

SOLSTICE® ZE (HFO-1234ze)

TECHNICAL DATA SHEET

Solstice® ze refrigerant (HFO-1234ze) is the best medium pressure, low GWP refrigerant on the market when considering the balance of all properties. It is an energy-efficient alternative to traditional refrigerants in different medium temperature uses and has been selected by a number of equipment manufacturers for applications with a capacity range from several kW to 20MW and charges varying from 300g to 13mT.

Recognized and awarded by the industry, Solstice® ze meets the criteria that are most important to refrigerants users: Performance, Cost Effectiveness, Environmental Impact and Safety.

GENERAL PROPERTIES	
Chemical Name	Trans-1,3,3,3-Tetrafluoroprop-1-ene
Formula	CF ₃ CH=CHF
Appearance	Colorless
ODP (ODP-R11=1)	0
GWP REV /5TH IPCC (GWP CO ₂ =1)	1
ASHRAE Standard 34 Class	A2L
Flammability Limits – ASTM E681-04 @ 69.8°F	Nonflammable
Flammability Limits – ASHRAE 34 @ 212°F	7% – 12% (by volume)

UNITS		
PROPERTIES	FLUID	R1234ze(E) refprop result
Molecular weight	114.0	lbm/lb-mol
Boiling temperature @ 0 psig	-2.2	F
Critical temperature	228.9	F
Critical pressure	527.2	psia
Critical volume	0.03274	ft ³ /lbm
Critical density	30.5	lbm/ft ³
Saturated liquid pressure @ 77°F	96.5	psia
Saturated vapor pressure @ 77°F	72.3	psia
Vapor density @ 0 psig boiling point	0.356	lbm/ft ³
Vapordensity @ 77°F	1.643	lbm/ft ³
Vapor pressure @ 77oF	72.304	psia
Liquid density @ 32°F	77.42	lbm/ft ³
Liquid density @ 77°F	72.61	lbm/ft ³
Liquid heat capacity @ 77°F	0.331	Btu/lbm-R
Vapor heat capacity @ 77oF	0.233	Btu/lbm-R
Liquid thermal conductivity @ 77°F	0.0429	Btu/(h-ft-R)
Vapor thermal conductivity @ 77F	0.0079	Btu/h-ft-F
Liquid viscosity @ 77°F	1.28E-04	lbm/ft-sec
Vapor viscosity @ 77°F	8.22E-06	lbm/ft-sec

Scientific notation should write as 10-x
i.e., 5.5E-04 = 5.5x10⁻⁴
5.5E04 = 5.5x10⁺⁴

BENEFITS

- Field tests of air-cooled chillers in similar systems comparing Solstice® ze with propane (R-290) show significantly lower energy consumption
- Higher energy efficiency or Coefficient of Performance (CoP) than R-134a across a range of applications and conditions
- Solstice® ze is a pure molecule, it can be used in flooded systems
- Fast Implementation: Solstice® ze exhibits similar performance to medium-pressure refrigerants like R-134a, so only minor considerations are required to use Solstice® ze.
- Solstice® ze refrigerant's lower discharge pressure results in less mechanical stress, extending the life of the compressor.
- More energy efficient in hot regions than competitive LGWP alternatives for this type of equipment.

APPLICATIONS

- Air-cooled and water-cooled chillers
- District heating and cooling
- Heat pumps
- Refrigerators
- Vending machines
- Beverage dispensers
- Air dryers
- CO₂ cascade systems, etc.



MATERIALS COMPATIBILITY

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

PLASTICS AND ELASTOMERS

Solstice® ze is compatible with most common materials. Since there are many different grades and formulations of these materials, we recommend that compatibility testing be performed on the specific grade of materials under consideration and at the conditions of use when designing new systems.

DESICCANTS

Desiccant driers compatible with Solstice® ze are commercially available. Contact individual drier manufacturers for specific recommendations.

LUBRICANTS

POE (polyol ester) oil is recommended for using Solstice® ze. As with most ultra-low GWP refrigerants, Solstice® ze is more miscible and more soluble in oil than traditional HFCs or HCFCs. When a higher miscibility is very favorable in systems for returning oil

to compressors from the liquid side of the circuit, a higher solubility means that more refrigerant will be trapped in gaseous phase in the oil sump. A direct consequence is the reduction in working viscosity of the lubricating mixture (combination of lubricant and refrigerant) to the compressor bearings. The minimum viscosity criterion to operate under the highest bearing loads varies depending on compressor and bearing technology, so there could be a need for certain technologies and at certain conditions to increase the viscosity of the lubricant for compressors used with Solstice® ze to maintain reliable bearing lubrication.

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.

alternatives such as hydrocarbons and ammonia, which are either extremely flammable or highly toxic.

LEAKS

If a large release of Solstice® ze vapor occurs, take the same measures as with R-134a.

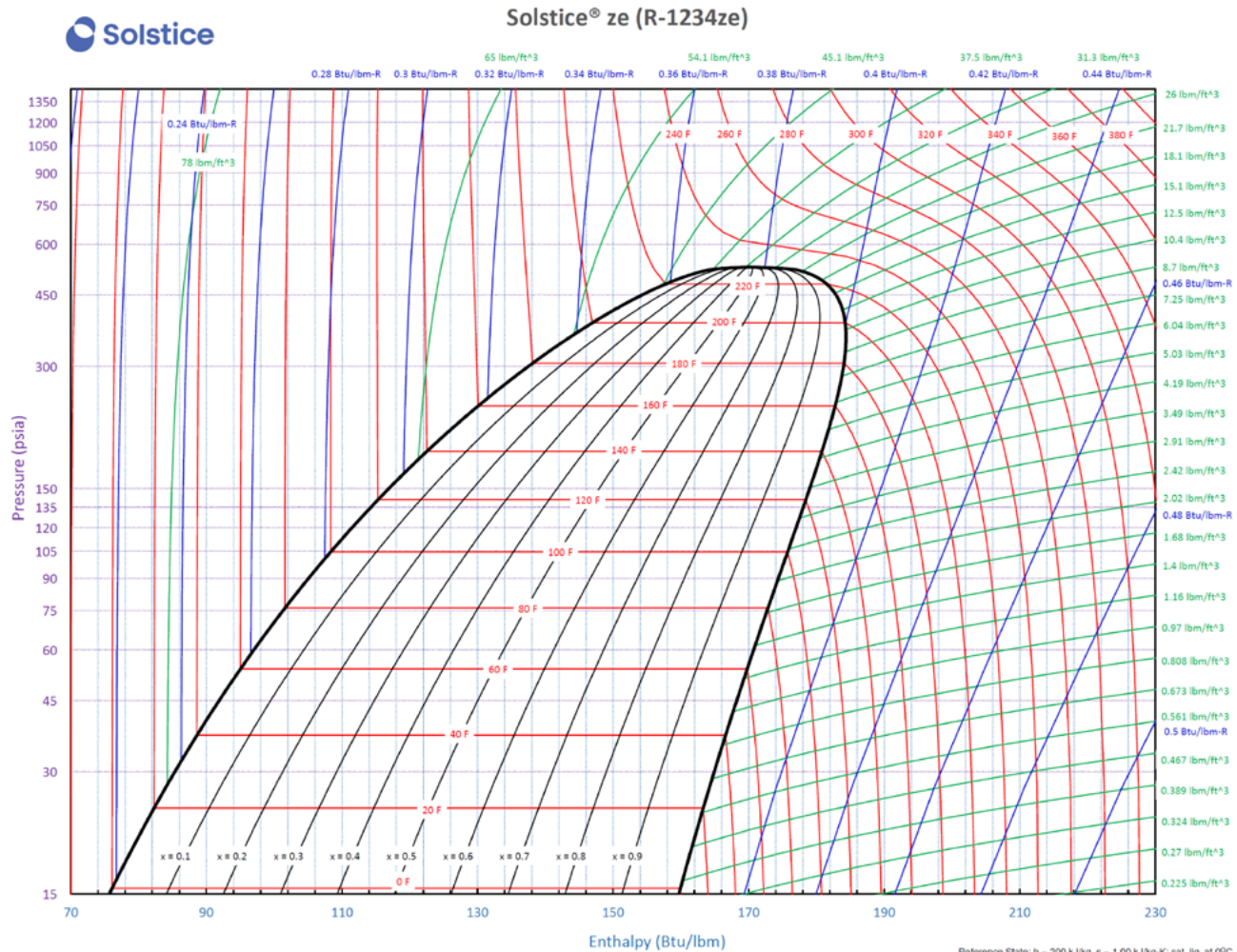
LEAK DETECTION

Hand-held leak detectors can be used for pinpointing leaks. For monitoring an entire room on a continual basis, leak monitors are available. Leak detection is important for protection of those in proximity of the system, refrigerant conservation, equipment protection and performance, and reduction of emissions. Customers should consult the equipment manufacturer for appropriate detectors.

SAFETY AND STORAGE

Solstice recommends reading the Safety Data Sheet (SDS) before using the product. Solstice® ze refrigerant is significantly safer in use than

PRESSURE AND ENTHALPY



PRESSURE AND TEMPERATURE	
psig	°F
0	-2.2
5	10.3
10	20.6
15	29.3
20	36.9
22	39.7
24	42.4
26	45.0
28	47.6
30	50.0
32	52.3
34	54.6
36	56.7
38	58.9
40	60.9
42	62.9
44	64.9
46	66.8
48	68.7
50	70.5
55	74.8
60	78.9
70	86.6
80	93.6
90	100.1
100	106.1
105	108.9
110	111.7

PRESSURE AND TEMPERATURE	
psig	°F
115	114.4
120	117.0
125	119.6
130	122.0
135	124.4
140	126.8
145	129.1
150	131.3
155	133.5
160	135.7
165	137.8
170	139.8
175	141.8
180	143.8
185	145.7
190	147.6
195	149.5
200	151.3
205	153.1
210	154.9
215	156.6
220	158.4
230	161.7
240	164.9
250	168.1
260	171.1
270	174.1
280	177.0



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