R32 Refrigerant Products

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R32 Refrigerant Products

New Air conditioner and Air-to-Water Heat Pump Products

Historical background

Why do we need to change the refrigerant?

Refrigerant Development

Ozone depletion factor of HCFC refrigerants

ODP value =>

ozone depletion factor *to describe the impact to the ozone layer*

Refrigerant for air conditioners

R22
GWP = 1810
ODP = 0,055

Refrigerant for commercial refrigeration

R22	R502	R12
GWP = 1810	GWP = 4657	GWP = 10890
ODP = 0,055	ODP = 1	ODP = 1

Refrigerant Development

New HFC Refrigerants with ODP = 0

but -> high GWP

GWP value =>

Global warming potential based on CO2 (GWP=1)

Refrigerant for air conditioners

R407c	***R410A***
GWP = 1774	*GWP = 2088*
ODP = 0	*ODP = 0*

Refrigerant for commercial refrigeration

R134a	***R404a***
GWP = 1430	*GWP = 3922*
ODP = 0	*ODP = 0*

*But these refrigerants or blends are having a massive **global warming potential***

Refrigerant Development

R32 History –

In June 2011

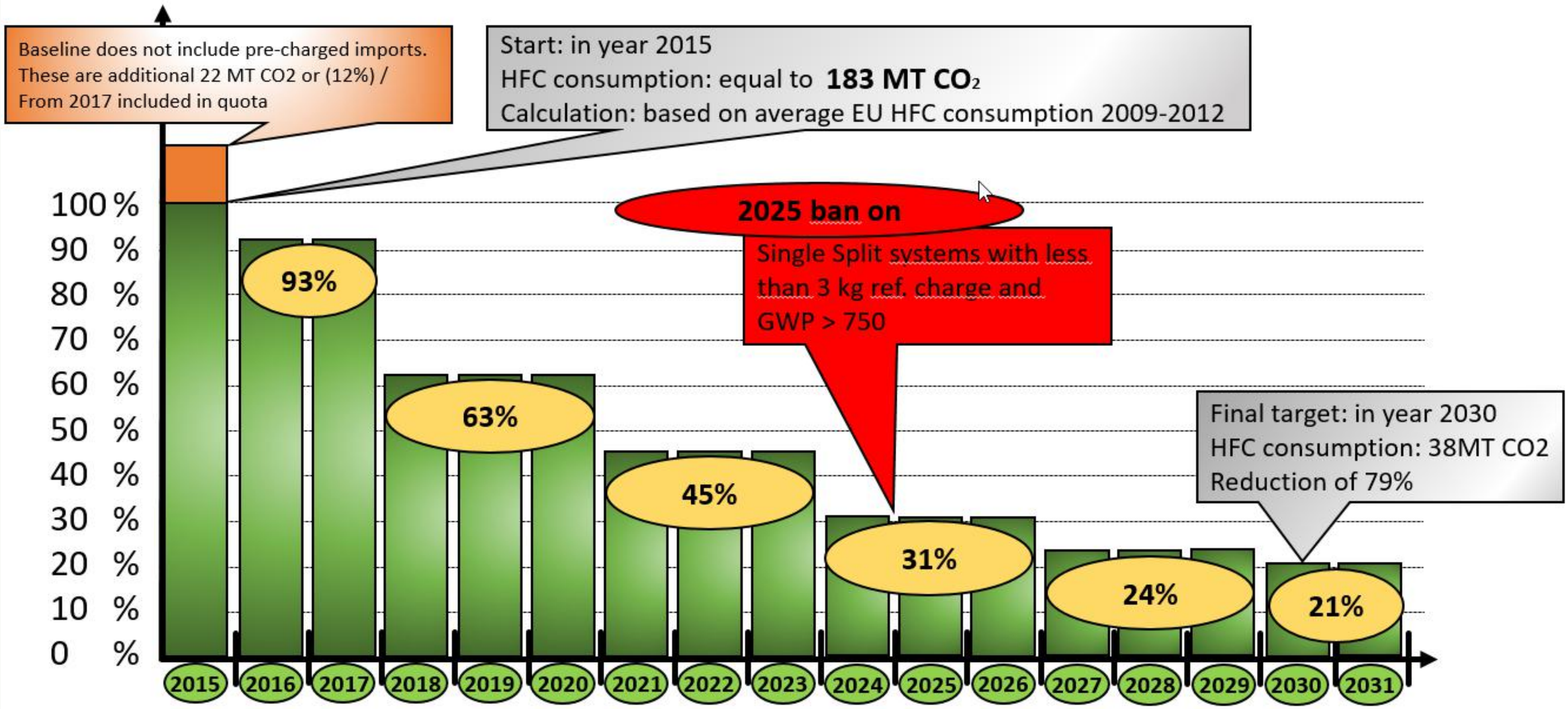
- Japanese Government (METI)
- and leading ac manufacturers
- agreed to introduce R32 technology
- into Indonesia to phase out of R22.

Since 2012 - R32 products are launched in

- Indonesia,
- Japan,
- Australasia,
- and Europe.

Refrigerant Development

HFC Phase down Roadmap



Safety and refrigerant classifications

Refrigerant Safety

Refrigerant Safety Groups

Toxicity

A	No / low toxic substances	Toxic above 400ppm
B	higher toxic substances	Toxic below 400ppm

Flammability

1	Not flammable	No combustion
2	low flammability	Combustion energy < 19MJ/Kg
3	high flammability	Combustion energy > 19MJ/Kg

Refrigerant Safety

New additional Refrigerant safety group

A2L category according to [ISO817] referring to [ASHREA34]

A2L

3 conditions have to match for A2L safety classification

Burning velocity	LFL value	Heat of combustion
< 10cm/s	> 0.3kg/m³	< 19MJ/kg

Refrigerant Safety

R32 fulfils the A2L characteristics

Heat of combustion

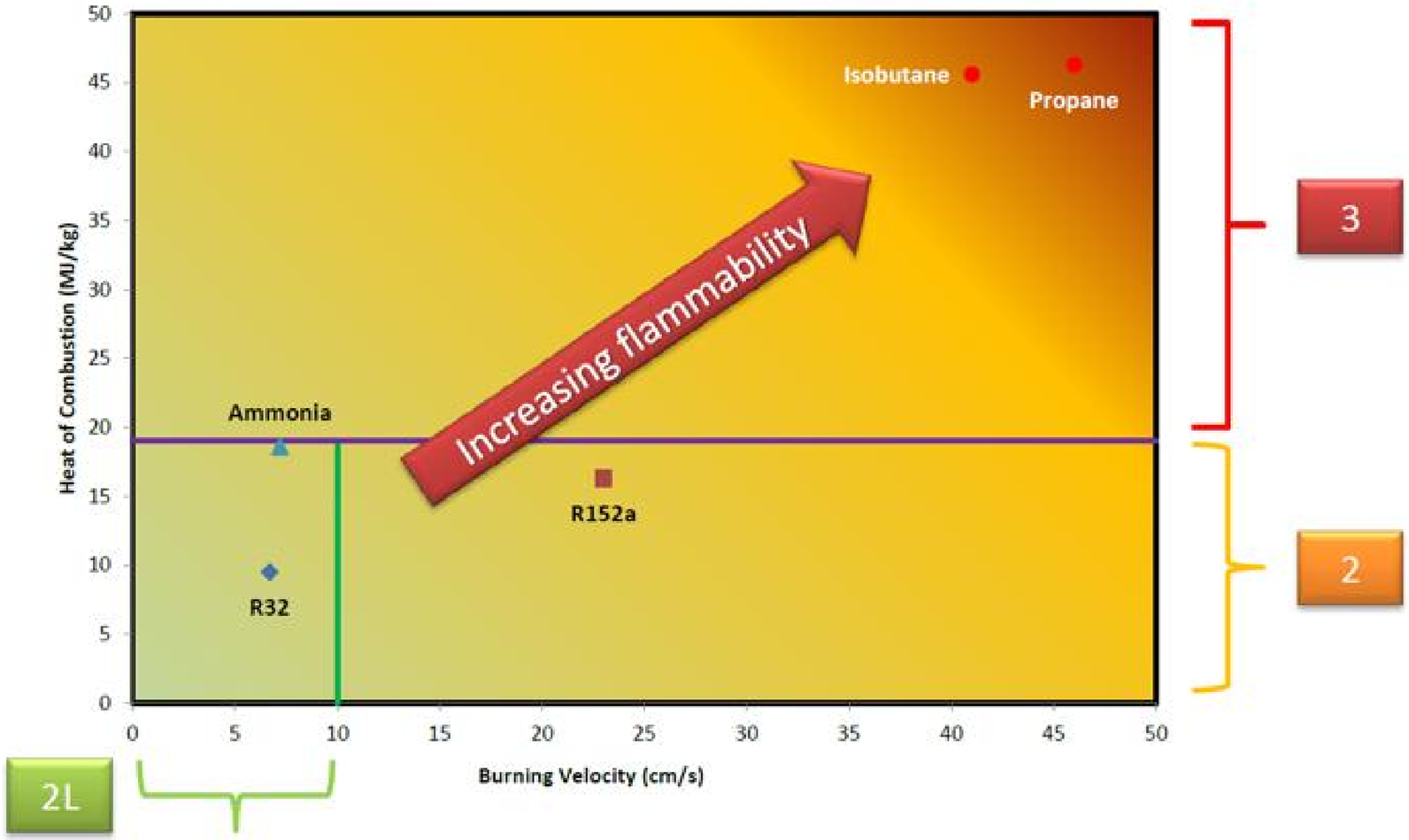
< 9.5MJ/kg

Burning velocity

6.7cm/s

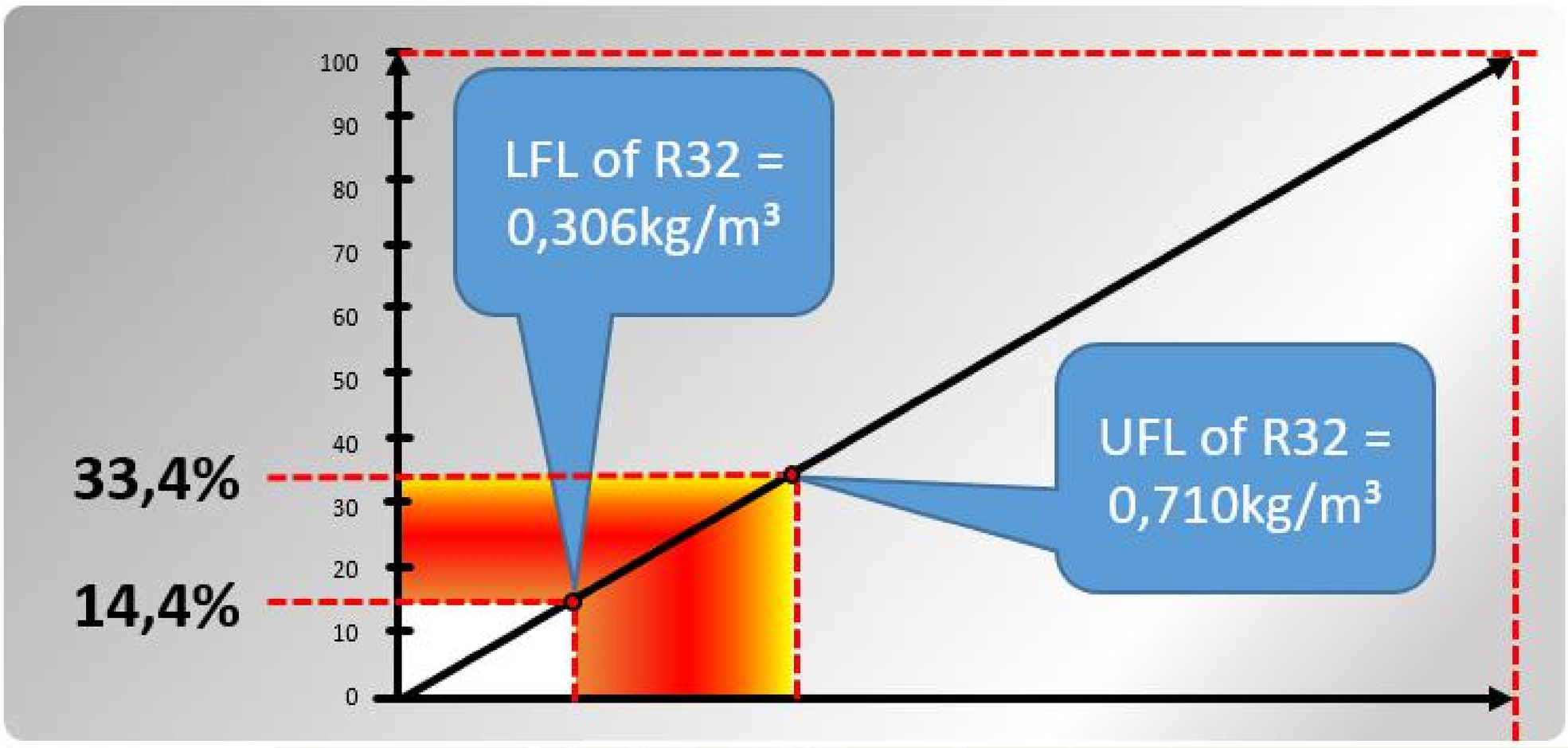
LFL value

0.306kg/m³



Refrigerant Safety

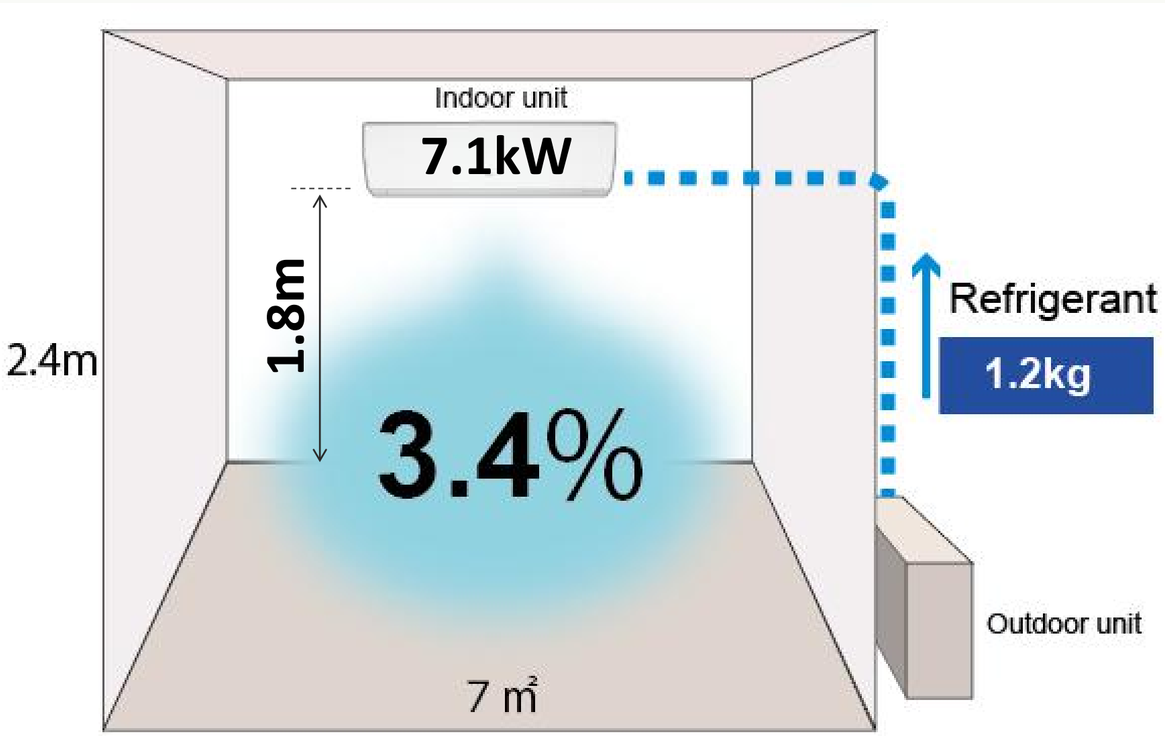
LFL (Lower flammability limit)
UFL (Upper flammability limit)



Installation

Installation example / refrigerant concentration

In the event of all refrigerant leaks in 7.1kW class model in an approximately 7m^2 room, its refrigerant concentration is only 3.4%, which is lower than minimum concentration to burn.



R32 refrigerant density: 2.116kg/m3 (30℃; 1013mbar)
Volume of refrigerant amount 1.2kg: 1.2/2.116=0.567m³
Room volume: 7m2× 2.4m=16.8m³
Refrigerant concentration: 0.567/16.8=0.03375=3.4vol%

Refrigerant concentration area

14 to 30 vol.%

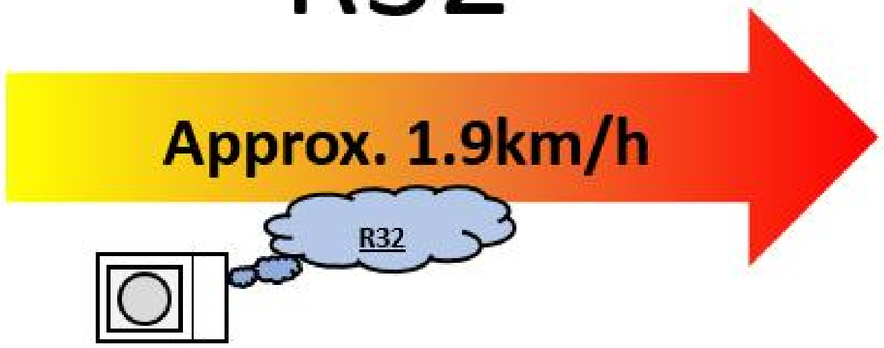
Refrigerant Safety

Burning velocity

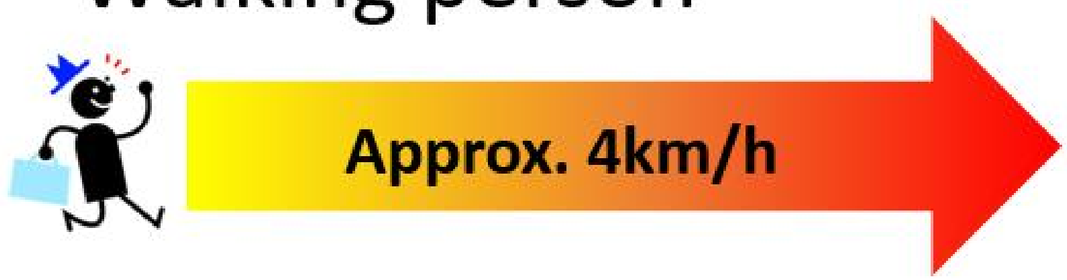
R32 — R290

Flame propagation

R32



Walking person



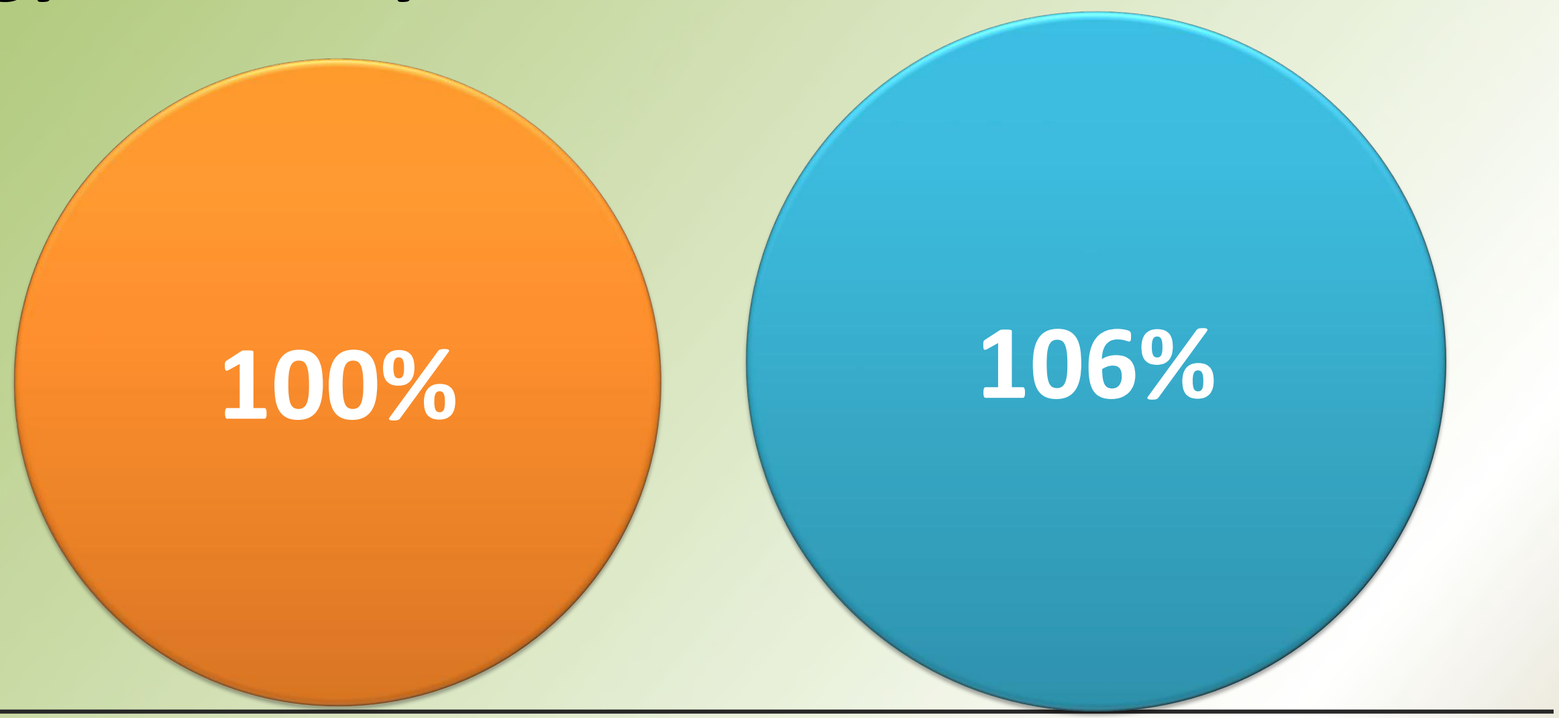
R32

effects on the system

R32 effects on the system

Higher EER / COP compared to R410a

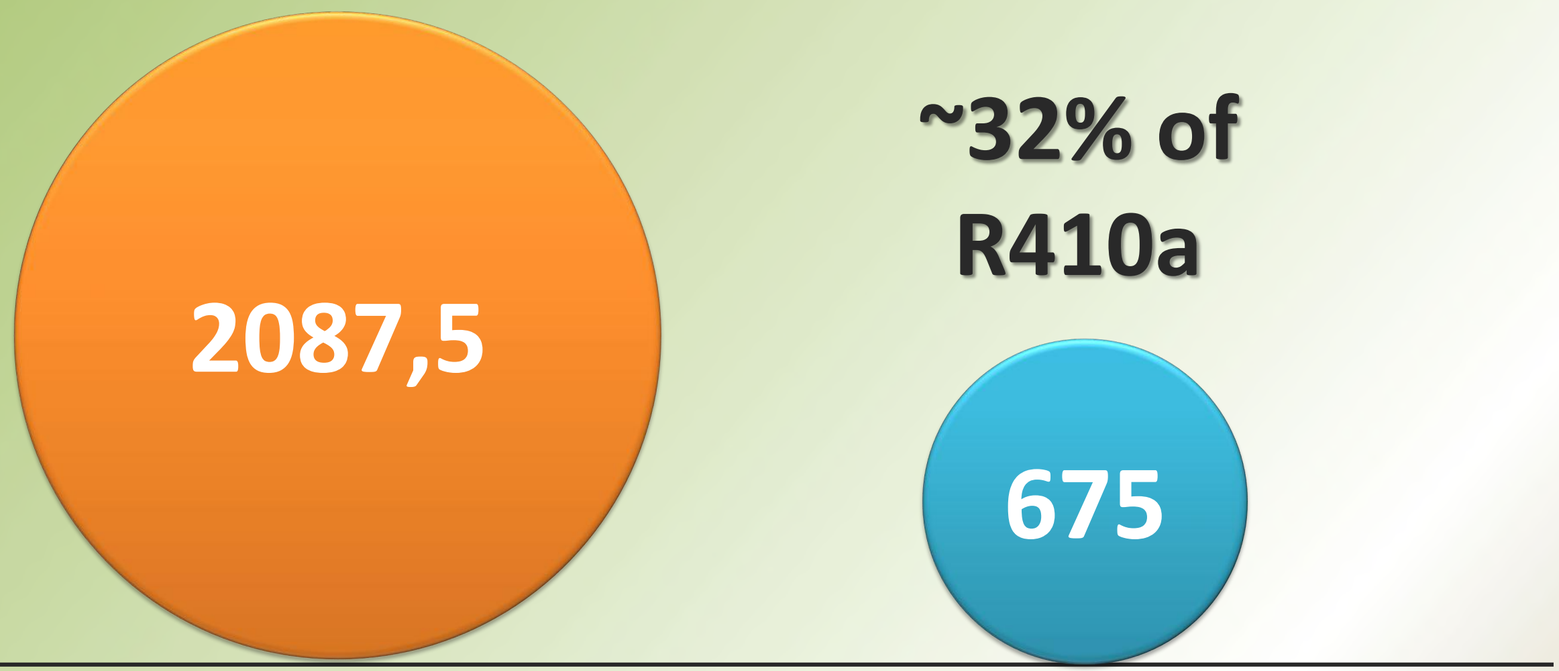
EER=> Energy efficiency ratio



R32 effects on the system

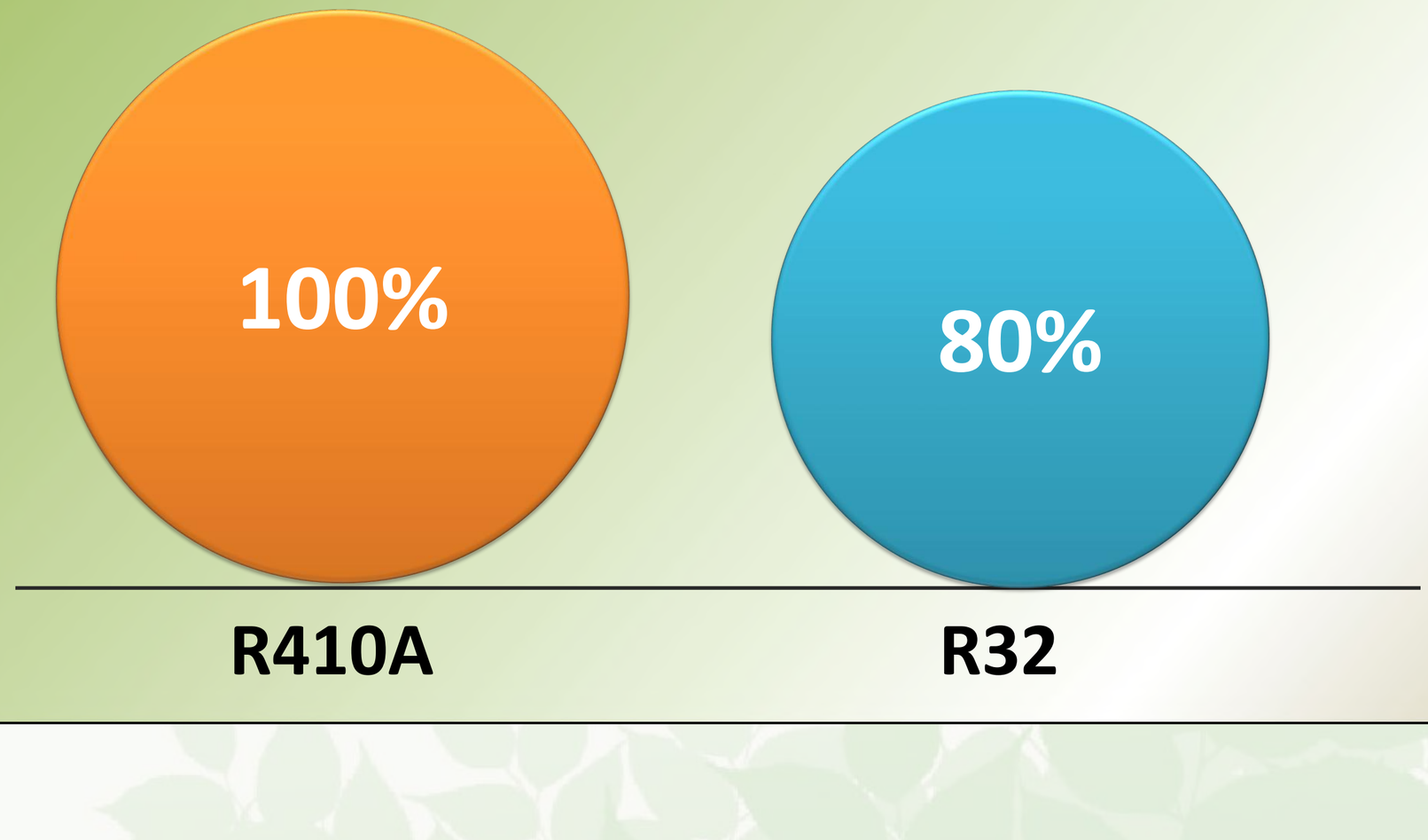
Much lower GWP compared to R410a

GWP=> Global warming potential



R32 effects on the system

Reduced refrigerant charge compared to R410a



R32 effects on the system

Reduced pipe diameters

Capacity	R410A Liquid / gas	R32 Liquid / gas
07 KBTU / 2.0kW class	6.35 / 9.52	6.35 / 9.52
09 KBTU / 2.5kW class	6.35 / 9.52	6.35 / 9.52
12 KBTU / 3.5kW class	6.35 / 9.52	6.35 / 9.52
14 KBTU / 4.0kW class	6.35 / 12.7	6.35 / 9.52
18 KBTU / 5.0kW class	6.35 / 12.7	6.35 / 9.52
24 KBTU / 7.1kW class	6.35 / 15.88	6.35 / 12.7

R32 effects on the system

Comparison of units in the same classification

	R410A	R32
		
	ASYG12LMCE / AOYG12LMCE	ASYG12KMTA / AOYG12KMTA
EER	3.50	3.65
COP	3.92	4.17
SEER	7.00	7.30
SCOP	4.00	4.40
Efficiency class cooling	A++	A++
Efficiency class heating	A+	A+
Operation range cooling	-10°C till +43°C	-10°C till +46°C
Operation range heating	-15°C till +24°C	-15°C till +24°C
Refrigerant charge (CO2 eq. T)	0.85kg (1.8T)	0.70 kg (0.473T)

R32 effects on the system

Comparison of units in the same classification

	R410A	R410A	R32
			
	ASYG12LUCA / AOYG12LUC	ASYG12LTCA / AOYG12LTC	ASYG12KGTA / AOYG12KGCA
EER	3.87	4.12	4.22
COP	4.30	4.40	4.40
SEER	7.05	8.50	8.51
SCOP	4.00	4.60	5.10
Efficiency class cooling	A++	A+++	A+++
Efficiency class heating	A+	A++	A+++
Operation range cooling	-10°C till +43°C	-10°C till +43°C	-10°C till +46°C
Operation range heating	-15°C till +24°C	-15°C till +24°C	-15°C till +24°C
Refrigerant charge (CO2 eq. T)	1.05kg (2.2T)	1.20kg (1.8T)	0.85 kg (0.6T)

Standards for the new refrigerant

Standards - Generic Standard

EN378 / ISO5149

EN 378 :2016
Refrigerating systems and heat pumps. Safety and environmental requirements

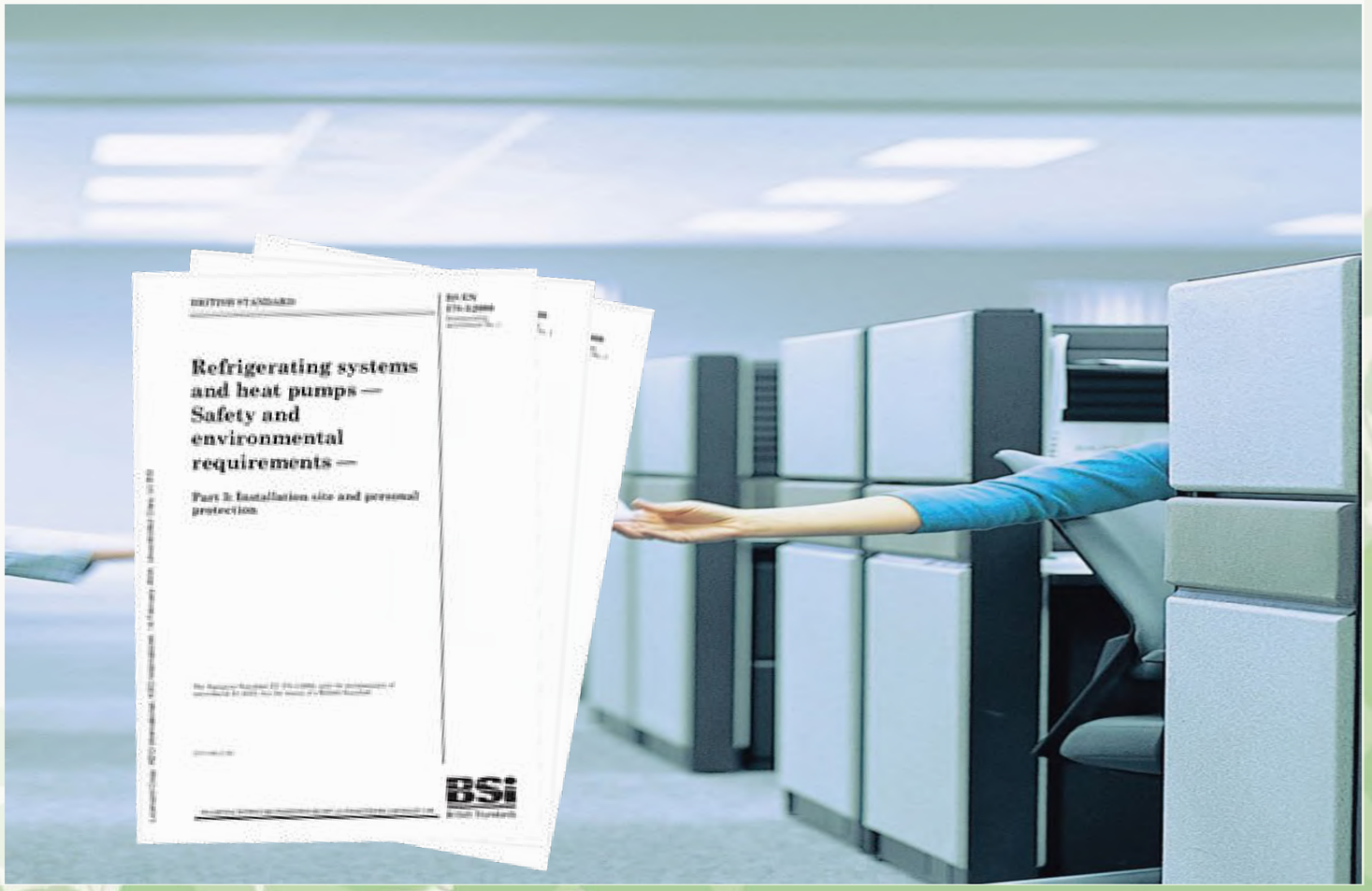
ISO 5149 :2014
Refrigerating systems and heat pumps - Safety and environmental requirements

Main difference:

EN378 includes the EU F-GAS requirements

Common:

Recognition of A2L Refrigerants



Standards - Product Standard

3. International und European Standards – IEC / EN 60335-2-40

IEC		
Edition	**Published date**	**Status**
4.0	2002	withdrawn
4.2	2005	withdrawn
5.0	2013	withdrawn
5.1	2016	valid
6	2018	released

EN		
Edition	**Published date**	**Status**
4.0	2003	withdrawn
…	…	withdrawn
4.2	2012	valid

ISO: International Organization for Standardization (Geneva)
IEC: International Electro Technical Commission (Geneva)

CEN: European Committee for Standardization (Brussels)
CENELEC: European Committee for Electro Technical Standardization (Brussels)

FUJITSU

Standards

Manufacturers
Installation Guides / Manuals

AIR CONDITIONER
Wall Mounted Type

Contents

1. SAFETY PRECAUTIONS

- Be sure to read this manual thoroughly before installation.
- The warnings and precautions indicated in this manual contain important information pertaining to your safety. Be sure to observe them.
- Hand this manual, together with the operating manual, to the customer. Request the customer to keep them on hand for future use, such as for relocating or repairing the unit.

⚠ WARNING	Indicates a potentially or imminently hazardous situation which, if not avoided, could result in death or serious injury.
⚠ CAUTION	Indicates a potentially hazardous situation that may result in minor or moderate injury or damage to property.

⚠ WARNING

- Installation of this product must be done by experienced service technicians or professional installers only in accordance with this manual. Installation by non-professional or improper installation of the product might cause serious accidents such as injury, water leakage, electric shock, or fire. If the product is installed in disregard of the instructions in this manual, it will void the manufacturer's warranty.
- Do not turn on the power until all work has been completed. Turning on the power before the work is completed can cause serious accidents such as electric shock or fire.
- If refrigerant leaks when you are working, ventilate the area. If the leaking refrigerant is exposed to a direct flame, it may produce a toxic gas.
- Installation must be performed in accordance with regulations, codes, or standards for electrical wiring and equipment in each country, region, or the installation place.
- Do not use means to accelerate the defrosting process or to clean, other than those recommended by the manufacturer.
- This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety. Children should be supervised to ensure that they do not play with the appliance.
- To avoid danger of suffocation, keep the plastic bag or thin film used as the packaging material away from young children.
- The appliance shall be stored in a room without continuously operating ignition sources (for example: open flames, an operating gas appliance or an operating electric heater).
- Do not pierce or burn.
- Be aware that refrigerants may not contain an odor.

INSTALLATION MANUAL

PART No. 9387603002-02

[Original Instructions] For authorized service personnel only.

⚠ CAUTION

- Read carefully all safety information written in this manual before you install or use the air conditioner.
- Install the product by following local codes and regulations in force at the place of installation, and the instructions provided by the manufacturer.
- This product is part of a set constituting an air conditioner. The product must not be installed alone or be installed with a device not authorized by the manufacturer.
- Always use a separate power supply line protected by a circuit breaker operating on all wires with a distance between contact of 3 mm for this product.
- To protect the persons, earth (ground) the product correctly, and use the power cable combined with an Earth Leakage Circuit Breaker (ELCB).
- This product is not explosion proof, and therefore should not be installed in an explosive atmosphere.
- To avoid getting an electric shock, never touch the electrical components soon after the power supply has been turned off. After turning off the power, always wait 5 minutes or more before you touch the electrical components.
- This product contains no user-serviceable parts. Always consult experienced service technicians for repairing.
- When moving or relocating the air conditioner, consult experienced service technicians for disconnection and reinstallation of the product.
- Do not touch the aluminum fins of heat exchanger built-in the indoor or outdoor unit to avoid personal injury when you install or maintain the unit.
- Do not place any other electrical products or household belongings under the product. Condensation dripping from the product might get them wet, and may cause damage or malfunction to the property.

- Be careful not to scratch the air conditioner when handling it.

English | Deutsch | Français | Español | Italiano | Ελληνικά | Português | Русский | Türkçe

Precautions for using R32 refrigerant

The basic installation work procedures are the same as conventional refrigerant (R410A, R22) models.
However, pay careful attention to the following points:

Since the working pressure is 1.6 times higher than that of refrigerant R22 models, some of the piping and installation and service tools are special. (See *2.1. Special tools for R32 (R410A)*.)
Especially, when replacing a refrigerant R22 model with a new refrigerant R32 model, always replace the conventional piping and flare nuts with the R32 and R410A piping and flare nuts on the outdoor unit side.
For R32 and R410A, the same flare nut on the outdoor unit side and pipe can be used.

Models that use refrigerant R32 and R410A have a different charging port thread diameter to prevent erroneous charging with refrigerant R22 and for safety. Therefore, check beforehand. [The charging port thread diameter for R32 and R410A is 1/2-20 UNF.]

Be more careful than R22 so that foreign matter (oil, water, etc.) does not enter the piping. Also, when storing the piping ,securely seal the opening by pinching, taping, etc. (Handling of R32 is similar to R410A.)

⚠ CAUTION

1-Installation (Space)

- That the installation of pipe-work shall be kept to a minimum.
- That pipe-work shall be protected from physical damage.
- That compliance with national gas regulations shall be observed.
- That mechanical connections shall be accessible for maintenance purposes.
- In cases that require mechanical ventilation, ventilation openings shall be kept clear of obstruction.
- When disposing of the product is used, be based on national regulations, property processed.

AIR CONDITIONER
OUTDOOR UNIT

⚠ CAUTION
R32
REFRIGERANT

INSTALLATION MANUAL

For authorized service personnel only.

PART No.9320394004-02

Contents

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- The warnings and precautions indicated in this manual contain important information pertaining to your safety. Be sure to observe them.
- Hand this manual, together with the operating manual, to the customer. Request the customer to keep them on hand for future use, such as for relocating or repairing the unit.

⚠ WARNING	indicates a potentially or imminently hazardous situation which, if not avoided, could result in death or serious injury.
⚠ CAUTION	indicates a potentially hazardous situation that may result in minor or moderate injury or damage to property.

⚠ WARNING

To avoid getting an electric shock, never touch the electrical components soon after the power supply has been turned off. After turning off the power, always wait 10 minutes or more before you touch the electrical components..

Installation of this product must be done by experienced service technicians or professional installers only in accordance with this manual. Installation by non-professional or improper installation of the product might cause serious accidents such as injury, water leakage, electric shock, or fire. If the product is installed in disregard of the instructions in this manual, it will void the manufacturer's warranty.

Do not turn on the power until all work has been completed. Turning on the power before the work is completed can cause serious accidents such as an electric shock or a fire.

If refrigerant leaks when you are working, ventilate the area. If the leaking refrigerant is exposed to a direct flame, it may produce a toxic gas.

Installation must be performed in accordance with regulations, codes, or standards for electrical wiring and equipment in each country, region, or the installation place.

Do not use this equipment with air or any other unspecified refrigerant in the refrigerant lines. Excess pressure can cause a rupture.

During installation, make sure that the refrigerant pipe is attached firmly before you run the compressor. Do not operate the compressor under the condition of refrigerant piping not attached properly with 2-way or 3-way valve open. This may cause abnormal pressure in the refrigeration cycle that leads to rupture and even injury.

When installing or relocating the air conditioner, do not mix gases other than the specified refrigerant (R32) to enter the refrigerant cycle.
If air or other gas enters the refrigerant cycle, the pressure inside the cycle will rise to an abnormally high value and cause rupture, injury, etc.

For appropriate working of the air conditioner, install it as written in this manual.

To connect indoor unit and outdoor unit, or indoor unit and branch box, use air conditioner piping and cables available through your local distributor. This manual describes proper connections using such installation set.

Do not modify power cable, use extension cable or branch wiring. Improper use may cause electric shock or fire by poor connection, insufficient insulation or over current.

Do not purge the air with refrigerants but use a vacuum pump to vacuum the installation.

There is no extra refrigerant in the outdoor unit for air purging.

Do not use means to accelerate the defrosting process or to clean, other than those recommended by the manufacturer.

The appliance shall be stored in a room without continuously operating ignition sources (for example: open flames, an operating gas appliance or an operating electric heater.

Do not pierce or burn.

Be aware that refrigerants may not contain an odor.

Using the same vacuum pump for different refrigerants may damage the vacuum pump or the unit.

Use a clean gauge manifold, vacuum pump and charging hose for R32 or R410A exclusively.

⚠ WARNING

Do not modify this unit, such as opening a hole in the cabinet.

During the pump-down operation, make sure that the compressor is turned off before you remove the refrigerant piping.
Do not remove the connection pipe while the compressor is in operation with 2 way or 3 way valve open. This may cause abnormal pressure in the refrigeration cycle that leads to rupture and even injury.

⚠ CAUTION

This unit must be installed by qualified personnel with a capacity certification of handling refrigerant fluids. Refer to regulation and laws in use on installation place.

Install the unit by following local codes and regulations in force at the place of installation, and the instructions provided by the manufacturer.

This unit is part of a set constituting an air conditioner. The unit must not be installed alone or be installed with non-authorized device by the manufacturer.

When installing pipes shorter than 3 m, sound of the outdoor unit will be transferred to the indoor unit, which will cause large operating sound or some abnormal sound.

To protect the persons, earth(ground) the unit correctly, and use the power cable combined with an Earth Leakage Circuit Breaker (ELCB).

The units are not explosion proof, and therefore should not be installed in explosive atmosphere.

This unit contains no user-serviceable parts. Always consult experienced service technicians for repairing.

When moving or relocating the air conditioner, consult experienced service technicians for disconnection and reinstallation of the unit.

Children should be monitored to ensure they do not play with the device.

This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety. Children should be supervised to ensure that they do not play with the appliance.

Do not touch the aluminum fins of heat exchanger built-in the indoor or outdoor unit to avoid personal injury when you install or maintain the unit.

Do not place any other electrical products or household belongings under indoor unit or outdoor unit. Condensation dripping from the unit might get them wet, and may cause damage or malfunction of your property.

Precautions for using R32 refrigerant

The basic installation work procedures are the same as conventional refrigerant (R410A, R22) models.
However, pay careful attention to the following points:

⚠ WARNING

Since the working pressure is 1.6 times higher than that of refrigerant R22 models, some of the piping and installation and service tools are special. (See *2.1. Special tools for R32 (R410A)*.)
Especially, when replacing a refrigerant R22 model with a new refrigerant R32 model, always replace the conventional piping and flare nuts with the R32 and R410A piping and flare nuts on the outdoor unit side.
For R32 and R410A, the same flare nut on the outdoor unit side and pipe can be used.

Models that use refrigerant R32 and R410A have a different charging port thread diameter to prevent erroneous charging with refrigerant R22 and for safety. Therefore, check beforehand. [The charging port thread diameter for R32 and R410A is 1/2 inch.]

Be more careful than R22 so that foreign matter (oil, water, etc.) does not enter the piping. Also, when storing the piping ,securely seal the opening by pinching, taping, etc. (Handling of R32 is similar to R410A.)

Installation precautions and requirements

Installation

Indoor unit

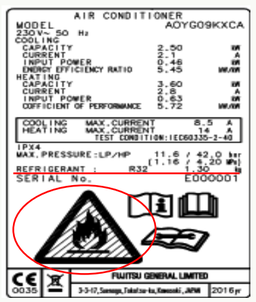
Precautions on the flammable refrigerant R32 as mentioned on the labels

	Labels	
Indoor unit	Rating label	
	Warning label (R32)	
Carton	Label (carton)	

Installation

Outdoor unit

Precautions on the flammable refrigerant R32 as mentioned on the labels

<table>
<tr><th></th><th colspan="2">Labels</th></tr>
<tr><td>Outdoor unit</td><td>Rating label</td><td>Label R32</td></tr>
<tr><td></td><td colspan="2"> 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<tr><td>Carton</td><td>Label (carton)</td><td> 
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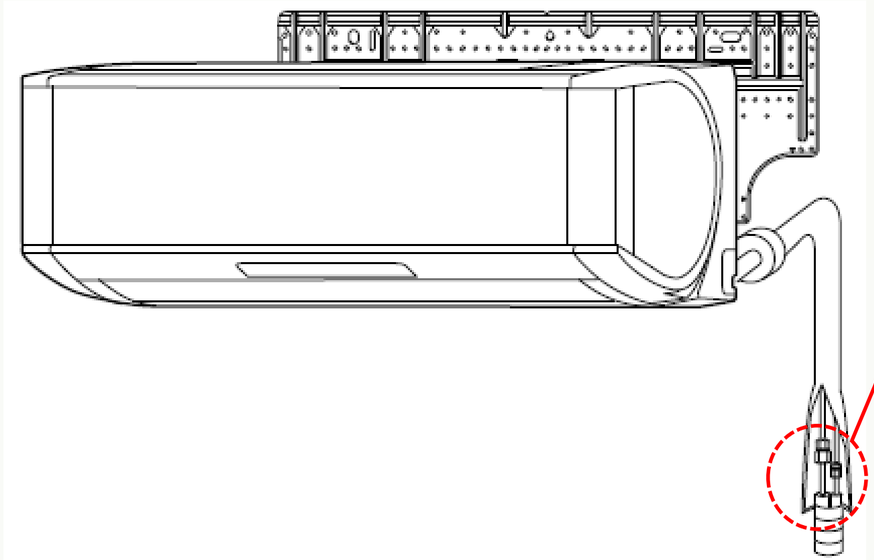
Installation

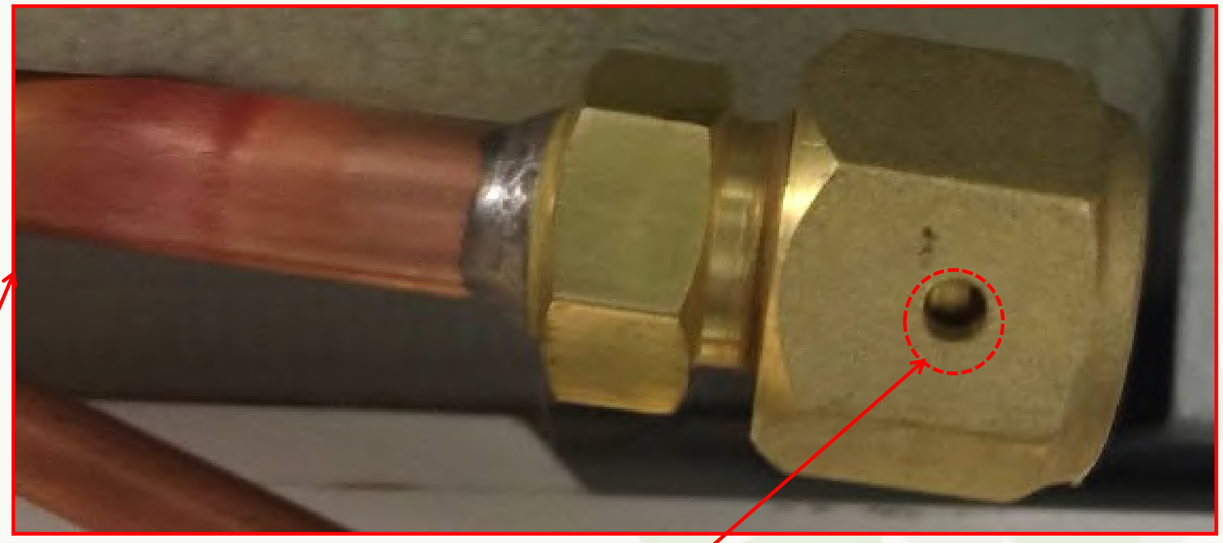
Tools and Materials - requirements

Installation

Indoor unit flare nut type

The flare nuts are equipped in total with 3 holes. This measure is done to reduce the risk of cracking the flare nuts due to icing condition. (During defrost operation)





2 more holes are behind

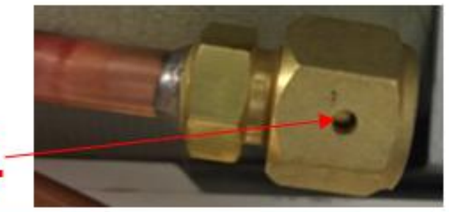
Installation

Measure of the flare nut for the A2L refrigerant

- Revised regulation

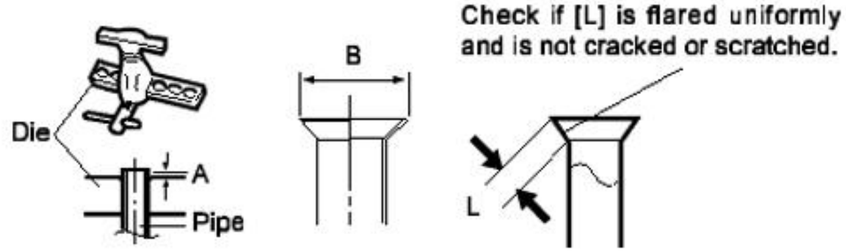
  EN60335-2-40 → v6 after IEC revised to v6 (the end of 2018?)
  IEC60335-2-40 (v5) → the end of 2017 v6

  - Mechanical connectors used indoors shall comply with ISO 14903.



- When mechanical connectors are reused indoors, sealing parts shall be renewed.
- When flared joints are reused indoors, the flare part shall be re-fabricated.

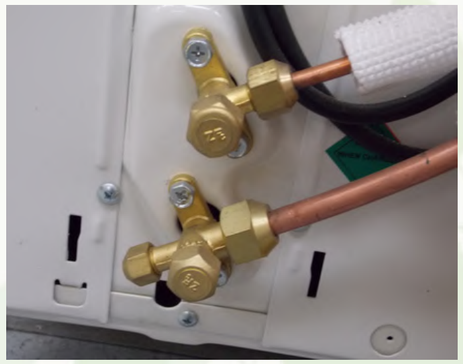
Re-fabricated



Installation

Brazing tools (same as R410A)

Caution when brazing! Flammable refrigerant containing units are not allowed to be connected during brazing!



Even if OU valves are closed!

Installation

Vacuum pump & Recovery unit

Dedicated products for A2L or higher flammability classified refrigerants. Non electrical sparking On/Off switch.

Installation

Charge and recovery cylinder

Special left thread adaptor

Special red marked refrigerant cylinder for flammable gas

Fujitsu General R32 Product Line-Up

Less is more

- Less space
- Less noise
- Less refrigerant

Chillventa Exhibition
Nuremberg 16-18. 10. 2018

Environmental Comparison

REFRIGERANT R32

Refrigerant charge comparison

< Refrigerant >

	Current model	New model
Refrigerant [kg]	0,7 – 1,05	0,6 – 0,85
Diff.	-12% - -25%	

< t CO_2-equivalent >

	Current model	New model
t CO_2-equiv.	1,462 – 2,192	0,371 – 0,574
Diff.	-72% - -74%	

*Tentative; depending on the compared systems

Lineup (Wall mounted)

<2018>

Series	Ref.	
Flagship range series **nocria X**	R32	
Designer range series (High spec & design)	R32	
Standard range series (High efficiency & comfort)	R32	
ECO Range Series (Comfort for large room)	R32	
Designer range series (High spec & design)	R410A	
Designer range series (High COP)	R410A	
Standard range series (High efficiency & comfort)	R410A	
Standard range series (Comfort for large room)	R410A	
ECO range series (Compact & comfort)	R410A	

<2019>

: New series

Series	Ref.	
Flagship range series **nocria X**	R32	
Designer range series (High spec & design)	R32	
Exquisite design series (High efficiency & comfort)	R32	
Standard range series (High efficiency & comfort)	R32	
Eco range series (High spec & design)	R32	
Standard range series (High efficiency & comfort)	R32	
ECO Range Series (Comfort for large room)	R32	
Designer range series (High spec & design)	R410A	
Designer range series (High COP)	R410A	
Standard range series (High efficiency & comfort)	R410A	
Standard range series (Comfort for large room)	R410A	
ECO range series Compact & comfort	R410A	

Lineup (Wall mounted)

<2019>

: New series

Series	Ref.		
Flagship range series nocria X	R32		KX - Series
Designer range series (High spec & design)	R32		KG - Series
Exquisite design series (High efficiency & comfort)	R32		KE - Series
Standard range series (High efficiency & comfort)	R32		KM - Series
Eco range series (High spec & design)	R32		KP - Series
Standard range series (High efficiency & comfort)	R32		KM - Series
ECO Range Series (Comfort for large room)	R32		KL - Series
Designer range series (High spec & design)	R410A		LU - Series
Designer range series (High COP)	R410A		LT - Series
Standard range series (High efficiency & comfort)	R410A		LM - Series
Standard range series (Comfort for large room)	R410A		LF/LM – Series
ECO range series Compact & comfort	R410A		LL - Series

Duct Lineup

<2018>

Series	Ref.	
Mini duct	R410A	
Slim duct	R410A	
Medium static pressure duct (Compact & comfort)	R410A	
Medium static pressure duct (Standard)	R410A	
High Static Pressure Duct	R410A	
Big duct	R410A	

<2019>

: New series

Series	Ref.	
Slim Duct	R32	
Medium Static Pressure Duct (Compact & Comfort)	R32	
Medium Static Pressure Duct (Standard)	R32	
Mini duct	R410A	
Slim duct	R410A	
Medium static pressure duct (Compact & comfort)	R410A	
Medium static pressure duct (Standard)	R410A	
High Static Pressure Duct	R410A R32	
Big duct	R410A	

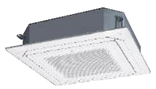
Cassette Lineup

<2018>

Series	Ref.	
Compact 4-way flow series	R410A	
Circular flow series	R410A	
4-way flow series	R410A	

<2019>

: New series

Series	Ref.	
Compact 4-way flow series	R32	
Circular flow series	R32	
Compact 4-way flow series	R410A	
Circular flow series	R410A	
4-way flow series	R410A	

R32 PAC Outdoor Units

Small and light weight outdoor unit

<12/14 model>

Current model

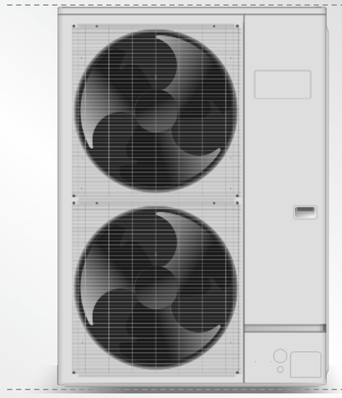
New model

Weight -17.5%!

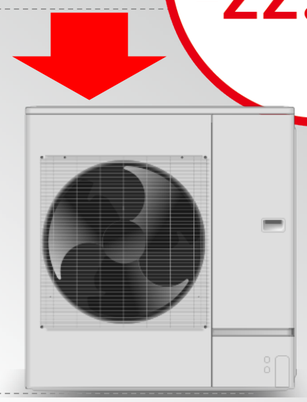
	Current model	New model
Weight [kg]	40	33

<45/54 model>

Current model



New model



Height -22.7%!

	Current model	New model
Height [mm]	1,290	998

Multi Split Lineup

<2018>

Series		Ref.	
2 Rooms multi up to 2 units		R410A	
3 Rooms multi up to 3 units		R410A	
4 Rooms multi up to 4 units		R410A	
5 Rooms multi up to 5 units		R410A	
6 Rooms multi up to 6 units		R410A	
8 Rooms Multi up to 8 units		R410A	
Simultaneous Multi	Twin/Triple (Single phase)	R410A	
	Twin/Triple (3 phase)	R410A	
	Twin/Triple/Double Twin (3 phase)	R410A	

<2019>

: New series

Series		Ref.	
2 Rooms multi			
3-4 Rooms multi			
2 Rooms multi up to 2 units		R410A	
3 Rooms multi up to 3 units		R410A	
4 Rooms multi up to 4 units		R410A	
5 Rooms multi up to 5 units		R410A	
6 Rooms multi up to 6 units		R410A	
8 Rooms Multi up to 8 units		R410A	
Simultaneous Multi	Twin/Triple (Single phase)	R410A 	
	Twin/Triple (3 phase)	R410A	
	Twin/Triple/Double Twin (3 phase)	R410A	

Lineup (ATW)

WATERSTAGE™

<2018>

	Series	Ref.	
Split	High Power series	R410A	
	Comfort series	R410A	
Split DHW integrated	High Power series	R410A	
	Comfort series	R410A	
Mono bloc	Compact series with hydraulic unit	R410A	

<2019>

: New series

	Series	Ref.	
Split	Super High Power series	R410A	
	Comfort series		
	High Power series	R410A	
	Comfort series	R410A	
Split DHW integrated	Comfort series		
	High Power series	R410A	
	Comfort series	R410A	

Many thanks for your attention !

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