DAIKIN

R-32

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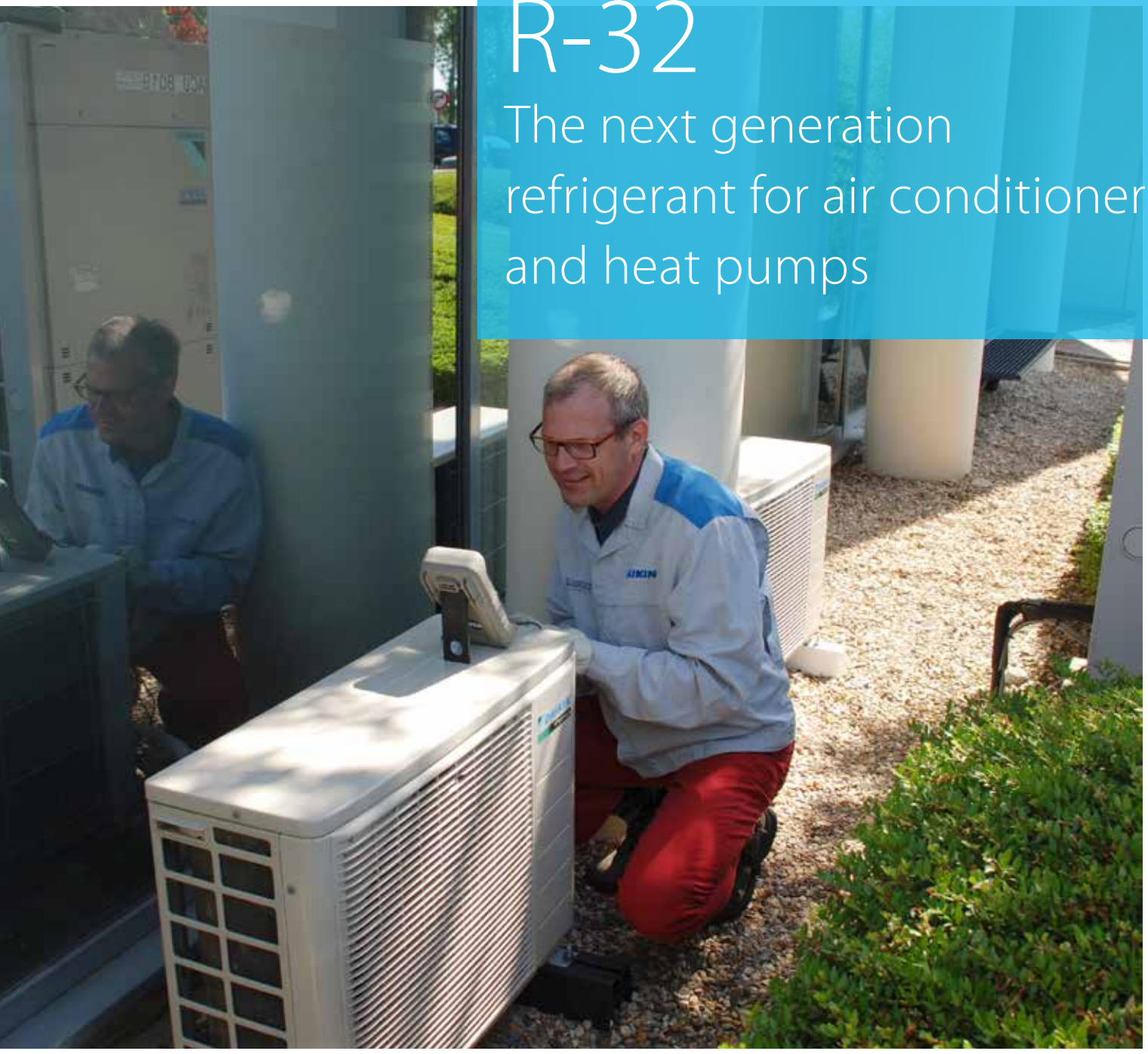
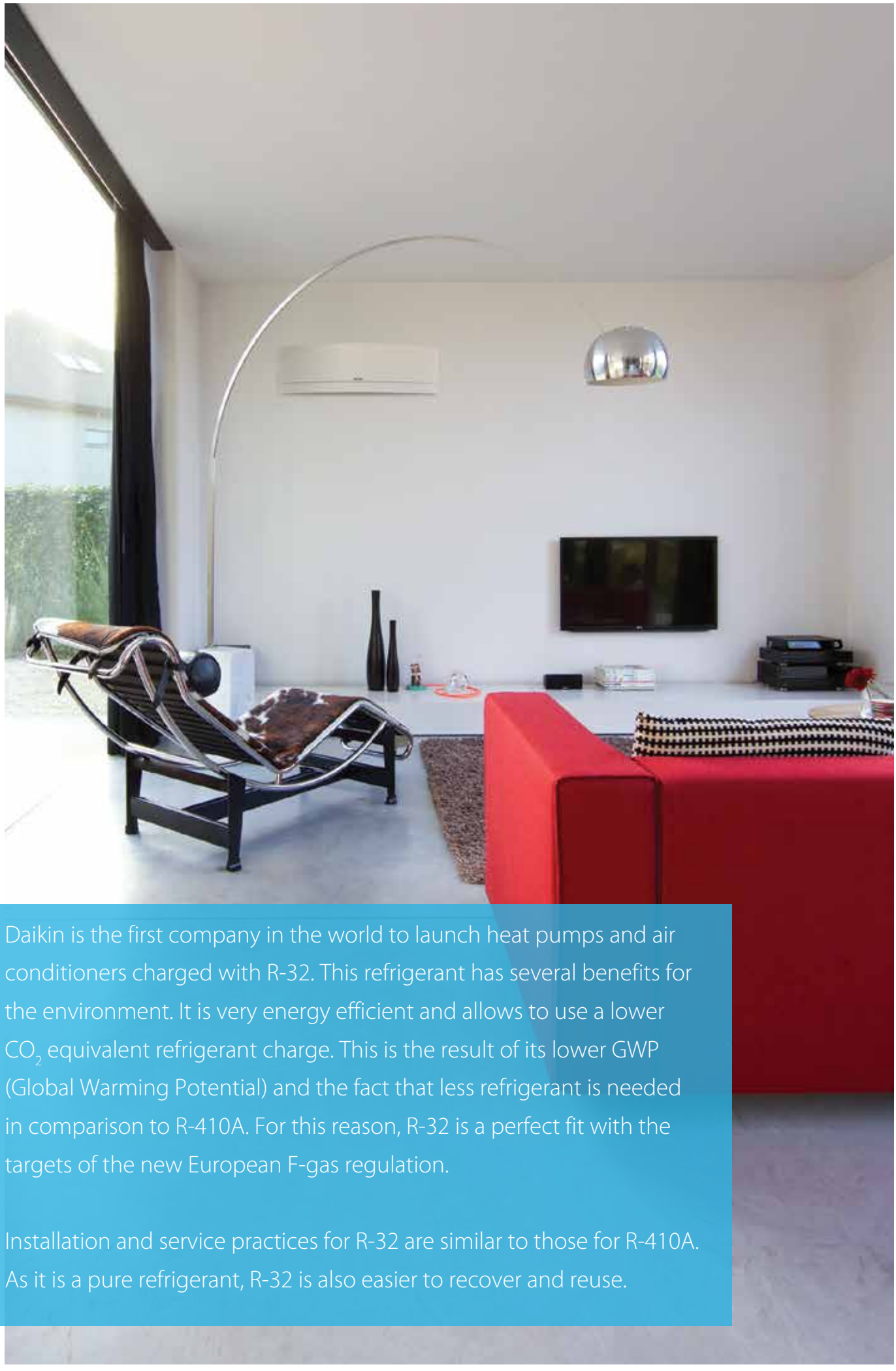
The next generation refrigerant for air conditioners and heat pumps





Daikin is the first company in the world to launch heat pumps and air conditioners charged with R-32. This refrigerant has several benefits for the environment. It is very energy efficient and allows to use a lower CO_2 equivalent refrigerant charge. This is the result of its lower GWP (Global Warming Potential) and the fact that less refrigerant is needed in comparison to R-410A. For this reason, R-32 is a perfect fit with the targets of the new European F-gas regulation.

Installation and service practices for R-32 are similar to those for R-410A. As it is a pure refrigerant, R-32 is also easier to recover and reuse.

Why has Daikin introduced

R-32 models?

A core element of Daikin's corporate philosophy is that the company strives to be a leader in applying environmentally friendly practices, with energy efficiency and refrigerant choice as key factors. Daikin launched the first worldwide air conditioners with R-32 refrigerant at the end of 2012 in Japan, where several million units have since been installed. Subsequently, R-32 models have been providing indoor climate comfort in other countries such as Australia, New Zealand, India, Thailand, Vietnam, the Philippines, Malaysia and Indonesia. In 2013, R-32 models made their debut in Europe, adding new environmental benefits to the unrivalled control they offer users.

In all of us,
a green heart

Examples of products available in Europe with R-32 refrigerant:

Ururu Sarara

FTXM

Sky Air round flow cassette

What is R-32?

R-32's chemical name is difluoromethane. It is a refrigerant which has been used for many years as a component of the refrigerant blend R-410A (which is 50% R-32 and 50% R-125). Daikin was the first company to recognise that there are several advantages of using pure R-32 instead of using it as part of a blend. Many other industry players have now followed suit.

	R-410A	R-32
Composition	Blend of 50% R-32 + 50% R-125	Pure R-32 (no blend)
GWP (Global Warming Potential)	2087.5	675
ODP (Ozone Depletion Potential)	0	0

What is GWP?

Global Warming Potential (GWP) is a number which expresses the potential impact that a particular refrigerant would have on global warming if it were released into the atmosphere. It is a relative value which compares the impact of 1kg of refrigerant to 1kg of CO_2 over a period of 100 years.

Although this impact can be avoided by preventing leaks and ensuring proper end of life recovery, choosing a refrigerant with a lower GWP and minimising the volume of refrigerant will reduce the risk to the environment if a leak were to occur accidentally.

What is ODP?

Ozone Depletion Potential (ODP) is a number that refers to the harmful impact on the stratospheric ozone layer caused by a chemical substance. It is a relative value which compares the impact of a refrigerant to a similar mass of R-11. Thus, the ODP of R-11 is defined to be 1.

Refrigerants with er lower environmental impact

R-32, R-410A, R-134a and other refrigerants currently used in the European Union do not deplete the ozone layer. The previous generation refrigerants such as R-22 had a detrimental effect on the stratospheric ozone layer because they contained chlorine. Since 2004, EU regulations have banned any new equipment using ozone-depleting refrigerants such as R-22. Since January 2015, servicing existing equipment with R-22, even with recycled R-22, has also been banned.

Phasing out R-22

If your customer is still using R-22 based equipment today, you should recommend replacing it soon and not waiting until a breakdown occurs. Deciding to change to R-32 equipment instead of R-22 would create a double benefit for the environment. It would eliminate the risk of damaging the ozone layer and would be a better solution in terms of the global warming impact. Just replacing the R-22 refrigerant with R-32 in an existing installation is not allowed because oil and pressures are different. However, it may be possible to replace the indoor and outdoor units and keep the refrigerant piping. (More detailed instructions are available in our catalogue on R-22 replacement technologies)

Helping consumers
to make the right choice

How you can advise about the choice of an air conditioner or heat pump with a lower global warming impact

The main impact on global warming from air conditioners or heat pumps comes from the electricity they use

If the electricity is generated by renewable sources, this impact can be close to zero. However, if it comes from power plants using fossil fuels, the impact is far higher. In any case, even when the electricity source is low emission, it is still important to be energy efficient and not waste energy.

European Energy labels (A+++, A++, A+, A, B, C, etc.) allow consumers to compare the energy efficiency of air conditioners and heat pumps.

→ **Recommend that your customers choose a model with a top class energy label**

The other impact on global warming comes from the refrigerant gas circulating within the system

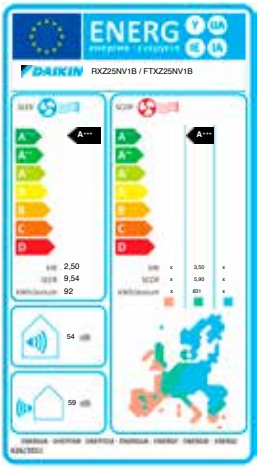
Although this impact can be avoided by preventing leaks and ensuring proper end of life recovery, choosing a refrigerant with a lower GWP and minimising the volume of refrigerant will reduce the risk to the environment if a leak were to occur accidentally.

→ **Recommend that your customers select a model with a low CO_2 equivalent refrigerant charge**

The CO_2 equivalent value is indicated on the advertising materials (catalogues, Daikin website). It is the amount of refrigerant in kg multiplied by the GWP value.

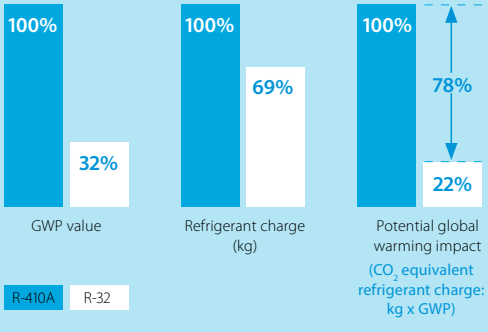
Top class energy labels

Daikin R-32 models up to 12.5 kW are ranked with very high energy labels of A+ and beyond.
The Ururu Sarara range is **top ranked with A+++ energy labels in both cooling and heating mode.**



Example: Daikin Emura size 3.5 kW

If your customer chooses a 3.5 kW Daikin Emura air conditioner charged with R-32 refrigerant the energy label classification in cooling mode is A+++ and in heating mode A++. In addition, **the CO_2 equivalent refrigerant charge is 78% lower than the same model charged with R-410A**. This is because R-32 has a GWP which is 1/3rd the GWP of R-410A, and the refrigerant volume is also 31% lower.



The revised EU F-gas regulation

and why R-32 was introduced

Refrigerants' impact on global warming

If released into the atmosphere, refrigerants can have an impact on global warming. In 2006, EU regulators implemented the so-called 'F-gas regulation' to minimise the risk of a certain group of fluorinated greenhouse gases, of which the most important are the HFC gases commonly used as refrigerants.

Certification worked

A certification system was introduced for installation and service companies. This, in combination with mandatory leak inspections for systems with a charge of 3kg or more, has successfully reduced emissions. (Note: the revised F-gas regulation still requires leak inspections, but the threshold changed to 5 Tonnes CO_2 equivalent or more, which is equivalent to 2.4 kg of R-410A or 7.4 kg of R-32.)

EU and industry working together

Despite the fact that F-gas emissions currently only represent 2% of total EU greenhouse gas emissions, EU regulators and the industry have recognised that more can be done in view of the EU roadmap towards a low carbon economy. That is why a revised F-gas regulation came into force at the beginning of 2015. This regulation encourages the design of equipment with lower CO_2 equivalent refrigerant values. In other words, equipment with lower refrigerant GWP or a lower refrigerant charge, but ideally a reduction in both (commonly known as the 'phase down' on HFC consumption, expressed in CO_2 equivalents). Thanks to the revised F-gas regulation, the EU's F-gas emissions will be cut by two-thirds by 2030 compared with 2014 levels.

GWP is not the only parameter

There is no refrigerant which can meet the needs of every kind of application. This means that Daikin had to evaluate its options carefully, taking into account not only reduction of GWP and the amount used, but also aspects such as energy efficiency, safety and affordability.

For example, selecting a refrigerant with a lower GWP, but which uses more energy would not be a good choice, as it would be counterproductive for the total product's global warming impact.

10 years ahead of product bans

The new F-gas regulation bans the use of refrigerants with a GWP above 750 in single split air conditioners with a refrigerant charge below 3kg from 2025. Daikin already introduces R-32 models 10 years ahead of this requirement, because the sooner the industry changes to lower GWP refrigerants, the earlier the environmental impact of HFC emissions can be reduced.

R-32 - Frequently Asked Questions

1. Is R-32 a safe refrigerant?

Because R-32 belongs to the category of lower flammable refrigerants (class 2L in ISO 817 standard), it can be used safely in most air conditioner and heat pump applications. Instructions from the manufacturers of R-32 equipment and from the suppliers of R-32 refrigerant cylinders must, of course, be followed, as must European and national safety rules, as is the case for any type of refrigerant.

R-32 will not ignite if the concentration level in a room stays below the lower flammability limit (0.306kg/m^3). International and European safety legislation and standards such as EN 60335-2-40 and EN 378 define requirements for remaining well below the lower flammable limit in the case of accidental leakage.

R-32 is also difficult to ignite. Sparks generated by relays or switches in household appliances as well as common static electricity do not have sufficient energy to ignite R-32.

R-32 is a low-toxic refrigerant, it belongs to the same low toxicity classification as R-410A.

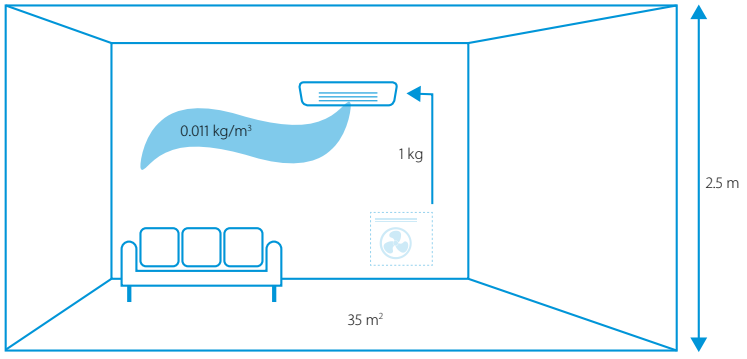
For example

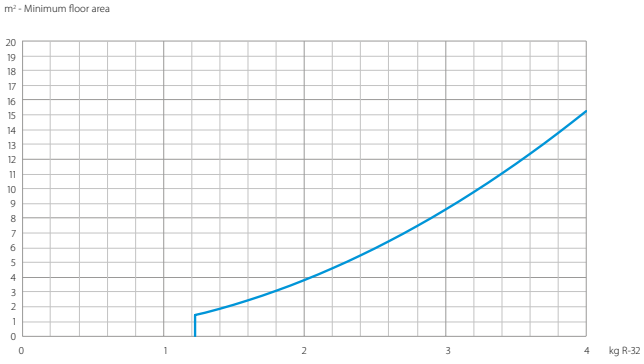
Current Daikin model ranges using R-32 have following requirements to guarantee safe use, which are perfectly possible to meet in practice.

		Minimum required floor area	Typical floor area for these models	OK to install R-32?
Daikin Emura	FTXJ20 -RXJ20	no limits	20 m^2	Yes
	FTXJ25-RXJ25	no limits	25 m^2	Yes
	FTXJ35 -RXJ35	no limits	35 m^2	Yes
	FTXJ50-RXJ50	2,76 m^2	50 m^2	Yes
FTXM	FTXM20-RXM20	no limits	20 m^2	Yes
	FTXM25-RXM25	no limits	25 m^2	Yes
	FTXM35-RXM35	no limits	35 m^2	Yes
	FTXM42-RXM42	3.44 m^2	42 m^2	Yes
	FTXM50-RXM50	3.44 m^2	50 m^2	Yes
Round flow cassette	FCAHG71F-RZAG71LV1	7.8m^2	68m^2	Yes
	FCAHG100F-RZAG7100V1	17.8m^2	95m^2	Yes
	FCAHG125F-RZAG125LV1	17.8m^2	95m^2	Yes
	FCAHG140F-RZAG140LV1	17.8m^2	134m^2	Yes

Calculated based on the requirements of the EN 60335-2-40 safety standard,
using maximum refrigerant charge values for maximum piping length between indoor and outdoor.

Even if all the refrigerant leaked into this room, the lower flammable limit (0.306kg/m^3) would not be reached.





2. Why do standards classify R-32 as a lower flammable refrigerant while the safety data sheet says it is an extremely flammable refrigerant?

International Standard ISO 817:2014 divides the flammability of refrigerants into **4 categories**:
› Class 1 - No flame propagation
› Class 2L - Lower flammability
› Class 2 – Flammable
› Class 3 - Higher flammability

This classification is based on several criteria, such as the lower flammable limit, heat of combustion and burning velocity. **R-32 falls into the 'lower flammability' or Class 2L category**. This type of classification is used as a reference in other standards which look at the application of equipment, for example the installation of an air conditioner in a certain room size and building type.

The flammability classification shown on Material Safety Data Sheets and cylinder labels is determined in accordance with the Globally Harmonized System of Classification and Labelling of Chemicals (GHS).

GHS classifies flammable gases in 2 categories: flammable (cat. 1) and extremely flammable (cat. 2). The GHS classification uses a different approach mainly used as a guidance for international transport rules: gases are classified only by the percentage concentration of gas required to create a flammable mixture in air. Other important factors such as how easy the gas is to ignite or how it behaves once ignited are currently not taken into consideration.

This is why, on safety data sheets, R-32 is classified as extremely flammable, like propane (R-290) or isobutane (R-600a) although in reality their flammability risk is quite different. In ISO standards, R-32 is classified as a lower flammable refrigerant (Class 2L), like ammonia and HFO refrigerants, whereas R-290 and R-600a belong to the category of higher flammability (Class 3).

3. Is installing and servicing R-32 equipment different from R-410A equipment?

The installation and service methods for R-32 are very similar to R-410A.
› Working pressures for R-32 and R-410A are similar (Design pressure for R-410A: 4.15 MPa, for R-32: 4.29 MPa)
› For charging requirements, R-32 is easier to handle as it can be charged in both a gas and a liquid state (not possible with R-410A which always needs to be charged in liquid state. Adding R-410A in gas form may cause the refrigerant composition to change, preventing normal operation).

The equipment manufacturer's and the refrigerant cylinder provider's safety instructions must, of course, be adhered to.
› For equipment, these instructions are similar to R-410A (ventilation required, no smoking, etc.). However, there are additional indications for ensuring a minimum required room size for some R-32 models (see table above in question 1).
› When repairing an indoor unit, a draught needs to be created from indoors to outdoors to provide good ventilation. This can be created by opening all windows and doors in the building, for example, to extract the air inside the room and have it replaced by fresh air.

4. As a technician, do I need new tools to install and service R-32 equipment?

It is particularly important to check that manifolds, leak detectors and recovery pumps can be used with R-32. Tools are available which are permitted and suitable for both R-32 and R-410A. If you are in doubt, check with the tool supplier. For recovering R-32 you need an approved R-32 recovery cylinder.
Other installation tools such as charging hose, scale, torque wrench, flare tool, pipe bender and the vacuum pump are the same, so you can use R-410A installation tools.

5. Will R-410A no longer be available?

R-410A will remain available for servicing equipment which has already been installed. For new equipment, the use of R-410A will be banned in Europe in single split air conditioners with a refrigerant charge below 3kg from 2025, but not in other applications. However, the use of R-32 is expected to grow in other applications as well because of the 'phase down' targets of the EU F-gas regulation.

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Paper from responsible sources
FSC® C109049

ECPEN16-017 xxx · 08/16

The present publication supersedes ECPEN15-017A.
Printed on non-chlorinated paper.