



REDUCED GWP HFO BLEND SOLUTION FOR
LOW AND MEDIUM TEMPERATURE REFRIGERATION EQUIPMENT

**The most energy-efficient, reduced-GWP
alternative to R-404A available**

Reduced GWP and Higher Energy Efficiency

The superior energy efficiency of Honeywell Solstice[®] N40 (R-448A) makes it a clear winner compared to R-404A. Add in its significantly lower global warming potential – more than two-thirds lower – and it's easy to see why Solstice N40 should be your refrigerant choice for years to come. It is a nonflammable (ASHRAE A1) replacement for R-404A or R-22 in supermarket and commercial refrigeration applications.

A key feature of Solstice N40, is its reduced compressor discharge temperature at both medium and low temperature conditions, helping to further minimise application and retro-fit costs.

Applications

Solstice N40 is an HFO blend designed to replace R-404A in low- and medium-temperature refrigeration equipment such as supermarket fridge and freezer cases and transport refrigeration. The performance and properties of Solstice N40 have been calculated to closely match that of R-404A and R-22 for both new and retrofit applications.

Performance

In a variety of supermarket trials conducted in Europe and the U.S., Solstice N40 demonstrated >3% lower energy consumption in low-temperature

applications and in some cases >10% lower energy consumption in medium-temperature applications as compared to R-404A.

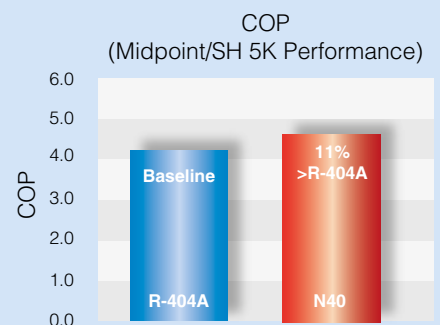
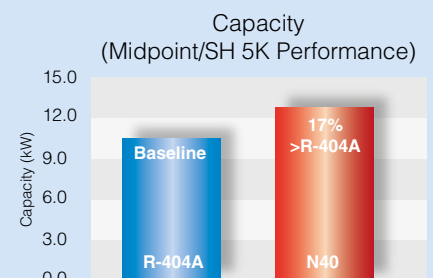
Solstice N40 also provides similar performance to refrigeration systems using R-22 for low and medium temperature applications.

Increased operating envelope compared to other R-404A alternatives allows for a considerably lower discharge temperature when operating at low temperature conditions. This helps not only to reduce the cost of application but also helps to minimise energy consumed.

Solstice N40 is simply

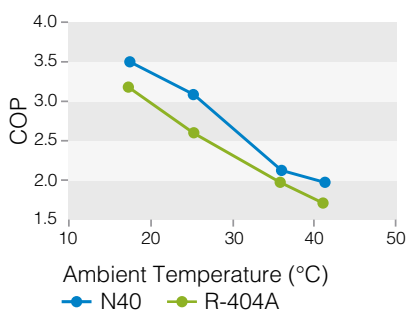
Data by Emerson, one of the largest compressor producers, show that Solstice N40 is superior to R-404A in capacity and performance.

Scroll System Analysis
@ -6.7°C / 48.9°C

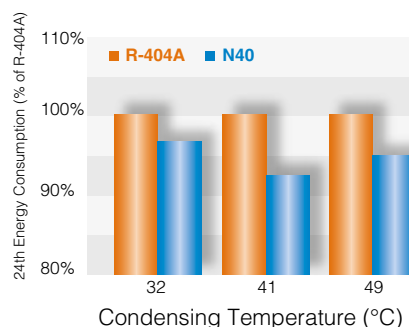


Independent Verification of N40 Performance

In a recent 'Supermarket Refrigeration Evaluation' made under controlled laboratory conditions, the **Oak Ridge National Laboratory** calculated an increase in capacity of 7.5% and an improved energy efficiency of over 11% when compared against R-404A.



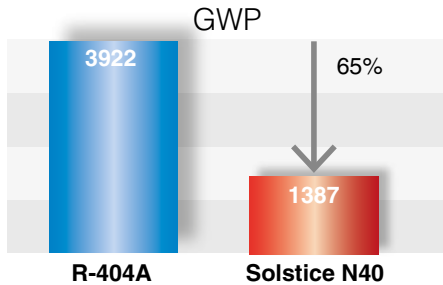
Emerson Climate Technologies also tested Solstice N40 in their Supermarket Laboratory and demonstrated up to 8% lower energy consumption in medium temperature and 3% in Low temperature regulated testing against R-404A.



Oak Ridge National Laboratory test results

Environmental Impact

Solstice N40 has 5-10% higher energy efficiency than R-404A. Its GWP of 1387 (GWP rev 4th IPCC) is 65% lower than R-404A and 34% lower than R-407A.



Safety

Non-flammable (ASHRAE A1).

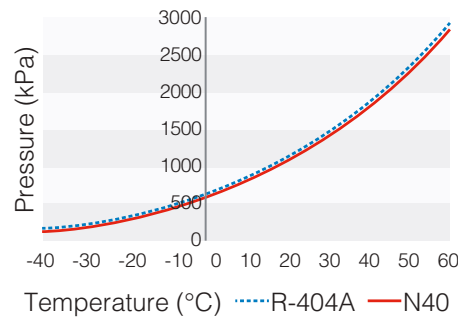
Physical properties

Solstice® 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 3rd/4th/5th IPCC	1300/1387/1273
Flammability Limits – ASTM E681-04 @ 21°C	Non Flammable
ASHRAE Std. 34 Safety Class	A1
ATEL/ODL (kg/m ³)	0.390
Practical limit kg/m ³	0.390
LFL (% vol)	Non flammable
REACH	Registered

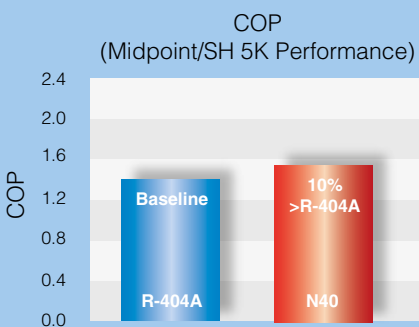
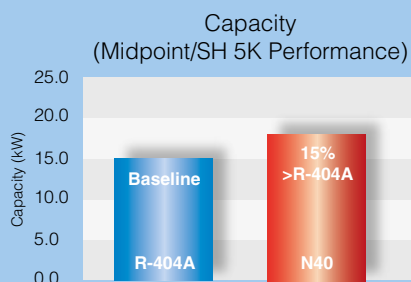
Pressure and temperature

P (1)	LT °C (2)	VT °C (3)
100	-46.4	-40.2
150	-37.7	-31.6
200	-31.0	-25.0
250	-25.6	-19.6
300	-20.9	-15.0
350	-16.8	-10.9
400	-13.1	-7.3
450	-9.7	-3.9
500	-6.6	-0.9
550	-3.8	1.9
600	-1.1	4.5
650	1.4	7.0
700	3.8	9.3
750	6.0	11.5
800	8.1	13.6
850	10.2	15.6
900	12.1	17.5
950	14.0	19.4
1000	15.8	21.1
1050	17.5	22.8
1100	19.2	24.4
1150	20.8	26.0
1200	22.4	27.5
1250	23.9	29.0
1300	25.4	30.5
1350	26.8	31.9
1400	28.2	33.2
1450	29.5	34.5
1500	30.9	35.8
1550	32.2	37.1
1600	33.4	38.3
1650	34.7	39.5
1700	35.9	40.6
1750	37.0	41.8
1800	38.2	42.9
1850	39.3	44.0
1900	40.4	45.1
1950	41.5	46.1
2000	42.6	47.1
2050	43.6	48.1
2100	44.7	49.1
2200	46.7	51.1
2300	48.6	52.9
2400	50.5	54.7
2500	52.3	56.4
2600	54.1	58.1
2700	55.8	59.7
2800	57.5	61.3
2900	59.1	62.8

PT Chart



Semi-Hermetic System Analysis @ -31.6°C / 43.3°C



(1) Pressure (absolute) kPa
 (2) Liquid (bubble) Temperature °C
 (3) Vapour (Dew) Temperature °C

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.

Compatibility of 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 when designing new systems. Customers should consult with the manufacturer or conduct further independent testing. Please contact Honeywell for more specific information.

Safety and Storage

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.

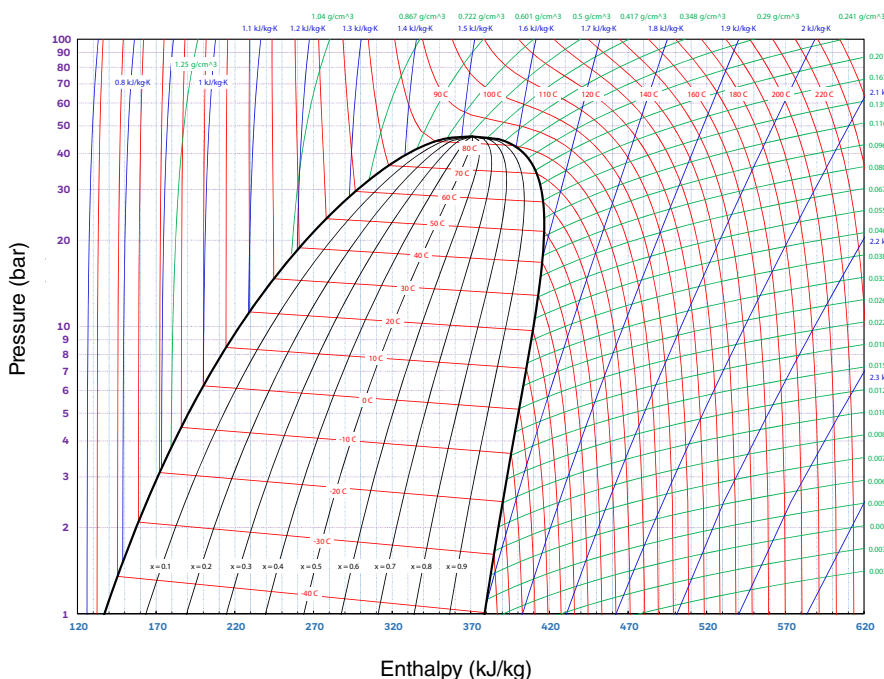
Package Sizes

Solstice N40 is available in vertical tanks 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 Solstice® N40 (R-448A)



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Please visit us at

www.honeywell-refrigerants.com/europe

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Available tools

Simulation software

Honeywell's Genetron Software – for refrigerants modelling – allows you to simulate your system with the right refrigerant and export the results to Excel. It has recently been updated to include both N40 and N13, so you can compare performance of multiple refrigerants, learn the line sizing and many more – all for free. It is available in English, German, Spanish, Portuguese and Italian.

Download the software from <http://www.honeywell-refrigerants.com/europe>

Smart phones apps

Download **Honeywell PT Chart Refrigerants EU applications for iOS and Android** free



Solstice® Low GWP Refrigerants:
**Winner of the
Low Carbon Achievement
of the Year**



RESPONSIBLE CARE®
OUR COMMITMENT TO SUSTAINABILITY

RESPONSIBLE CARE

Honeywell Performance Materials and Technologies, as a member of the American Chemistry Council, has adopted Responsible Care® as the foundation of health, safety, and environmental (HS&E) excellence in our business. Responsible Care is the chemical industry's global voluntary initiative under which companies, through their national associations, work together to continuously improve their health, safety and environmental performance, and to communicate with stakeholders about their products and processes.