



**LOW GWP**  
**AND HIGHER**  
**ENERGY**  
**EFFICIENCY**

Solstice® N40

**Honeywell**

# SOLSTICE® N40 (R448A) IS THE MOST ENERGY-EFFICIENT, REDUCED-GWP ALTERNATIVE TO R404A AVAILABLE

The superior energy efficiency of Honeywell Solstice® N40 (R448A) makes it a clear winner compared to R404A. 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's a nonflammable (ASHRAE A1) replacement for R404A or R22 in supermarket applications.

## SOLSTICE N40 IS SIMPLY BETTER

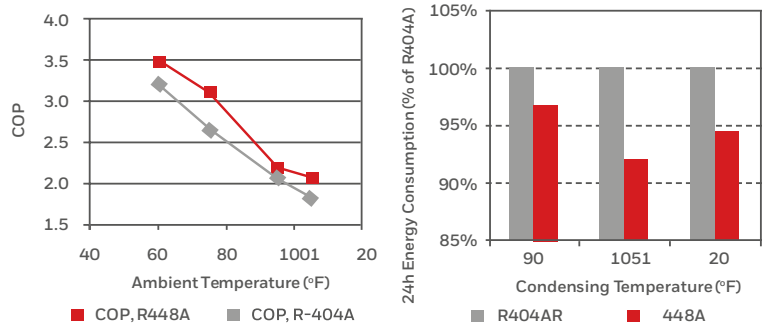
As the charts below show, Solstice N40 (R448A) demonstrates lower energy consumption, increased refrigeration capacity and coefficient of performance (COP) compared to R404A.

## RAPID, COST-EFFICIENT ADOPTION

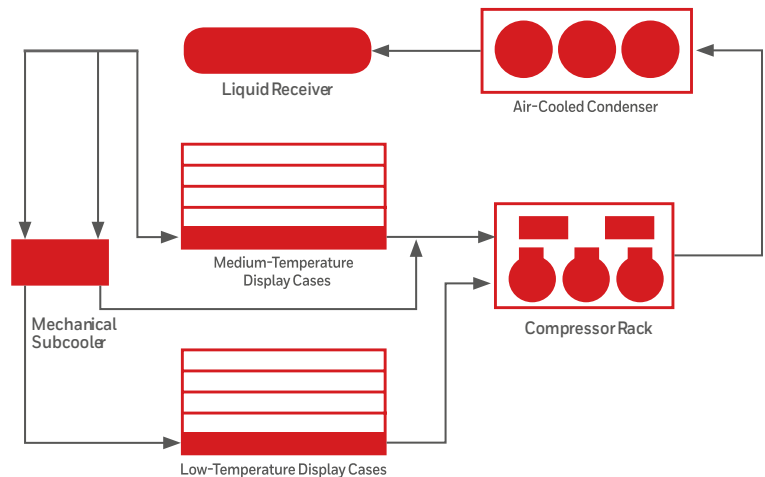
Honeywell has made switching to Solstice N40 (R448A) a breeze. It's a near drop-in replacement, so you don't have to worry about a long learning curve. With Solstice N40, you can get right to work.

- Similar operating pressures as HFCs
- Same lubricant as HFCs (POE)
- Compatible with all system components
- Solstice N40 in approval process for use with Copeland Discus and Scroll, Bitzer, Carlyle

- Low- and medium-temp refrigeration applications
- Nonflammable (ASHRAE A1)
- Near drop-in replacement for R404A
- GWP of 1273 is 68% lower than R404A and 34% lower than R407A
- 5-10% higher energy efficiency than R404A
- Equivalent to R22 performance in low and medium-temp applications



In recent laboratory tests at Emerson Climate Technologies, Solstice N40 demonstrated up to 8% lower energy consumption than R404A.



Above: In a full-scale supermarket refrigeration experimental evaluation under controlled laboratory conditions at Oak Ridge National Laboratories, Solstice N40 increased system COP by 11.6% and capacity by 7.5% over the ambient temperature range

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# Refrigerant Pipe Sizes Solstice® N40 (R-448A)

Technical Bulletin

Product: Solstice N40

Bulletin#: 10 rev 0.0

Application: Refrigeration systems using R-448A



## Background

Refrigerant pipe sizes in a typical supermarket system consist of the compressor discharge, condenser return, and individual circuit liquid and suction pipes.

The correct pipe sizes help to ensure proper oil return and low pressure drop.

## Problem

A simple sizing chart is needed for use by installation and service technicians and system designers.

## Resolution

The following charts give recommended pipe sizes for +15 °F saturated suction temperature and -25 °F saturated suction temperature.

For unique situations please contact Honeywell technical support.

## Suction Line Sizes +15 °F SST

Capacity BTUH	Total Equivalent Length, FT											
	50			100			150			200		
	SUCTION (in)		LIQ (in)	SUCTION (in)		LIQ (in)	SUCTION (in)		LIQ (in)	SUCTION (in)		LIQ (in)
H	V	H		V	H		V	H		V		
6,000	1/2	1/2	3/8	5/8	1/2	3/8	5/8	1/2	3/8	7/8	1/2	3/8
12,000	5/8	5/8	3/8	7/8	5/8	3/8	7/8	5/8	3/8	7/8	5/8	3/8
18,000	7/8	7/8	3/8	7/8	7/8	3/8	1-1/8	7/8	3/8	1-1/8	7/8	3/8
24,000	7/8	7/8	3/8	1-1/8	7/8	3/8	1-1/8	7/8	1/2	1-1/8	7/8	1/2
30,000	7/8	7/8	3/8	1-1/8	7/8	1/2	1-1/8	7/8	1/2	1-1/8	7/8	1/2
36,000	1-1/8	1-1/8	3/8	1-1/8	1-1/8	1/2	1-3/8	1-1/8	1/2	1-3/8	1-1/8	1/2
48,000	1-1/8	1-1/8	1/2	1-3/8	1-1/8	1/2	1-3/8	1-1/8	1/2	1-3/8	1-1/8	5/8
60,000	1-1/8	1-1/8	1/2	1-3/8	1-1/8	1/2	1-3/8	1-1/8	5/8	1-5/8	1-1/8	5/8
75,000	1-3/8	1-3/8	5/8	1-3/8	1-3/8	5/8	1-5/8	1-3/8	5/8	1-5/8	1-3/8	5/8
100,000	1-3/8	1-3/8	5/8	1-5/8	1-3/8	5/8	2-1/8	1-3/8	7/8	2-1/8	1-3/8	7/8
150,000	1-5/8	1-5/8	7/8	2-1/8	1-5/8	7/8	2-1/8	1-5/8	7/8	2-1/8	1-5/8	7/8
200,000	2-1/8	2-1/8	7/8	2-1/8	2-1/8	7/8	2-1/8	2-1/8	7/8	2-5/8	2-1/8	7/8
300,000	2-1/8	2-1/8	1-1/8	2-5/8	2-1/8	1-1/8	2-5/8	2-1/8	1-1/8	2-5/8	2-1/8	1-1/8
400,000	2-5/8	2-5/8	1-3/8	2-5/8	2-5/8	1-3/8	3-1/8	2-5/8	1-3/8	3-1/8	2-5/8	1-3/8
500,000	3-1/8	3-1/8	1-3/8	3-1/8	3-1/8	1-3/8	3-1/8	3-1/8	1-3/8	3-5/8	3-1/8	1-3/8

## Suction Line Sizes -25 °F SST

Capacity BTUH	Total Equivalent Length, FT											
	50			100			150			200		
	SUCTION (in)		LIQ (in)	SUCTION (in)		LIQ (in)	SUCTION (in)		LIQ (in)	SUCTION (in)		LIQ (in)
H	V	H		V	H		V	H		V		
6,000	7/8	7/8	3/8	7/8	7/8	3/8	7/8	7/8	3/8	1-1/8	7/8	3/8
12,000	7/8	7/8	3/8	1-1/8	7/8	3/8	1-1/8	7/8	3/8	1-1/8	7/8	3/8
18,000	1-1/8	1-1/8	3/8	1-3/8	1-1/8	3/8	1-3/8	1-1/8	3/8	1-3/8	1-1/8	1/2
24,000	1-1/8	1-1/8	3/8	1-3/8	1-1/8	1/2	1-3/8	1-1/8	1/2	1-5/8	1-1/8	1/2
30,000	1-3/8	1-3/8	3/8	1-3/8	1-3/8	1/2	1-5/8	1-3/8	1/2	1-5/8	1-3/8	1/2
36,000	1-3/8	1-3/8	1/2	1-5/8	1-3/8	1/2	1-5/8	1-3/8	1/2	2-1/8	1-3/8	1/2
48,000	1-5/8	1-5/8	1/2	1-5/8	1-5/8	5/8	2-1/8	1-5/8	5/8	2-1/8	1-5/8	5/8
60,000	1-5/8	1-5/8	1/2	2-1/8	1-5/8	5/8	2-1/8	1-5/8	5/8	2-1/8	1-5/8	5/8
75,000	2-1/8	2-1/8	5/8	2-1/8	2-1/8	5/8	2-1/8	2-1/8	5/8	2-5/8	2-1/8	5/8
100,000	2-1/8	2-1/8	7/8	2-1/8	2-1/8	7/8	2-5/8	2-1/8	7/8	2-5/8	2-1/8	7/8
150,000	2-5/8	2-5/8	7/8	2-5/8	2-5/8	7/8	3-1/8	2-5/8	7/8	3-1/8	2-5/8	7/8
200,000	3-1/8	3-1/8	7/8	3-1/8	3-1/8	7/8	3-1/8	3-1/8	7/8	3-5/8	3-1/8	1-1/8
300,000	3-5/8	3-5/8	1-1/8	3-5/8	3-5/8	1-1/8	3-5/8	3-5/8	1-1/8	4-1/8	3-5/8	1-1/8
400,000	4-1/8	4-1/8	1-3/8	4-1/8	4-1/8	1-3/8	4-1/8	4-1/8	1-3/8	4-1/8	4-1/8	1-3/8

Horizontal suction sizes in blue will exceed 2 °F pressure drop if 20 foot riser is included. Recommend 25% of horizontal line be increased 1 size to offset. Vertical suction riser sizes in green will have velocity lower than recommend if 50% load reduction occurs. Consider riser size reduction. Liquid sizes assume evaporator location 15 foot below elevation of receiver. See notes\*.

**\*Liquid line pressure drop:**

The liquid line sizes provided are calculated to equal 2 °F or less in equivalent pressure drop. If the evaporator is 15 feet below the receiver the pressure from the liquid refrigerant will compensate for this pressure drop. If the evaporator is not 15 feet or more below the receiver then refrigerant flashing may occur in the liquid line.

Honeywell recommends subcooling of the liquid to prevent liquid flashing. Subcooling at a minimum rate of 2 °F per 10 feet of elevation will prevent flashing. Additional subcooling or liquid insulation is recommended to offset warming of pipe through unconditioned areas.

**Condenser Liquid Return and Discharge Line Sizes +15 °F SST**

Capacity	Total Equivalent Length, FT							
	50		100		150		200	
BTUH	Cond to Receiver	Discharge	Cond to Receiver	Discharge	Cond to Receiver	Discharge	Cond to Receiver	Discharge
6,000	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8
12,000	3/8	3/8	3/8	1/2	3/8	1/2	3/8	1/2
18,000	1/2	1/2	1/2	1/2	1/2	5/8	1/2	5/8
24,000	5/8	1/2	5/8	5/8	5/8	5/8	5/8	5/8
30,000	5/8	5/8	5/8	5/8	5/8	7/8	5/8	7/8
36,000	5/8	7/8	5/8	7/8	5/8	7/8	5/8	7/8
48,000	7/8	7/8	7/8	7/8	7/8	7/8	7/8	7/8
60,000	7/8	7/8	7/8	7/8	7/8	7/8	7/8	7/8
75,000	7/8	7/8	7/8	7/8	7/8	1-1/8	7/8	1-1/8
100,000	1-1/8	1-1/8	1-1/8	1-1/8	1-1/8	1-1/8	1-1/8	1-1/8
150,000	1-3/8	1-1/8	1-3/8	1-1/8	1-3/8	1-3/8	1-3/8	1-3/8
200,000	1-5/8	1-3/8	1-5/8	1-3/8	1-5/8	1-3/8	1-5/8	1-3/8
300,000	2-1/8	1-3/8	2-1/8	1-5/8	2-1/8	1-5/8	2-1/8	1-5/8
400,000	2-1/8	1-5/8	2-1/8	1-5/8	2-1/8	1-5/8	2-1/8	2-1/8
500,000	2-5/8	1-5/8	2-5/8	2-1/8	2-5/8	2-1/8	2-5/8	2-1/8

**Condenser Liquid Return and Discharge Line Sizes -25 °F SST**

Capacity	Total Equivalent Length, FT							
	50		100		150		200	
BTUH	Cond to Receiver	Discharge	Cond to Receiver	Discharge	Cond to Receiver	Discharge	Cond to Receiver	Discharge
6,000	3/8	3/8	3/8	3/8	3/8	3/8	3/8	1/2
12,000	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
18,000	1/2	1/2	1/2	1/2	1/2	5/8	1/2	5/8
24,000	5/8	1/2	5/8	5/8	5/8	5/8	5/8	7/8
30,000	5/8	5/8	5/8	5/8	5/8	7/8	5/8	7/8
36,000	7/8	5/8	7/8	7/8	7/8	7/8	7/8	7/8
48,000	7/8	7/8	7/8	7/8	7/8	7/8	7/8	1-1/8
60,000	7/8	7/8	7/8	7/8	7/8	7/8	7/8	1-1/8
75,000	1-1/8	7/8	1-1/8	7/8	1-1/8	1-1/8	1-1/8	1-1/8
100,000	1-1/8	7/8	1-1/8	1-1/8	1-1/8	1-1/8	1-1/8	1-3/8
150,000	1-3/8	1-3/8	1-3/8	1-3/8	1-3/8	1-3/8	1-3/8	1-3/8
200,000	1-5/8	1-3/8	1-5/8	1-3/8	1-5/8	1-3/8	1-5/8	1-5/8
300,000	2-1/8	1-5/8	2-1/8	1-5/8	2-1/8	1-5/8	2-1/8	2-1/8
400,000	2-1/8	1-5/8	2-1/8	1-5/8	2-1/8	2-1/8	2-1/8	2-1/8
500,000	2-5/8	2-1/8	2-5/8	2-1/8	2-5/8	2-1/8	2-5/8	2-1/8

**Notes:**

- Refer to equipment manufacturer details for piping practices
- Pressure drop in lines kept below 2 °F equivalent saturation temp change
- 105 °F liquid temperature
- Liquid drain line velocity kept below 100 fpm
- Discharge line velocity kept below 3500 fpm
- All sizes indicate outside dimensions type K or L copper tubing
- Risers kept no larger than horizontal runs
- Equivalent length should include equivalent length for fittings. Refer to ASHRAE guidelines or the equivalent length chart for equivalent lengths of fitting.
- Vertical risers are kept between 900 and 4000 ft/min
- Horizontal lines are kept between 500 and 4000 ft/min

**Equivalent Length in Feet of Straight Pipe**

Linesize (Outside Diameter) Inch	Solenoid / Globe Valve	Angle Valve	900 Long Radius Elbow	450 Long Radius Elbow	Tee - Line	Tee - Branch
3/8	7	4	0.8	0.3	0.5	15
1/2	9	5	0.9	0.4	0.6	2.0
5/8	12	6	1.0	0.5	0.8	2.5
7/8	15	8	1.5	0.7	1.0	3.5
1-1/8	22	12	1.8	0.9	1.5	4.5
1-3/8	28	15	2.4	1.2	1.8	6.0
1-5/8	35	17	2.7	1.4	2.0	7.0
2-1/8	45	22	3.9	1.8	3.0	10
2-5/8	51	26	4.6	2.2	3.5	12

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