SOLSTICE® N40 (R-448A)

TECHNICAL DATA SHEET

Solstice® N40 (R-448A) is a zeotropic blend designed to serve as a replacement for R-404A, R-507, R-22, R-407 series and interim blends in low and medium temperature commercial refrigeration. This hydrofluoroolefin (HFO) blend demonstrates environmental and performance benefits in retrofits as well as new systems with a lower global warming potential (GWP) than legacy alternatives. Solstice N40 has zero ozone depletion potential (ODP) and it is rated as non-toxic and nonflammable (ASHRAE classified A1) refrigerant.



PHYSICAL PROPERTIES

Solstice® N40 (R-448A)	
Class/Type	Zeotropic blend
Formula"	26%/26%/21%/7%/20% R-32/R-125/R-134a/ R-1234ze(E)/R-1234yf
Appearance	Colorless
ODP (ODP-R11=1)	0
GWP 4th/5th IPCC	1387 / 1273
Flammability Limits – ASTM E681-04 @ 21°C	Nonflammable
ASHRAE Std. 34 Safety Class	A1
LFL (% vol)	Nonflammable

UNITS	
Molecular weight	86.3 lbm/lbmol
Boiling temperature	-51.0°F
Critical temperature	180.8°F
Critical pressure	666.4 psia
Critical volume	0.03356 ft3/lbm
Critical density	29.80 lbm/ft3
Vapor density at boiling point	0.2937 lbm/ft3
Liquid density at 32°F	74.77 lbm/ft3
Liquid Density At 77°F	68.50 lbm/ft3
Vapor Density At 77°F	3.053 lbm/ft3
Liquid Heat Capacity At 77°F	0.3717 Btu/lbm °R
Vapor Heat Capacity At 77°F	0.2767 Btu/lbm °R
Heat Of Vaporization At Boiling Point	103.9 Btu/lbm °R
Vapor Pressure At 77°F	162.1 psia"
Liquid Thermal Conductivity At 77°F	0.0469 Btu/h ft °R
Vapor Thermal Conductivity At 77°F	0.0084 Btu/h ft °R
Liquid Viscosity At 77°F	9.34 x 10-5 lbm/ft s
Vapor Viscosity At 77°F	8.41 x 10-6 lbm/ft s

BENEFITS

- Reduced GWP: 68% lower than R-404A
- 5%-15% lower energy consumption compared to R-404A
- Increased capacity versus R-404A

APPLICATIONS

- Low and medium temperature industrial direct expansion (DX) refrigeration for both new equipment and retrofits
- Food retail freezers, coolers, display cases
- Cold storage warehouses
- Self-contained condensing units

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MATERIALS COMPATIBILITY

Solstice does not recommend the use of chlorinated solvents to clean refrigeration systems or components.

DESICCANTS

Desiccant driers compatible with Solstice® N40 (R-448A) are commercially available. Contact individual drier manufacturers for specific recommendations.

LUBRICANTS

Polyolester (POE) oil is recommended for using Solstice N40. Compressor manufacturers typically qualify specific lubricants for use with their products. Users should check with the equipment manufacturer for the recommended lubricants for their system.

PLASTICS AND ELASTOMERS

Solstice N40 is compatible with most common materials. In the case of retrofit systems that may contain chlorinated materials, please contact your Solstice sales representative for specific information.

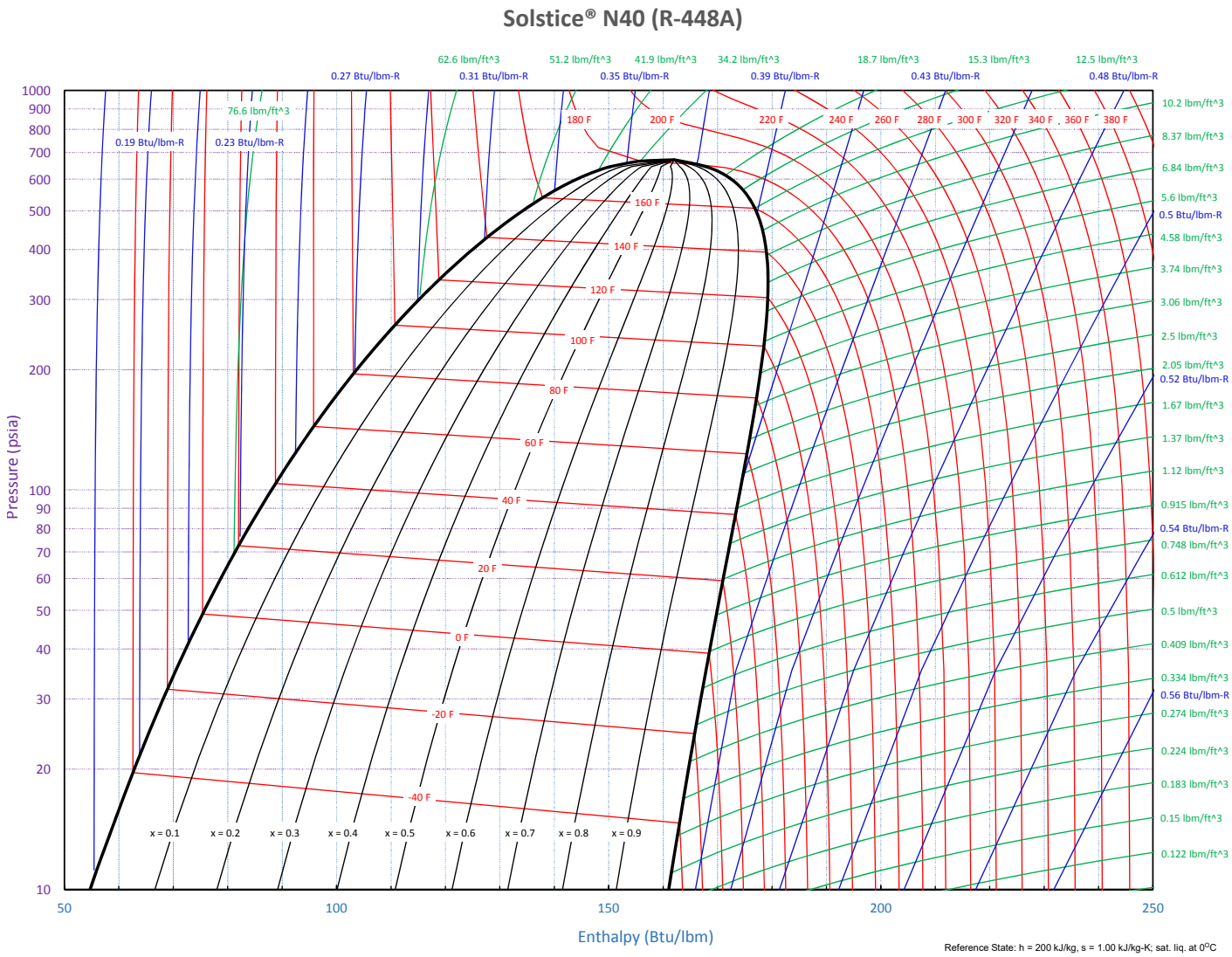
SAFETY AND STORAGE

Solstice recommends reading the Safety Data Sheet (SDS) before using Solstice N40. According to the compressed gas classification, Solstice N40 is nonflammable. It has similar storage and handling requirements to R-404A in bulk and cylinder.

LEAK DETECTION

Leak detectors can be used for pinpointing specific leaks or for monitoring an entire room on a continual basis. Leak detection is important for refrigerant conservation, equipment protection and performance, reduction of emissions and protection of those coming in contact with the system. Customers should consult the equipment manufacturer for appropriate detectors.

PRESSURE AND ENTHALPY



Reference State: h = 200 kJ/kg, s = 1.00 kJ/kg-K; sat. liq. at 0°C

PRESSURE AND TEMPERATURE

Pressure (psig)	Average Temperature (°F)	Liquid (Bubble) Temperature (°F)	Vapor (Dew) Temperature (°F)
0.0	-45.5	-51.0	-39.9
1.0	-43.0	-48.6	-37.5
2.0	-40.7	-46.2	-35.2
3.0	-38.5	-44.0	-32.9
4.0	-36.3	-41.9	-30.8
5.0	-34.3	-39.8	-28.8
6.0	-32.3	-37.8	-26.9
7.0	-30.5	-35.9	-25.0
8.0	-28.6	-34.1	-23.2
9.0	-26.9	-32.4	-21.4
10.0	-25.2	-30.6	-19.7
11.0	-23.5	-29.0	-18.1
12.0	-21.9	-27.4	-16.5
13.0	-20.4	-25.8	-15.0
14.0	-18.9	-24.3	-13.5
16.0	-16.0	-21.4	-10.6
18.0	-13.2	-18.6	-7.8
20.0	-10.6	-16.0	-5.2
22.0	-8.1	-13.5	-2.7
24.0	-5.7	-11.0	-0.3
26.0	-3.4	-8.7	2.0
28.0	-1.1	-6.5	4.2
29.0	-0.1	-5.4	5.3
31.0	2.1	-3.3	7.4
34.0	5.1	-0.2	10.4
37.0	8.0	2.7	13.3
40.0	10.8	5.5	16.0
43.0	13.4	8.2	18.7

Pressure (psig)	Average Temperature (°F)	Liquid (Bubble) Temperature (°F)	Vapor (Dew) Temperature (°F)
46.0	16.0	10.8	21.2
49.0	18.4	13.2	23.7
52.0	20.8	15.6	26.0
55.0	23.1	17.9	28.3
59.0	26.1	20.9	31.2
63.0	28.9	23.8	34.0
67.0	31.6	26.5	36.7
83.0	41.6	36.5	46.6
101.0	51.4	46.5	56.3
121.0	61.1	56.2	65.9
142.0	70.1	65.4	74.9
154.0	74.9	70.2	79.6
167.0	79.8	75.1	84.4
181.0	84.8	80.2	89.3
196.0	89.8	85.3	94.3
212.0	94.9	90.5	99.3
229.0	100.0	95.7	104.3
246.0	104.9	100.7	109.1
264.0	109.8	105.6	113.9
284.0	115.0	110.9	119.0
304.0	119.9	115.9	123.8
325.0	124.8	121.0	128.6
348.0	129.9	126.2	133.6
349.0	130.1	126.4	133.8
372.0	135.0	131.4	138.5
397.0	140.0	136.6	143.4
423.0	145.0	141.8	148.3
450.0	150.0	146.9	153.0

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