingly.

For R134a installations, the replacements options below the 600 GWP range fall already into a range of 150 GWP and below (R1234yf, R1234ze). The main trade-off gathered from the test data was loss of refrigerating capacity versus the baseline for some refrigerants, like R1234ze.

Conclusion:

In summary, when selecting an alternative refrigerant either so-called “natural” or synthetic, all market players should take aim at the lowest GWP solution possible.

The trade-offs to be considered are:

- flammability and the related safety measures
- temperature glide and the resulting system design
- control of discharge temperature
- refrigerating capacity

The HVACR industry faces significant product and technology changes. Most of our current products have to be qualified or redesigned to meet the very ambitious targets of the F-gas Regulation. This is a time and lab capacity consuming process without precedence in the industry. The flammability of the alternative refrigerants changes the landscape to a much larger extent than the change from CFCs to HFCs ever did.

First and foremost the knowledge barrier must be overcome by training involved stakeholders, mainly servicing, repairing and maintenance staff, to ensure a timely roll-out when working with alternative refrigerants.