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Klea® Edge

Klea® Edge™ 444A

Sustainable Refrigerant for the Automotive Aftermarket

High-performing and economical alternative to R-1234yf

Orbia Fluor & Energy Materials has over 70 years of experience delivering high-performing, sustainable refrigerant solutions to solve thermal management challenges. We leverage our technical and market expertise to deliver the best outcome for automotive aftermarket stakeholders.

Introducing Klea® Edge™ 444A, a new, direct replacement for R-1234yf for the automotive aftermarket. R-444A is a more economical and environmentally friendly option than R-1234yf* and cools faster** for enhanced passenger comfort.

R-444A provides the market options to meet current and future regulations for carbon emissions, while maintaining ease of use and recovery for service technicians and vehicle owners.

*Based on market conditions as of September 2024.
** Independant test lab data shows an improvement in cool down times.

R-444A | Physical Properties

Cool Down Rate: Third party testing data showed R-444A has a cool down rate of 4 minutes faster than R-1234yf

Property	Units	R-1234yf	R-444A
ASHRAE 34 Classification		A2L	A2L
GWP		1	93
Relative COP*		100%	105%**
Relative Volumetric Capacity*		100%	112%
Typical Temperature Glide*	K	0	7
Liquid Density (20°C)	kg/m^3	1110	1140
Bubble Point	°C	-29.5	-30
Saturated Vapor Pressure (20°C)	kPa	592	712

*Thermodynamic cycle calculation conditions: Single-stage, isentropic efficiency 65%, volumetric efficiency 100%, zero pressure drop Mean evap T = 10°C, Mean cond T = 40°C, Subcool = 5K, SH = 5K

**105% for drop in for R-1234yf system, up to 112% if the system is optimized

Pressure Temperature Chart

Black - Vapor Bold - Liquid

		R-444A		R-1234yf	
°F	°C	(psig)	(barg)	(psig)	(barg)
-20	-28.9			0.4	0.0
0	-17.8	4.9	0.3	9.2	0.6
20	-6.7	16.0	1.1	21.6	1.5
40	4.4	31.6	2.2	38.4	2.6
60	15.6	**76.3**	**5.3**	60.6	4.2
80	26.7	**109.1**	**7.5**	89.0	6.1
100	37.8	**150.0**	**10.3**	124.9	8.6
120	48.9	**199.9**	**13.8**	169.2	11.7
140	60.0	**259.9**	**17.9**	223.4	15.4
150	65.6	**294.1**	**20.3**	254.7	17.6

Benefits

- **A2L Rating:** R-444A has been designated 'A2L' classification rating, by ASHRAE/ISO which means that it is mildly flammable and has low toxicity.[1]
- **Regulatory Compliant:** R-444A with a GWP_{100} <150 meets strict GWP targets (and complies with EPA Technology Transition Rules for many sectors). It has zero ozone depletion potential (ODP).
- **Compatible*:** R-444A will work with any system that uses R-1234yf.
- **Easy to Use:** R-444A is a direct replacement replacement for R-1234yf in auto air conditioning. R-1234yf or R-134a service equipment can be re-purposed to service R-444A vehicles. Retrofitting can be completed with common A/C service tools.
- **High Performing:** R-444A offers up to 10% higher cooling/heating capacity[2] in direct replacement scenarios compared to R-1234yf; 'Cold Air Faster'. It may also give higher energy efficiency, which will enable internal combustion engine vehicles to see improved fuel economy. Electric vehicles may experience extended range. Both leading to an improved passenger experience.
- **Affordable:** R-444A is an economical alternative to R-1234yf.[3] Charge size is the same as R-1234yf.
- **Sustainable:** R-444A has a comparable carbon footprint[4] compared to R-1234yf with minimal TFA derogation in the atmosphere.[5]
- **Stable:** R-444A is chemically stable, its composition remains in specification from charging through recovery from a/c systems, with no known polymerization.[6]
- **Service Equipment:** Service tools and equipment are being made available by leading manufacturers. The dedication and use of existing equipment is also an option.

[1] See applicable regional regulations codes and product/standards which cover the use of flammable refrigerants, e.g. ASHRAE standard 15.

[2] Third party test data from automotive application confirmed R-444A delivered 2-3°C colder air and 4-minute faster pulldown to 22°C than R-1234yf.

[3] Based on market conditions as of July 2025.

[4] LCCP CO2 Equivalent Emissions during Vehicle's Lifetime.

[5] Based on the findings EFCTC Position Paper 08 October 2021 which states 'HFO-1234ze, HFO-1336mzz and HCFO-1233zd are broadly estimated to contribute less than 0.01 µg/L to the average concentration of TFA in European rainwater through to 2050'.

[6] Based on internal laboratory testing.

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