

## Characteristics

Solstice N40 (R-448A) is a zeotropic blend designed to serve as a replacement for R-22 and R-404A in supermarket refrigeration retrofits or new systems. It provides an excellent combination of low GWP and high energy efficiency.

## Applications

Solstice N40 (R-448A) is an excellent low GWP and non-flammable refrigerant option for low and medium temperature in commercial refrigeration. This includes supermarket systems, vending machines (plug-ins) and other similar.

## Physical properties

Solstice <sup>®</sup> N40 (R-448A)		
Class/Type	Zeotropic blend	
Formula	26%/26%/21%/7%/20% R-32/R-125/R-134a/R-1234ze/R-1234yf	
Kind	HFC / HFO	
Appearance	Colourless	
ODP (ODP-R11=1)	0	
GWP rev 3 <sup>rd</sup> /4 <sup>th</sup> /5 <sup>th</sup> IPCC	1300 / 1387 / 1273	
ASHRAE Std. 34 Safety Class	A1	
ATEL/ODL (kg/m <sup>3</sup> )	0.390	
Practical limit kg/m <sup>3</sup>	0.390	
LFL (% vol)	Non flammable	
REACH	Registered	
Units		SI
Molecular weight	86.3	kg/mol
Boiling temperature	-45.9	°C
Critical temperature	83.7	°C
Critical pressure	46.6	bar
Critical volume	0.00208	m <sup>3</sup> /kg
Critical density	480.2	kg/m <sup>3</sup>
Vapour density at boiling point	4.701	kg/m <sup>3</sup>
Liquid density at 0°C	1192.5	kg/m <sup>3</sup>
Liquid density at 25°C	1092.3	kg/m <sup>3</sup>
Vapor density at 25°C	48.5	kg/m <sup>3</sup>
Liquid heat capacity at 25°C	1.553	kJ/kg·°K
Vapour heat capacity at 25°C	1.165	kJ/kg·°K
Heat of vaporization at boiling point	241.1	kJ/kg
Vapour Pressure at 25°C	1107.1	kPa
Liquid thermal conductivity at 25°C	80.6	W/m·°K
Vapor thermal conductivity at 25°C	14.6	W/m·°K
Liquid viscosity at 25°C	138.1	µPa·sec
Vapour viscosity at 25°C	12.5	µPa·sec

## Pressure and temperature

Pressure (kPa)	Liquid (bubble) Temperature (°C)	Vapor (Dew) Temperature (°C)
100	-46.2	-40.0
150	-37.5	-31.4
200	-30.8	-24.8
250	-25.3	-19.4
300	-20.6	-14.7
350	-16.5	-10.6
400	-12.8	-7.0
450	-9.4	-3.7
500	-6.4	-0.6
550	-3.5	2.2
600	-0.8	4.8
650	1.7	7.3
700	4.1	9.6
750	6.3	11.8
800	8.5	13.9
850	10.5	15.9
900	12.4	17.8
950	14.3	19.7
1000	16.1	21.4
1050	17.9	23.1
1100	19.5	24.8
1150	21.2	26.4
1200	22.7	27.9
1250	24.2	29.4
1300	25.7	30.8
1350	27.2	32.2
1400	28.6	33.6
1450	29.9	34.9
1500	31.2	36.2
1550	32.5	37.4
1600	33.8	38.6
1650	35.0	39.8
1700	36.2	41.0
1750	37.4	42.1
1800	38.6	43.2
1850	39.7	44.3
1900	40.8	45.4
1950	41.9	46.5
2000	43.0	47.5
2050	44.0	48.5
2100	45.1	49.5
2200	47.1	51.4
2300	49.0	53.2
2400	50.9	55.0
2500	52.7	56.8
2600	54.5	58.4
2700	56.2	60.1
2800	57.9	61.6
2900	59.5	63.2

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## Materials compatibility

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

## Desiccants

Desiccant driers compatible with Solstice N40 are commercially available. Individual drier manufacturers should be contacted for specific recommendations.

## Lubricants

POE (polyol ester) 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. 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. Customers should consult the manufacturer or conduct further independent testing.

## Safety and Storage

Honeywell recommends reading the Material Safety Data Sheet (MSDS) before using the product. Solstice Solstice N40 (R-448A) has similar storage and handling requirements to R-404A in bulk and cylinder, since according to the compressed gas classification it is nonflammable.

## Literature

Honeywell has a wide range of literature available on Solstice N40 including case studies, customers references, etc.

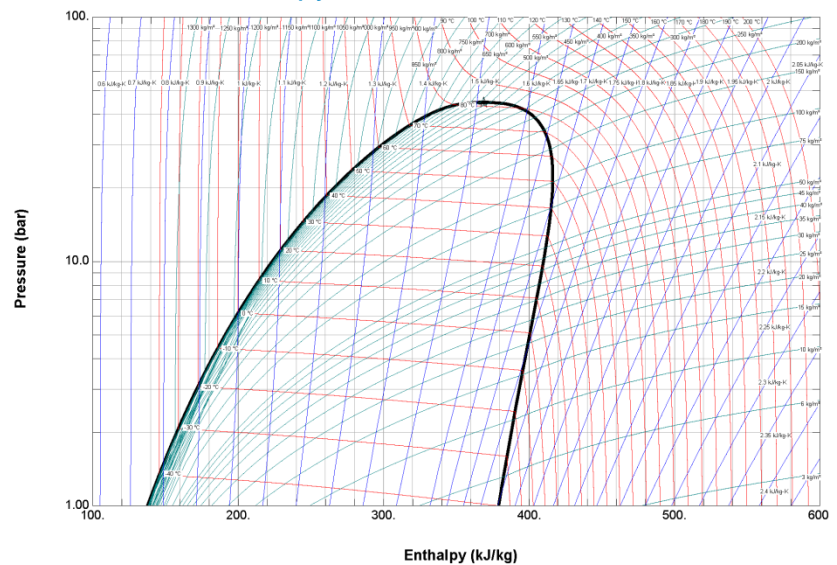
## Package Sizes

Solstice N40 is available in roll drum and ISO bulk. For other packing sizes please contact Honeywell distribution network.

## Leaks and leak detection

If a large release of Solstice N40 vapour occurs, the same measures as with R-404A need to be taken. 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.

## Pressure and enthalpy



## Available tools

Simulation software Honeywell's refrigerants modelling software is a free-download software program that eliminates the guesswork involved in selecting a refrigerant by allowing refrigeration engineers to run simulations based on actual data. The tool runs property calculations of refrigerants, conducts thermodynamic evaluations of air conditioning and refrigeration cycles, and provides a first principle thermodynamic comparison of new alternative refrigerants for retrofit applications or new system designs. The software models systems from simplified basic cycles to large, complex refrigeration systems. The results can be exported to Microsoft Excel, where the data can be manipulated in a variety of ways. The software also creates typical Mollier diagrams (Pressure-Enthalpy, Temperature-Entropy). You can download the Genetron Refrigerants Modelling Software at <https://www.honeywell-refrigerants.com/europe/genetron-refrigerants-modeling-software-download/>

## Smart phones apps

Download Honeywell PT chart ruler application for iOS and Android free



## Information and contact

For information and support on new applications, contact your local Honeywell representative, visit [www.honeywell-refrigerants.com/europe](http://www.honeywell-refrigerants.com/europe) or send us an email at [fluorines.europe@honeywell.com](mailto:fluorines.europe@honeywell.com)

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