

Switch for Good.

Anyone wanting to make the switch to highly flammable natural refrigerants can count on us: Our products satisfy all established safety requirements.

ebmpapst

the engineer's choice



About ebm-papst.

ebm-papst is a leader in ventilation and drive engineering technology and a much sought-after engineering partner in many industries. With around 20,000 different products, we have the perfect solution for practically every requirement. We have placed the highest emphasis on economy and ecology for many years.

We believe the consistent further development of our highly-efficient GreenTech EC technology provides our customers with the best opportunities for the future in industrial digitization. With GreenIntelligence, ebm-papst already offers intelligent networked complete solutions that are unique anywhere in the world today and that secure our customers a decisive advantage.

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Six reasons that make us the ideal partner:

Our systems expertise.

You want the best solution for every project. The entire ventilation system must thus be considered as a whole. And that's what we do – with **motor technology** that sets standards, sophisticated **electronics** and **aerodynamic** designs – all from a single source and perfectly matched.

Our spirit of invention.

We are also always able to develop customized solutions for you with our versatile team of over 600 engineers and technicians.

Our lead in technology.

We are not only pioneers and trailblazers in the development of highly efficient EC technology, we also recognized the opportunities of digitization at an early stage. Therefore, we can offer solutions today that combine the highest energy efficiency with the advantages of IoT and digital networking.

Closeness to our customers.

ebm-papst has 25 production locations worldwide (including facilities in Germany, China and the USA), together with 49 sales offices, each of which has a dense network of sales representatives. You will always have a local contact, someone who speaks your language and knows your market.

Our standard of quality.

Our quality management is uncompromising, at every step in every process. This is underscored by our certification according to international standards including DIN EN ISO 9001, TS declaration of conformity and DIN EN ISO 14001.

Our sustainable approach.

Assuming responsibility for the environment, for our employees and for society is an integral part of our corporate philosophy. We develop products with an eye to maximum environmental compatibility, in particular resource-preserving production methods. We promote environmental awareness among our young staff and are actively involved in sports, culture and education. That's what makes us a leading company – and an ideal partner for you.

The consequences of the *F-Gas Regulation* for air-conditioning, refrigeration and building technology.

From Kyoto to Paris and onward to the German Climate Action Plan 2050 and the F-Gas Regulation.

Climate protection is the defining global issue of our age. Efforts made worldwide to minimize environmental catastrophes such as droughts and deluges culminate in climate summits and treaties. In 1997, there was the Kyoto Protocol. 2015 then brought the Paris Agreement, an accord concluded among 197 states with the goal of restricting global warming to well below two degrees Celsius. 163 states had formulated their own climate-protection plans in addition to the goals of the Paris Agreement. EU Regulation 517/2014 on fluorinated greenhouse gases (F-gases) has also been introduced, causing EC Regulation 842/2006 to be repealed.

The F-Gas Regulation and the resulting restrictions.

The “F-Gas Regulation” has been in force since January 1, 2015. It poses major challenges for operators and manufacturers alike. By 2030, fluorinated greenhouse gas (F-gas) emissions in the EU must be reduced by 70 million t to 35 million t of CO₂ equivalent.

The phase-down procedure.

Controls at a national level are needed for the targets of the F-Gas Regulation to be realized. An incremental restriction – or “phase-down” – of partially fluorinated hydrocarbons is a crucial regulatory approach for achieving a reduction in emissions of fluorinated greenhouse gases.

Major uncertainty on the refrigerant market.

The market for conventional refrigerants has reacted sensitively to the phase-down stages outlined in the F-Gas Regulation. Refrigerants with a high GWP rating are particularly affected. As such, the availability of these refrigerants is set to significantly decrease, while their prices will dramatically increase as dictated by supply and demand if the market fails to react quickly enough.

Switch for Good with natural refrigerants.

Anyone wanting to shield themselves from market bottlenecks and steep price hikes as far as possible ought to start switching to natural refrigerants with low global-warming potential (GWP) as soon as possible. However, it should be noted that these are often flammable. In other words, it is only possible to make the switch with products that satisfy established standards for flammable refrigerants.



The ventilation- and drive-technology solutions from leading innovation and technology company ebm-papst satisfy standards for flammable refrigerants, which helps manufacturers and operators to switch for Good.

Important *questions and answers* about the Switch for Good.

Who needs to comply with the F-Gas Regulation?

The F-Gas Regulation concerns stationary refrigerating plants and air conditioners, stationary heat pumps and fire-safety equipment, refrigerating plants in refrigerated trucks and trailers, electrical switchgear, and organic Rankine circuits that are filled with partially fluorinated hydrocarbons. The operator is responsible for monitoring and documenting all plant data.

What are the aims of the F-Gas Regulation?

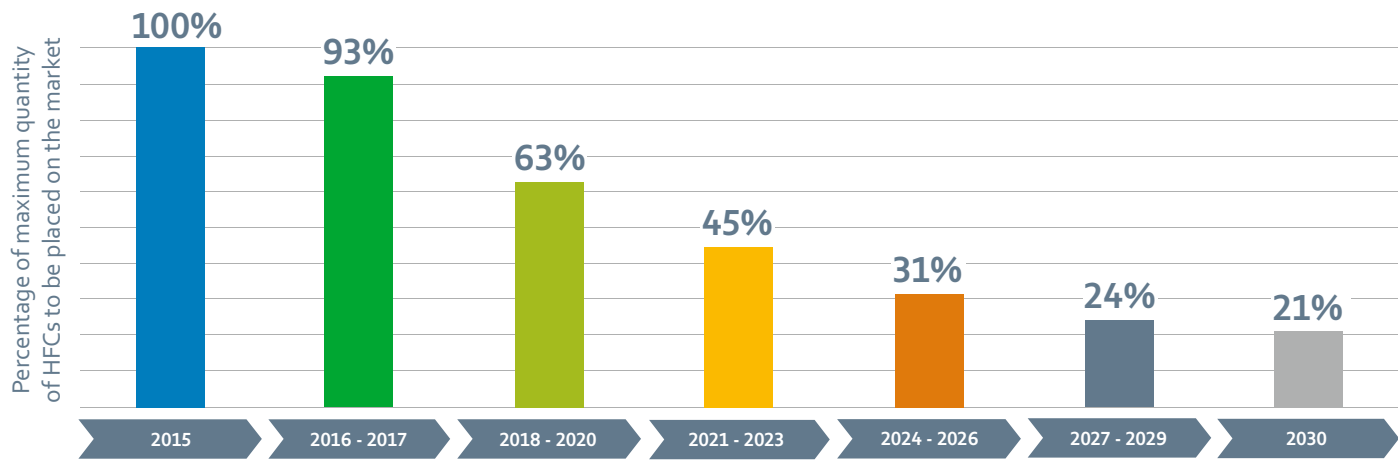
The regulation is a state-supported incentive to use natural refrigerants that are free from F-gases. The proportion of partially fluorinated hydrocarbons available in the EU today is to be reduced to 21% by 2030 in an incremental phase-down. Please refer to the chart below.

What exactly are natural refrigerants?

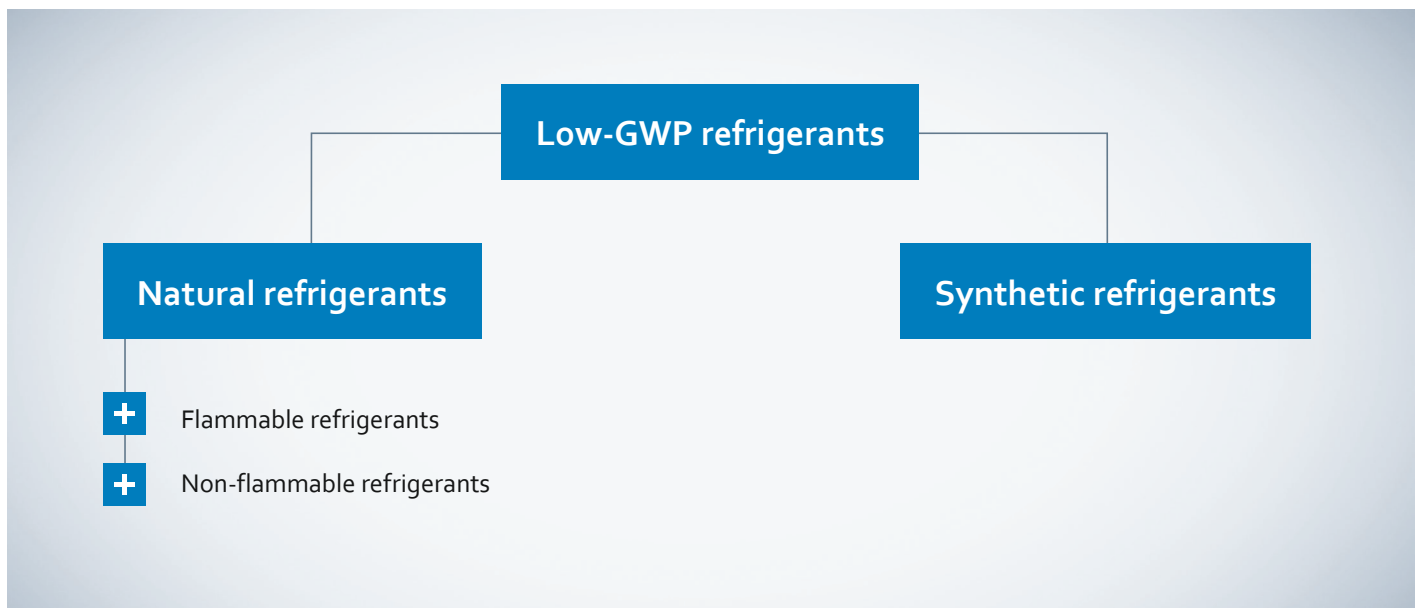
Natural refrigerants are substances that occur naturally in our environment. They include water, air, carbon dioxide, ammonia, and hydrocarbons.

Substances among these natural refrigerants vary depending on two main factors: their impact on the greenhouse effect and their flammability. Flammable refrigerants include ammonia (R717), propane (R290), propylene/propene (R1270), and isobutane (R600a).

Regulation (EU) No 517/2014 on fluorinated greenhouse gases (F-gases)



	from 1 January 2015	from 1 January 2020	from 1 January 2022
Placing on the market prohibitions	Domestic refrigerators and freezers that contain HFCs with GWP of 150 or more.	Stationary refrigeration equipment, that contains, or whose functioning relies upon, HFCs with GWP of 2,500 or more except equipment intended for application designed to cool products to temperatures below -50 °C.	Multipack centralized refrigeration systems for commercial use with a rated capacity of 40 kW or more that contain, or whose functioning relies upon, F-gases with GWP of 150 or more, except in the primary refrigerant circuit of cascade systems where F-gases with a GWP of less than 1,500 may be used.
		Refrigerators and freezers for commercial use (hermetically sealed equipment) that contain HFCs with GWP of 2,500 or more.	Refrigerators and freezers for commercial use (hermetically sealed equipment) that contain HFCs with GWP of 150 or more.



What does the phase-down procedure cover?

The phased-down 30% reduction of partially fluorinated hydrocarbons in 2018 prescribed in the F-Gas Regulation will be followed by a further 18% reduction in 2021.

In accordance with this approach, companies that launch 100 t of CO₂ equivalent or more onto the market need a quota. From January 1, 2020, no fluorinated greenhouse gases with a global-warming potential (GWP) rating of 2,500 or higher are permitted to be used for maintenance or repairs on refrigerating plants with a capacity of 40 t of CO₂ equivalent or more.

Also affected will be central refrigerating plants used for commercial purposes and rated at more than 40 kW from January 1, 2022, certain mono-split air conditioners with a rating of 750 GWP or more from January 1, 2025, and certain aerosols and foams.

Why is it advisable to make the switch from synthetic refrigerants?

When synthetic, halogenated substances escape from air-conditioning or refrigerating plants, they are accompanied by their harmful effects on the climate. Considering that 3.4 million tonnes of CO₂ equivalent were emitted in 2006 by commercial refrigerating plants alone, it is clear that this must be slowed at all costs. After all, this

alone amounts to almost 35% of the total emissions of partially fluorinated hydrocarbons in Germany.

Natural refrigerants, on the other hand, have unlimited availability and only minimal global-warming potential.

Are natural refrigerants always flammable?

No, but this is advantageous. The reason is simple: A low GWP means that the refrigerant is quickly broken down when it enters the atmosphere. This can only be ensured if it is chemically reactive, and high reactivity typically goes hand in hand with high flammability.

How can this safety risk be effectively countered?

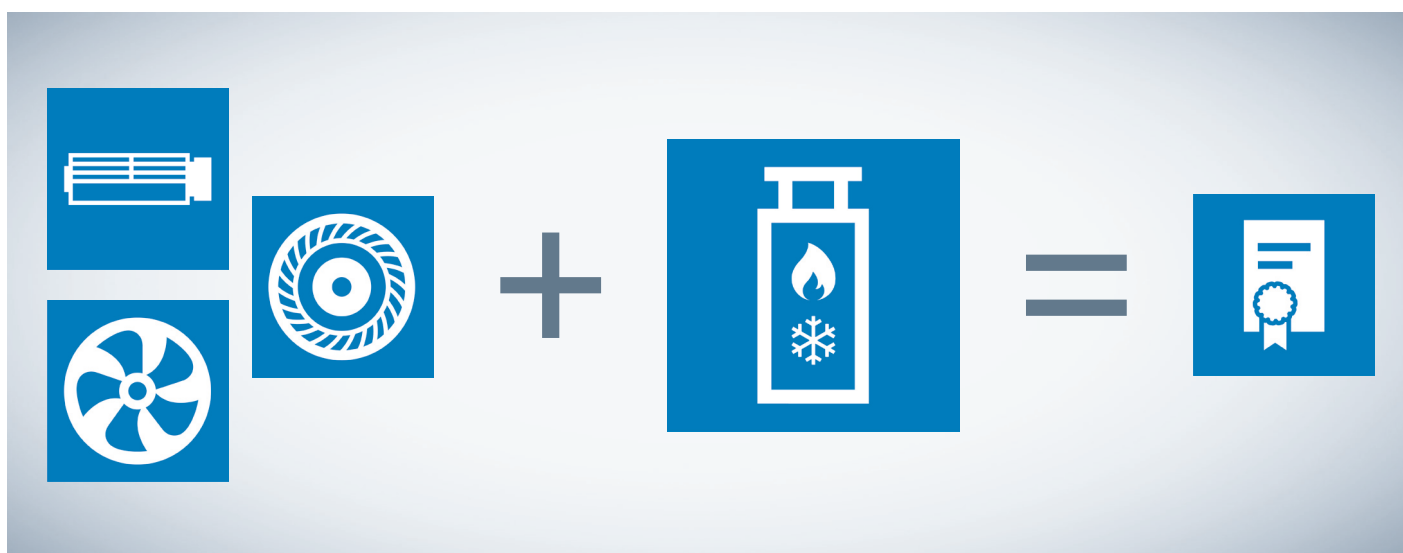
When developing air conditioners, refrigerating plants, domestic refrigerators, and heat pumps, manufacturers should make an effort to use only product components – such as the ones supplied by ebm-papst – that satisfy all established standards concerning the use of flammable refrigerants.

Is it true that only ATEX products can be safely used in conjunction with flammable refrigerants?

No, this is not true: Standard ebm-papst products without explosion protection are adequate. Find out more on Page 6.

Perfect Match.

ebm-papst and flammable natural refrigerants: the perfect combination!



In summary, it is safe to say that choosing refrigerants is becoming more and more important. The "Switch for Good" to low-GWP refrigerants (i.e., substances with a GWP rating of less than 150) also necessitates special requirements and designs due to the flammability of these substances. This will involve a major shake-up in the production of air conditioners, refrigerating plants, domestic refrigerators, and heat pumps. We support our customers wherever we can with this transition.

Which standards need to be satisfied when it comes to the use of flammable refrigerants?

- Tumble dryers = EN 60335-2-11
- Household cooling devices = EN 60335-2-24
- Air conditioners and heat pumps = EN 60335-2-40
- Commercial refrigerating technology = EN 60335-2-89

In line with standard EN 378, there is a further classification of flammable refrigerants into flammability levels from 1–3 and toxicity levels from A–B.

The broad and ever-expanding product portfolio at ebm-papst satisfies these standards: The products it contains can therefore be used safely in conjunction with flammable refrigerants.

Standard products without explosion protection are adequate.

This is why plant engineers do not require special ATEX products in order to use flammable refrigerants in their plants. Standard ebm-papst products are already adequate because the thermal sensor is installed encapsulated within the stator. Consequently, there is no danger of deflagration or explosion. ATEX products only become necessary when the maximum filling capacity of refrigerant defined in the respective standard is exceeded.

In the case of refrigerating plants with over 150 g refrigerant, for instance, it might make sense to divide the plants into several circuits. If that is not possible, we also offer a suitable solution: ebm-papst fans with energy-saving motors and ATEX approval II 3G nA IIA T4. They satisfy ATEX standard EN 60079 and are therefore also approved for use in larger refrigerated display cases, composite and cascade systems.

Learn more here:

ebmpapst.com/refrigerants

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Applications and standards

Here, you can learn which ebm-papst products already satisfy established safety requirements today!



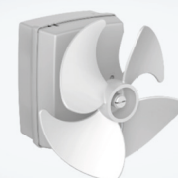
Tumble dryers *EN 60335-2-11*

Maximum filling capacity of A3 refrigerant: 150 g
Our solution: RadiCal centrifugal fan



Household cooling devices *EN 60335-2-24*

Maximum filling capacity of A3 refrigerant: 150 g
Our solution: DE 020 motor series



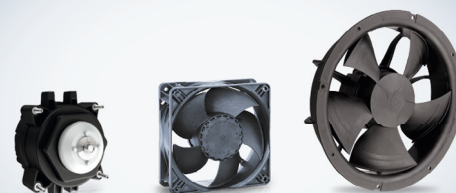
Air conditioners and heat pumps *EN 60335-2-40*

Maximum filling capacity of A3 refrigerant: 1 kg or rather 5 kg (depending on the place of installation)
Our solution: Axial fans HyBlade® and AxiBlade



Commercial refrigerating technology *EN 60335-2-89*

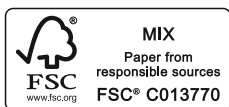
Maximum filling capacity of A3 refrigerant: 150 g (500 g in the case of IEC 60335-2-89)
Our solution: NiQ energy-saving motor, ACi 4400 tubeaxial fan, and energy-saving fan



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