

# FORANE<sup>®</sup> 404A

- Non-ozone depleting refrigerant, near-azeotropic blend.
- Well suited refrigerant for a variety of medium- and low-temperature refrigeration applications.
- Forane<sup>®</sup> 404A has a very low temperature glide\* (less than 1°C) which makes it often suitable for flooded evaporator technology

## MAIN PROPERTIES

Composition	R-143a (52%)	R-125 (44%)	R-134a (4%)
Type	HFC Near-azeotropic blend		
ASHRAE safety classification	A1 - non-toxic and non-flammable		
GWP*	3922		
Recommended lubricant	POE		

\* GWP value for 100-year time horizons according to IPCC 2007 Fourth Assessment Report

## MAIN APPLICATIONS

- Food display and storage cases
- Cold storage rooms
- Ice machines
- Food processing
- Industrial refrigeration
- Transport refrigeration (refrigerated containers, trucks, vessels...)

## LUBRICATION

Forane<sup>®</sup> 404A requires a polyolester (POE) lubricant to ensure complete miscibility between oil and refrigerant. Miscibility is important for oil return to the compressor, especially in large systems with long runs of piping.

## CHARGING

Due to the near-azeotropic nature of Forane<sup>®</sup> 404A, it is better to charge it as liquid to prevent fractionation (changes in the designed refrigerant composition) but it can also be charged as gas. In situations where vapor would normally be charged into a system, a valve should be installed in the charging line to flash liquid from the cylinder into vapor.

## DELIVERIES

Forane<sup>®</sup> 404A can be delivered in various packaging:

- **bulk:** ISO container (18 tons) or ton-tank (780 kg).
- **pallet of 40 or 100 disposable cylinders** (10.9 kg each cylinder). This disposable packaging is commercialized according to local regulations.
- **other packaging available under requests.**

## THERMODYNAMIC PROPERTIES

This information is based on values calculated using the NIST REFPROP Database (NIST Standard Reference Database 23, Version 9.0, Lemmon, E. W., Huber, M. L., and McLinden, M. O., Thermophysical Properties Division, 2010).

Critical temperature: 72°C

Saturation points (bubble and dew points at same composition).

Temperature (°C)	Liquid Phase Pressure (bar)	Vapor Phase Pressure (bar)	Liquid Phase Density (kg/m <sup>3</sup> )	Vapor Phase Density (kg/m <sup>3</sup> )	Liquid Phase Enthalpy (kJ/kg)	Vapor Phase Enthalpy (kJ/kg)	Liquid Phase Entropy (kJ/(kg.K))	Vapor Phase Entropy (kJ/(kg.K))
-40	1,4	1,3	1287	7	147	344	0,79	1,64
-35	1,7	1,6	1271	9	154	347	0,82	1,63
-30	2,1	2,0	1255	11	160	349	0,85	1,63
-25	2,5	2,5	1239	13	166	352	0,87	1,62
-20	3,1	3,0	1222	15	173	355	0,90	1,62
-15	3,7	3,6	1205	18	180	358	0,92	1,62
-10	4,4	4,3	1187	22	186	361	0,95	1,61
-5	5,2	5,1	1169	26	193	363	0,97	1,61
0	6,1	6,0	1150	30	200	366	1,00	1,61
5	7,1	7,0	1131	36	207	368	1,03	1,61
10	8,3	8,2	1110	42	214	371	1,05	1,60
15	9,6	9,4	1089	48	221	373	1,08	1,60
20	11,0	10,8	1067	56	229	375	1,10	1,60
25	12,5	12,4	1044	65	236	377	1,13	1,60
30	14,3	14,1	1019	76	244	378	1,15	1,59
35	16,2	16,1	993	88	252	379	1,18	1,59
40	18,3	18,1	965	102	260	380	1,20	1,59
45	20,6	20,4	934	118	269	381	1,23	1,58
50	23,1	23,0	899	138	278	381	1,25	1,57
55	25,9	25,7	860	163	287	380	1,28	1,57
60	28,8	28,7	813	195	297	378	1,31	1,56
65	32,1	32,0	753	240	309	374	1,35	1,54

The statements, technical information and recommendations contained herein are believed to be accurate as of the date hereof. Since the conditions and methods of use of the product and of the information referred to herein are beyond our control, ARKEMA expressly disclaims any and all liability as to any results obtained or arising from any use of the product or reliance on such information; NO WARRANTY OF FITNESS FOR ANY PARTICULAR PURPOSE, WARRANTY OF MERCHANTABILITY OR ANY OTHER WARRANTY, EXPRESS OR IMPLIED, IS MADE CONCERNING THE GOODS DESCRIBED OR THE INFORMATION PROVIDED HEREIN. The information provided herein relates only to the specific product designated and may not be applicable when such product is used in combination with other materials or in any process. The user should thoroughly test any application before commercialization. Nothing contained herein constitutes a license to practice under any patent and it should not be construed as an inducement to infringe any patent and the user is advised to take appropriate steps to be sure that any proposed use of the product will not result in patent infringement.

See MSDS for Health & Safety Considerations