



# FORANE<sup>®</sup>410A

- Non-ozone depleting refrigerant, near-azeotropic blend.
- Developed for air conditioning as well as some medium temperature refrigeration applications.

## MAIN PROPERTIES

Composition	 R-125 (50%)	 R-32 (50%)
Type	HFC Near-azeotropic blend	
ASHRAE safety classification	A1 - non-toxic and non-flammable	
GWP*	2088	
Recommended lubricant	POE	

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

## MAIN APPLICATIONS

- Residential and commercial air conditioning systems
- Small chillers
- Heat pumps
- Dehumidifiers
- Medium temperature commercial refrigeration

## PERFORMANCE

Forane<sup>®</sup> 410A has a high cooling capacity, thus leading to good performance with low refrigerant charge. Forane<sup>®</sup> 410A equipments provide the best energy efficiency for air conditioning.

## LUBRICATION

Polyolester (POE) lubricant must be used with Forane<sup>®</sup> 410A to ensure complete miscibility between oil and refrigerant. Care must be taken when handling POE lubricants because they are hygroscopic, which means that they can readily absorb moisture from the air. High levels of moisture in the system can lead to oil degradation and system failure.

## CHARGING

Due to the near-azeotropic nature of Forane<sup>®</sup> 410A, 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. Forane<sup>®</sup> 410A requires the use of manifold gauge sets, recovery machines, and cylinders specifically designed and rated for its higher pressures.

## DELIVERIES

Forane<sup>®</sup> 410A can be delivered in various packaging:

- **bulk:** ISO container (18 tons) or ton-tank (730 kg).
- **pallet of 40 or 100 disposable cylinders** (11.3 kg each cylinder). This disposable packaging is commercialized according to local regulations.
- **other packaging available under requests.**

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## 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: 71°C

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

Temperature (°C)	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	1,8	1313	7	142	405	0,77	1,90
-35	2,2	1297	9	149	407	0,80	1,89
-30	2,7	1280	11	156	410	0,83	1,88
-25	3,3	1263	13	163	412	0,86	1,86
-20	4,0	1245	15	170	414	0,89	1,85
-15	4,8	1227	18	178	416	0,92	1,84
-10	5,7	1209	22	185	418	0,94	1,83
-5	6,8	1190	26	192	420	0,97	1,82
0	8,0	1170	31	200	421	1,00	1,81
5	9,4	1150	36	208	423	1,03	1,80
10	10,9	1129	42	215	424	1,05	1,79
15	12,6	1106	49	223	425	1,08	1,78
20	14,5	1083	57	232	426	1,11	1,77
25	16,6	1059	66	240	426	1,14	1,76
30	18,9	1033	77	248	426	1,16	1,75
35	21,4	1006	89	257	426	1,19	1,74
40	24,3	976	103	266	425	1,22	1,73
45	27,3	943	120	276	424	1,25	1,72
50	30,7	907	141	286	422	1,28	1,70
55	34,4	865	167	297	419	1,31	1,68
60	38,4	815	201	308	414	1,35	1,66
65	42,8	748	250	322	406	1,39	1,63

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See MSDS for Health & Safety Considerations