# Press Release

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**Next stage in refrigerant regulation to take effect**

The next stage of the EU refrigerant regulation / F-gas regulation (EU) no. 517/2014 for fluorinated greenhouse gases will come into effect from 2020 and will see restrictions become significantly more stringent for manufacturers of systems using HFC refrigerants. Changes will also ensue for operators of existing installations and in terms of the duties and obligations of such operators around testing and documentation. Further shortages and price increases of refrigerants in frequent use to date are foreseeable.

Weiss Technik focusses development, production and service activities in three areas:

1. **Safeguarding supply and maintaining existing installations**

This also includes consultancy on and implementation of extended leak testing mandatory since 1 January 2017.

1. **Preservation of performance capability of environmental simulation systems**

Alternative refrigerants must not restrict the performance capability of systems. The comparability of test results produced in the past, present and in the future must be ensured.

1. **Harmlessness of alternative refrigerants**

Environmental simulation systems require a lot of energy. Refrigerants used are often greenhouse gases. They should, however, neither be toxic nor combustible nor ozone depleting.

Specifically, this means:

**Safeguarding supply**

From 1 January 2020, refrigerants with a GWP (Global Warming Potential) of greater than 2500 will no longer be permitted in new systems in the field of environmental simulation. Former standard refrigerant R404A therefore will continue to be permitted only for refilling. An exemption exists for systems with testing option below -50°C and military installations.

Weiss Technik converted all standard systems to R449A in 2016 (GWP 1397), and as of 2018 conversion is complete.

The next stage in quota policy takes effect concurrently with the prohibition of further refrigerants: Just 63% of the refrigerant quantity of 2015 will be permissible in the EU thereafter (based on CO2 equivalents). Refrigerants with a high GWP are very unappealing to manufacturers and dealers due to their disproportional consumption above quota. The price for R23 consequently has increased almost tenfold, R404A has become virtually impossible to source in some parts of Europe. Major refrigerant manufacturers have announced the ceasing of production of R404A.

For customers of Weiss Technik, the supply of R23 is safeguarded. Long-term supply contracts, an independently owned R23 stock and a functioning recycling process create investment security for all customers with applications in the extended temperature range.

Existing installations using R404A can be converted to R452A (GWP 2141) at little expense. Weiss Technik is well placed to provide consultancy and undertake conversions owing to the largest service network in Europe, having already converted dozens of installations since 2017.

**Leakage testing on environmental simulation systems**

Leakage testing on environmental simulation systems has been an operator obligation since 1 January 2017. From 5 tonnes of CO2 equivalent, equal e.g. to approx. 1.7 kg of R404A, an annual leak test must be performed by certified specialist personnel. The testing cycle is dependent on the refrigerant fill quantity and from 500 tonnes of CO2 equivalent is just 3 months. For R23, this equates to a fill quantity of 34 kg. The testing cycle can be extended by an automatic leakage monitoring system.

The performance of leakage testing is also expected in accordance with EN 378-4. The pure refrigerant quantity is decisive in this regard. From 3 kg of refrigerant, the standard stipulates an annual test.

The “allowed” leakage rate is dependent on the refrigerant fill quantity and the construction time frame of the system. On a system constructed in 2008 with a fill quantity of < 10 kg, an annual leakage rate of 3% is permitted. The performance of leakage testing and any refilling must be documented by the operator and a certified technician.

Important: For refrigerant mixtures with temperature glide (zeotropic substances), refilling is difficult because the refrigerant can become unmixed. Refilling with an alternative refrigerant in fact is entirely prohibited because the parameters of the refrigerant mixture produced would be unknown.

The refilling of systems with refrigerants with GWP higher than 2500 meanwhile remains permissible only below 40t CO2 equivalent (equal to 10 kg R404A). Larger quantities may be filled only with recycled refrigerant.

**Preservation of performance capability of systems**

The new refrigerant mixtures are more environmentally friendly, though not as powerful as the previous ones. Technical modifications were necessary to the refrigerant circuit to maintain the same performance. With R449A, -40°C is achieved in Weiss Technik systems. It takes several minutes longer in comparison to R404A, as heat compensation is reduced in the lower range. Important: The rate of cooling in the range of the relevant standards, as required e.g. in IEC 60068-3-5, continues to be dependably achieved.

The refrigerant cascade system remains the first choice for greater performance in the extended temperature range. This allows the temperature to be reduced linearly down to below -65°C.

Alternative concepts, e.g. a two-stage compressor, require much more energy with less increase in performance and are often therefore uneconomical.

**Harmlessness of alternative refrigerants**

Weiss Technik is researching into alternative refrigerants that can be used harmlessly. For climate simulation systems, only refrigerants that are inflammable (including in the case of leakage), non-toxic and non-corrosive, and which have no ozone depletion potential (ODP) are considered. Refrigerants such as propane, nitrous oxide (N2O) or ammonia (NH3) therefore are excluded.

Weiss Technik has discontinued promising research into nitrous oxide. The substance damages the ozone layer and has an average retention time in the atmosphere of 114 years. It is not currently declared a refrigerant and is therefore not prohibited for environmental simulation systems despite its harmfulness to the ozone. The future regulation, however, is likely to address this. Users then would be in store for further regulatory obligations around documentation.

The aim of Weiss’s research efforts is to derive a replacement refrigerant that doesn’t require a compromise in terms of reliability, safety and performance. Testing down to -70°C must continue to be possible. Avoiding safety assessments, explosion risk appraisals or gas warning systems in test laboratories are a focus. Not least, Weiss Technik also ensures regulatory certainty in terms of ozone depletion potential and the supply of affordable, available replacement parts.

**Use of CO2 as a refrigerant**

Many other industries are switching to carbon dioxide as a refrigerant, for example in food retailing. In environmental simulation systems, CO2 is a suitable alternative to R23 only in large systems. The added costs for necessary components and the technical complexity are uneconomical for climate and temperature chambers.

Trials by Weiss Technik show temperatures to be achievable down to -48°C with CO2. The concept appeals, particularly as regards large systems that are frequently operated within a median temperature range, e.g. at -20°C. A one-stage system can be very efficiently operated in this range, the CO2 refrigerant circuit covers for instance requirements in the low temperature range or facilitates very high heat compensation in an area with high performance requirements.

Technical measures are necessary to deal with certain properties of CO2: The potentially high system pressure (up to 70 bar at an outside temperature of 30°C) is prevented by using a large excess pressure vessel or cessation cooling system with separate power supply. The outlay in this regard is justifiable in large systems.

**Summary**

* Operators of refrigeration systems are subject to new regulations. Certified servicing prevents problems in documentation and conversion.
* The market for specific refrigerants in Europe has virtually collapsed. Manufacturers of systems must themselves safeguard supply.
* Alternative, environmentally friendly refrigerants have drawbacks in terms of performance capability and reliability. Combustible, ozone-damaging and toxic substances have only very limited suitability as refrigerants. The necessary technical safety measures increase operating costs significantly.

**Sources:**

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N2O - The Dominant Ozone-Depleting Substance Emitted in the 21st Century: <http://science.sciencemag.org/content/suppl/2009/08/27/1176985.DC1/Ravishankara.SOM.pdf>

Emerson - CO2 as a Refrigerant — Five Potential Hazards of R744: <https://emersonclimateconversations.com/2015/07/02/co2-as-a-refrigerant-five-potential-hazards-of-r744/>

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EPA: <https://www.epa.gov/snap/unacceptable-substitute-refrigerants>

Honeywell - Stop R-404A and R-507: <https://www.honeywell-refrigerants.com/europe/wp-content/uploads/2017/03/honeywell-nomore404A-phase-out-information.pdf>

Chemours – R23: <https://www.chemours.com/Refrigerants/en_US/products/Freon/Freon23.html>

More information can be found at [www.weiss-technik.com](http://www.weiss-technik.com)

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**Photomaterial:**

**weisst**echnik Keeping a logbook concerning leakage detection and repairs by certified refrigerant technicians is mandatory.

**The Weiss Technik Companies**

The Weiss Technik Companies offer under the slogan - Test it. Heat it. Cool it. - solutions that are used around the world in research and development as well as in the production and quality assurance of numerous products. A strong distribution and service organisation with 22 companies in 15 countries at 40 locations ensures optimum customer support and guarantees a high degree of operational safety. The brand **weiss**technik® includes individual solutions for environmental simulation, clean rooms, climatic engineering, air dehumidification as well as containment solutions. With the test systems from the field of environmental simulation, different environmental influences around the globe can be simulated in time-lapse. The product is tested under real load for its functionality, quality, reliability, material resistance and service life. The dimensions of the test equipment range from laboratory test cabinets to test chambers for aircraft components with a volume of several hundred cubic meters. The Weiss Technik Companies are part of the Schunk Group based in Heuchelheim near Gießen, Germany.

**Schunk Group**
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