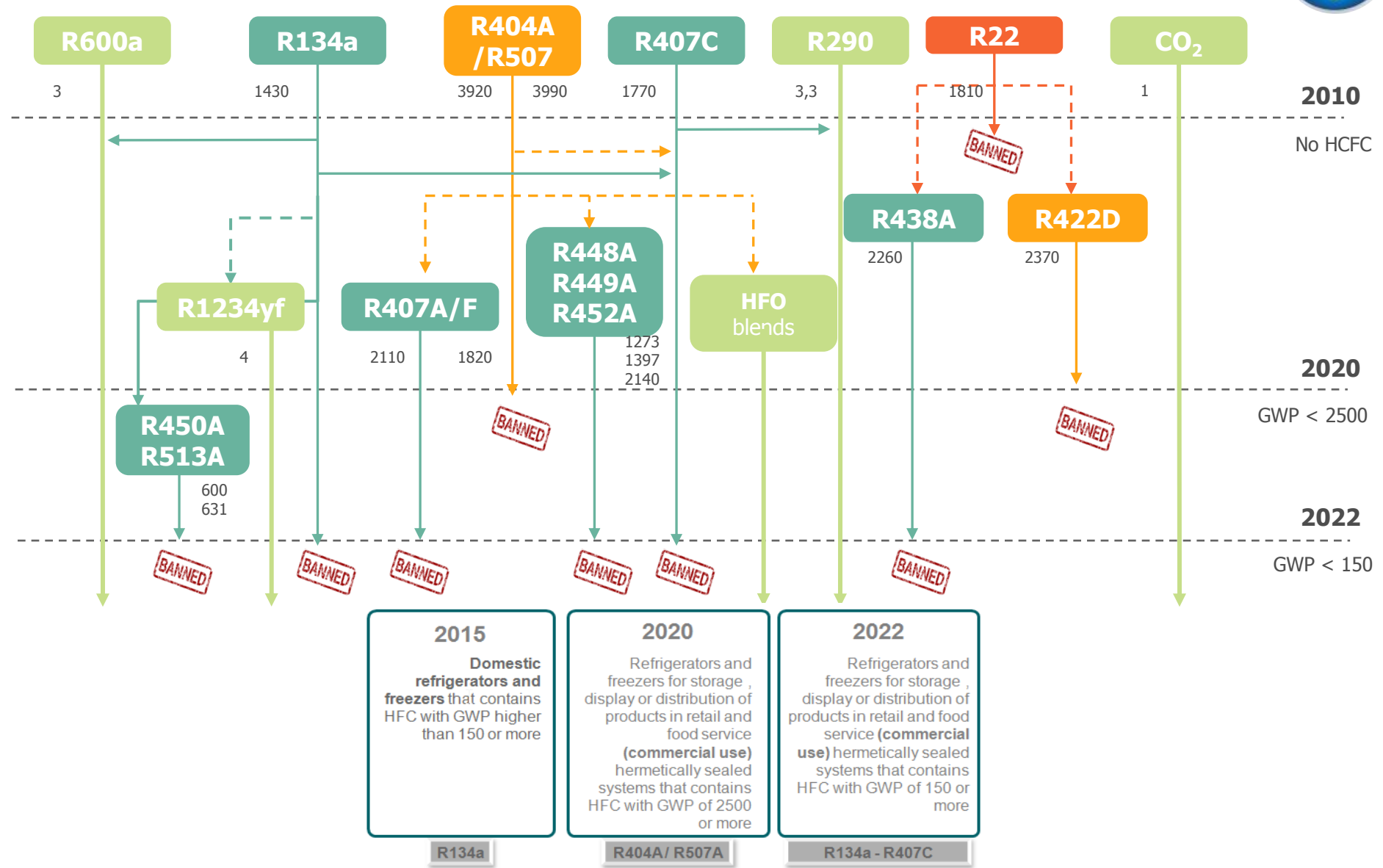




EU refrigerant status: F-Gas Directive



Interpretation of EU 517/2014 Directive

Status by application

Equipment Category	EU 517/2014 regulation GWP limit			
	2015	2020	2022	2025
Household Refrigerators and Freezers (herm. sealed)	150			
Commercial Refrigerators and Freezers (herm. sealed)		2500	150	
Movable Room A/C		150		
Split Air Conditioners below 3kg				750
Multipack Centralized Refrigeration Systems above 40kW	2500		150*	*ex primary in cascade 1500 limit
Stationary Refrigeration Equipment	2500			
Split Air Conditioners above 3kg		2500		??
Commercial Ice Machines (cubes, flakes)		2500		
Multipack Centralized Refrigeration Systems below 40kW		2500		
Dehumidifiers		150		
Beverage Coolers		2500	150	
Ice Cream Freezers		2500	150	
Ice Cream Makers		2500	150	
Water Fontains		2500		
Blast Chillers		2500		
Sanitary Water Heat Pumps		2500		
Heating Heat Pumps		2500		
Portable Air Conditioners		150		
Window Air Conditioners		150		750
Heat Pump Dryers		2500		
Refrigerated Food Processors (meat, whipped cream, etc)		2500		
Granita Machines		2500	150	
Small Chillers for Aquarium		2500		
Air Dryers		2500		
Chillers for Electric Equipment		2500		
Chillers for Industrial Equipment (Laser, Welding,etc)		2500		
Ultralow Freezers Below -50°C (high stage)		no limit	??	
Ultralow Freezers Below -50°C (low stage)		no limit		
Transport refrigeration		no limit	??	
Cold rooms		2500		

Please note: IMPORTANT

Find attached my *personal* interpretation of the relevant bans. However, I wish to add that it is the Member States which are in charge of implementing and enforcing Regulation (EU) No 517/2014, not the Commission. It is the EU Court of Justice which interprets EU legislation. The Commission can facilitate a more uniform implementation. To do the latter we will raise this issue in the next relevant committee meeting with the Member States.

Best regards,

Fgas Team

DG Climate Action

CO Refrigerant Status – R404A Replacement

Updated Jan, 2017

	R404A					
Refrigerant	R448A	R449A	R452A	R455A	R454C	R457A
UL compatibility	OK	OK	OK	waiting	waiting	waiting
Motor temp LL/HL	NOK	NOK	OK	waiting	waiting	waiting
Discharge temp LL/HL	NOK	NOK	OK	waiting	waiting	waiting
IEC	OK	OK	OK	waiting	waiting	waiting
Startability	OK	OK	OK	waiting	waiting	waiting
Calorimeter	OK	OK	OK	OK	OK	OK
R404A Envelope Life Test	NOK	NOK	acceptable	waiting	waiting	waiting
Valve impact velocity	OK	OK	OK	waiting	waiting	waiting
Product approval	Not a Drop In	Not a Drop In	OK	waiting	waiting	waiting
Final statement	Limited Approval*	Limited Approval*	Approved	not available	not available	not available

* possible limited approval on specific appliance

Embraco – R404A Transitory Solutions

R452A

GWP → 2141

ODP → 0

Replacement for: R404A/R507 (same envelope)

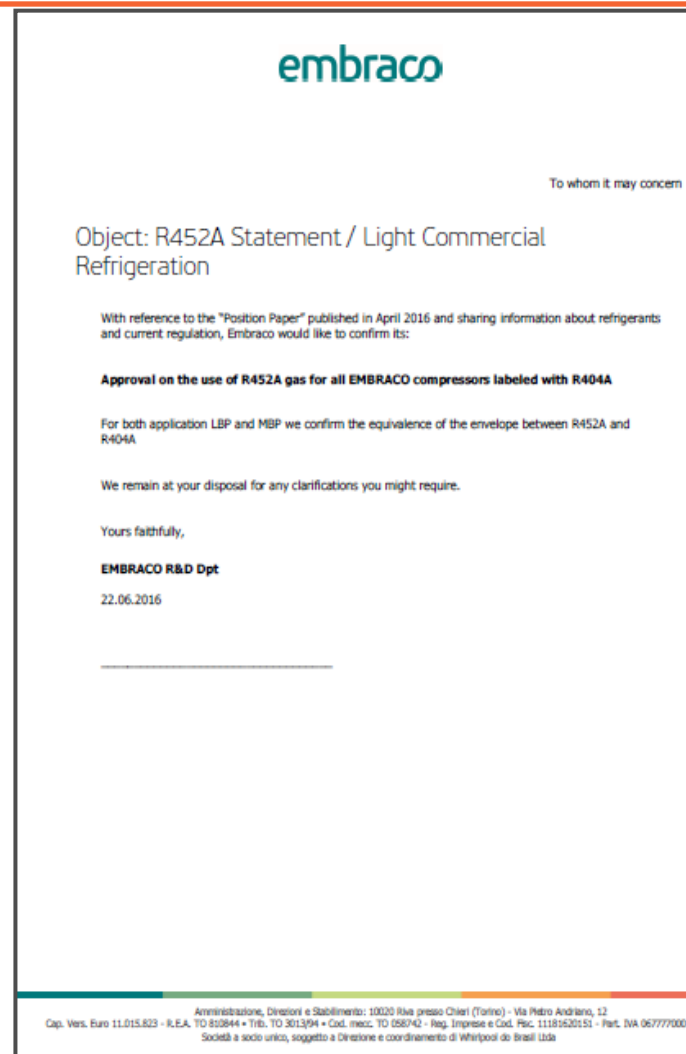
Approved for compressors and condensing units

Performance available

Suitable Application: LBP and MBP

Not flammable → ASHRAE Safety group A1

Low discharge temperature



Embraco – R404A vs R452A performance

	R 404A	R452A
Type	HFC blend	HFC blend
Safety class	A1	A1
Boiling Temp @ 1atm	-47°C	-47°C
Critical Temp	72°C	75°C
Bubble-Dew @1 bar(abs)	0,8K	3,8K

LBP applications

Δ CAP% (R404A -> R452A) ~ -2÷-8%

Δ Abs% (R404A -> R452A) ~ -1÷-8%

MBP applications

Δ CAP% (R404A -> R452A) ~ -5÷+3%

Δ Abs% (R404A -> R452A) ~ -5÷+1%

Embraco – R404A Transitory Solutions

R448A/R449A

GWP → 1273/1397

ODP → 0

Replacement for: R404A/R507

Suitable Application: LBP and MBP

Not flammable → ASHRAE Safety group A1

High motor winding temperature and high discharge temperature

CAUTION:
Application needs to be
**validated by Embraco Tech
Support Team**

Model /Voltage	ΔT vs R404A in deg C	Embraco internal standards				Starting	IEC standard	
		Winding temp		Discharge temp			AA1	AA2
		Low Load	High Load	Low Load	High Load			
NJ9238GK/J	R448A	20,4	9,7	13	9,8	OK	14,7	13,1
NEK6213GK/G	R448A	21,2	11,4	9,6	11,4	OK	19,8	16,3
NTU6240GK/D	R448A	11,9	0,4	10	8,1	OK	0	11,4
NEK2168GK/G	R448A	17,3	9	7,2	9,6	OK	15,2	13,8
NJ2212GK/G	R448A	18,2	10,3	-16,5	15,4	OK	20,6	14,3
NEU2140GK/B	R448A	10	13,5	-8,9	9,9	OK	13,9	8,9
NEU2168GK/D	R448A	7,6	6,8	-4,2	12,4	OK	16,6	11,3
NT6226GK/D CSR semi	R448A	14,6	9,2	13,4	10,3	OK	not tested	not tested
NT6226GK/D CSIR semi	R448A	16,5	19,6	14,1	26,4	OK	not tested	not tested
NJ9238GK/J	R449A	18,8	7,8	13,5	10,4	OK	12,9	10,7
NEK6213GK/G	R449A	25,8	8,2	3,6	4,3	OK	14,5	10,6
NTU6240GK/D	R449A	13,4	2	10,5	9,6	OK	16	9,3
NEK2168GK/G	R449A	10,4	3,8	6,0	5,8	OK	12,5	8,9
NJ2212GK/G	R449A	8,7	15,1	-17,4	17	OK	6,1	4,1

Compressor working
envelope has to be reduced
significantly otherwise its
life would shorten!!!

- within Embraco approval limits
- slightly out of Embraco approval limits
- out of Embraco approval limits

R404A Replacement – Low GWP Alternatives

Updated Jan, 2017

Refrigerant	R455A	R454C	R457A
UL compability	waiting	waiting	waiting
Motor temp LL/HL	waiting	waiting	waiting
Discharge temp LL/HL	waiting	waiting	waiting
IEC	waiting	waiting	waiting
Startability	waiting	waiting	waiting
Calorimeter	OK	OK	OK
R404A Envelope Life Test	waiting	waiting	waiting
Valve impact velocity	waiting	waiting	waiting
Product approval	waiting	waiting	waiting
Final statement	not available	not available	not available

-Embraco is currently testing three A2L refrigerants (slightly flammable)

- Charge limit is 150g as R290

- Calorimeter test was successful

- All these refrigerants will go now through the complete list of tests during 2017 and afterwards Embraco will be able to approve or not their usage

Embraco Recommendations

CURRENT REFRIGERANT	R404A	R134a	TODAY	
TRANSITORY SOLUTION	R134a* W/Different compressor	Approved Alternative	2022	
	R452A			
	R448A w/ caution			
	R449A			
	R407F Only for very customized systems			
	R407A			
FINAL SOLUTION	R290* w/ Different compressor	w/ different compressor	2022	
	HDR110 DR-3 ARM-20a Unsaturated HFC's (HFO) Under testing			
	R1270 w/ caution			
		R134a	Approved Alternative	2022
		R513A		
		R450A		
		R1234yf	w/ different compressor	2022
		R600a*		
		R290*		

*different displacement

Usage of some transitory solutions may require additional actions as for instance system condensing temperature reduction (larger condenser, improved ventilation) or return gas temperature reduction in order to achieve similar thermal profile as with refrigerant R404A