

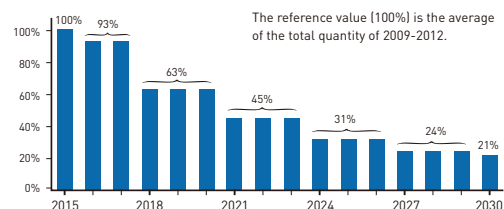
The following environmental regulations concern R22 and R404A

EU F-gas Regulation

R404A

Reduction of the quantity of hydrofluorocarbons placed on the market

■ Schedule of reduction of the quantity of hydrofluorocarbons (CO2 equivalent)
Source: Annex V



The reference value (100%) is the average of the total quantity of 2009-2012.

Producers and importers of more than 100 tonnes of CO2 equivalent of hydrofluorocarbons per year shall ensure the annual maximum quantity of hydrofluorocarbons placed on the market into the EU.[Article 15.]

The maximum quantity shall be calculated by applying the percentages on the left to the annual average of the total quantity placed on the market into the EU during period 2009 to 2012. [ANNEX V]

Prohibition of the use of high global warming potential gases on service or maintenance

From 1 January 2020, the use of fluorinated greenhouse gases, with a global warming potential of 2500 or more, to service or maintain refrigeration equipment with a charge size of 40 tonnes of CO2 equivalent or more, shall be prohibited.[Article 13-3]

The targets are HFC-23, HFC-125, HFC-143a, R-404a, R-422A, R-507A and so on.

This paragraph shall not apply to military equipment, equipment intended for applications designed to cool products to temperatures below -50 °C or refrigeration equipment, alternatives are not available or the other background pursuant to Article 11-3.

Also it shall not apply to, until 1 January 2030, reclaimed or recycled fluorinated greenhouse gases used for the maintenance or servicing of existing refrigeration equipment. [Article 12-6, Article 13-3(b)]

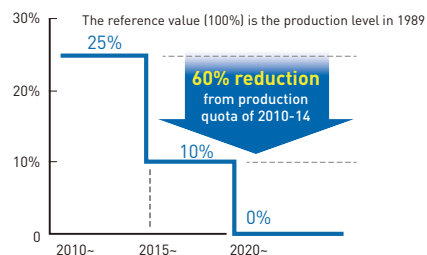
Source: REGULATION (EU) No 517/2014 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 April 2014 on fluorinated greenhouse gases and repealing Regulation (EC) No 842/2006

Montreal Protocol

R22

Announcement of phase-out of HCFCs (such as R22)

■ Phase out of HCFC volumes in non-A5 countries



The reference value (100%) is the production level in 1989

60% reduction
from production
quota of 2010-14

For new equipment, HCFCs are to be phased out entirely by 2020 in non-A5 countries[Note1] and by 2030 in A5 countries.[Note2]

This phase-out is based on an international intergovernmental agreement, the Montreal Protocol in 1987.

Production of CFCs (R12, R502, etc.) was completely phased out by 1996.

[Note1] Developing countries are categorized as operating under Article 5 of the Montreal Protocol. (Referred to as "Article 5 countries.")

However, any country that was a non-Article 5 country in the original draft and later changed is excluded.

[Note2] The Montreal Protocol allows as an exception production of HCFC for replenishment of refrigeration and air conditioning equipment existing in 2020 until 2029.

Source: Daikin Industries, Ltd. research

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R407H

DAIKIN MR ENGINEERING CO.,LTD.

Eco-friendly Refrigerant with Optimal Balance

Daikin Industries, Ltd. is a leading refrigerant manufacturer. Daikin manufactures R407H, an alternative to existing refrigerants such as R22 and R404A that have a high environmental impact. R407H has the safety, stability, and efficiency required of a refrigerant for ships. Being a low-GWP HFC refrigerant, R407H has superb environmental characteristics and availability.

GWP1495, Suitable as environmental options for ship classes

With GWP about 60% lower than that of R404A, R407H is suitable for "ecofriendly ships."

Available globally

Made of components (HFC) easily available around the world, R407H can be procured at all major ports.

Safety

Nonflammable

Safe for cargo and crew

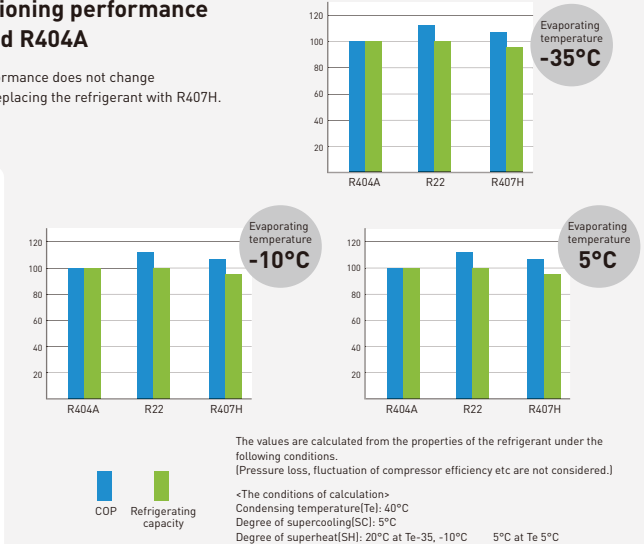
High Efficiency

Comparable refrigeration and air conditioning performance as R22 and R404A

Equipment performance does not change remarkably by replacing the refrigerant with R407H.

Comparison of refrigeration capacity and COP

Baseline (100%) = R404A



R407H

Eco-friendliness

Stability

HFC refrigerant with proven record

Unlike HFO refrigerant, there is no risk of decomposition from exposure to water. This reduces the risk of equipment failure.

What We Propose

For newly built ships

For existing ships

Please contact us about environmental correspondence of existing equipment.

We propose equipment replacement and refrigerant drop-in or retrofit depending on your demands.

Lineup of marine AC & refrigeration equipment

All main equipment including deck units, air-conditioners, and condensing units are compatible with R407H.

DECK UNIT

Centralized air conditioning for accommodation, etc. (25~50HP)



SMALL SIZE CONDENSING UNIT

Low temperature refrigeration for provision chambers. (4~8HP)



PACKAGED AIR CONDITIONER

Independent air conditioning for engine control rooms, etc. (3~20HP)



WATER CHILLING UNIT

Water chilling unit for large capacity central air conditioning systems. (40~120HP)



PACKAGED AIR CONDITIONER for Galley

Independent air conditioning system providing 100% fresh air for ship Galley. (3~8HP)



Equipment replacement

We can install the latest equipment in several ways depending on customers' requests.

To protect the hull, for instance, we can transfer component parts through the hatch and assemble them on the ship as follows.

* This is an example of disassembled delivery of Daikin's product (marine packaged air conditioner). The process will vary depending on the type of equipment and the ship type.

Packaged Air Conditioner

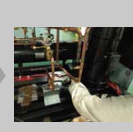


Delivered from Daikin Factory

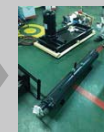
Disassembly



Disassemble electrical BOX

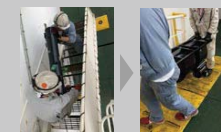


Disassemble refrigerant plumbing



Disassemble condenser and compressor

Deliver into the ship



Carry the disassembled parts through the hatch

Reassembly on board



Install fan assy



Install compressor and frames



Filling refrigerant

Completion



Commissioning test

Refrigerant drop-in and retrofitting existing systems

Recent equipment can be retrofitted to meet the latest environmental regulations. Please consult with our staff to find the best way.

Already in operation

Daikin's air conditioning equipment with R407H has been adopted and received favorably by customers.



"Kouzanmaru" / Syetems installed:
Packaged Air Conditioner