

**HUSSMANN®**

---

# Line Sizing

REFRIGERATION DATA GUIDE

October 2017



# Line Sizing Refrigeration Data

## Guidelines

---

### GENERAL INFORMATION

This document is for reference purposes only. The refrigeration equipment installer is responsible for the actual refrigeration pipe size selection and application of the refrigeration piping.

This document supersedes all previously published line sizing data – including planning data, installation instructions, or other stand-alone documents.

Partial information contained in this Line Sizing booklet is collected from ASHRAE Refrigeration Handbook. Refer to ASHRAE standards for line sizing criteria and applications.

Pressure drop calculations are determined as normal pressure loss associated with a change in saturation temperature of the refrigerant. Typically, the refrigeration system is sized for pressure losses equivalent to  $\leq 2^\circ\text{F}$  change to the relevant refrigerant temperature for each segment of the discharge, suction, and liquid lines. However in most applications, oil control via refrigerant line velocity should be a priority over refrigerant line pressure drops.

### REFRIGERATION LINE STUBS OUT

Refrigerant line stub sizes found on systems components such as compressors, accumulators, remote condensers should not be used as a guide for line size selection. Reduction fittings are field supplied and installed. These are general guidelines. The installer is responsible to account for any factors which may affect the system.

### CONDENSER LINE SIZING

A Condenser Line Sizing chart is established for an equivalent pipe run of 100 feet. For longer runs use the following formula:

$$\text{Table Capacity} * \sqrt{100/\text{Longer Length}} = \text{Longer Line Capacity}$$

Note: This formula applies only to remote condenser lines, and only to longer runs of these lines. A 50 ft run does not necessarily have double the capacity of a 100 ft. run.

### REFRIGERATION LINES, COMPLICATED RUNS

For excessively high vertical suction or discharge risers, p-trap locations or any design outside the standards, refer to ASHRAE Refrigeration Handbook or contact Hussmann Design Group for system design guidance.

### LINE SIZING TABLES

- R-22 Low Temp: Suction Line Sizing
- R-22 Low Temp: Liquid Line, Condenser Line and Remote Header Line Sizing
- R-22 Med Temp: Suction Line Sizing
- R-22 Med Temp: Liquid Line, Condenser Line and Remote Header Line Sizing
  
- R-404A and R-507A Low Temp: Suction Line Sizing
- R-404A and R-507A Low Temp: Liquid Line, Condenser Line and Remote Header Line Sizing
- R-404A and R-507A Med Temp: Suction Line Sizing
- R-404A and R-507A Med Temp: Liquid Line, Condenser Line and Remote Header Line Sizing
  
- R-407A Low Temp: Suction Line Sizing
- R-407A Low and Med Tempe: Liquid Line Sizing
- R-407A Low and Med Tempe: Remote Header Line Sizing
- R-407A Low and Med Temp: Condenser Line Sizing
- R-407A Med Temp: Suction Line Sizing
  
- R-407F Low Temp: Suction Line Sizing
- R-407F Low and Med Temp: Liquid Line Sizing
- R-407F Low and Med Temp: Remote Header Line Sizing
- R-407F Low and Med Temp: Condenser Line Sizing
- R-407F Med Temp: Suction Line Sizing
  
- R-448A and R-449A Low Temp: Suction Line Sizing
- R-448A and R-449A Low and Med Temp: Liquid Line Sizing
- R-448A and R-449A Low and Med Temp: Remote Header Line Sizing
- R-448A and R-449A Low and Med Temp: Condenser Line Sizing
- R-448A and R-449A Med Temp: Suction Line Sizing

## DIRECTIONS and NOTES

Select the proper chart for the refrigerant used. Select the MBH value that is equal to or greater than the MBH the line will be required to carry. Read the Line Size following the MBH.

**MBH:** values listed are always the maximum, except the Vertical Riser which uses a minimum value.

**Vertical Riser:** When the anticipated minimum refrigerated load capacity is less than the figure listed in the "Vertical Riser MBH" column, the riser should be reduced to the next size smaller. When equal to or greater than the figure listed, the riser should be the same size as the main tubing run.

## EQUIVALENT LENGTH *(in feet for copper piping)*

Copper fittings, valves and copper bends all add to friction line pressure drop. Due to the complexity of computing the pressure drop of each fitting, a general "equivalent feet (EF)" rating has been given to most standard fittings. Valve EF ratings can be found at manufactures web sites. For complicated system piping of suction, liquid and discharge lines it is suggested that each segment be converted to EF and line sizing continue with accurate lengths. However, experienced application engineers with a good understanding of site piping layouts, on pipe segments of 100' or greater, a general addition of 20% to 30% may be added to the subtotal of actual linear length for an estimated total of equivalent feet. For segments of less than 100' an added estimate of 50% to 75% may be add for a total EF.

Size (in)	Equivalent Length (feet)			
	90° Elbow	45° Elbow	Line Tee	Branch Tee
1/2	0.9	0.4	0.6	2.0
5/8	1.0	0.5	0.8	2.5
7/8	1.5	0.7	1.0	3.5
1 1/8	1.8	0.9	1.5	4.5
1 3/8	2.4	1.2	1.8	6.0
1 5/8	2.8	1.4	2.0	7.0
2 1/8	3.9	1.8	3.0	10.0
2 5/8	4.6	2.2	3.5	12.0

## SYSTEM CONSIDERATIONS

Pressure drops, velocities, copper cost, power consumption, refrigerant charge, oil control, efficiencies and system operation flexibility all need to be considered when designing the piping layout for retail/commercial refrigeration systems. Some of these requirements are a direct conflict to each other so a balance needs to be realized. A few notes to be kept in mind when designing a balanced system:

- A 2°F change in refrigerant saturation temperature (vapor or liquid) does not equate to a 2 psig change in pressure.
- For each foot in a liquid line riser, a general loss of 0.5 psig is added to the total liquid line pressure drop (PD). Subcooling the liquid to overcome any loss is the customarily accepted method. This can be natural subcooling from the condenser, suction to liquid heat exchangers or mechanical subcooling.
- Inversely, any liquid drop will subtract from the total PD.
- The pressure drops in hot gas or discharge lines are most forgiving and can readily accept 4 to 6 PD without penalty.
- Suction line design is critical for an efficient and balanced system, provide maximum oil return with minimum PD.
- Suction Lines are generally designed to have a PD loss no greater than the equivalent of about a 2°F change in saturation temperature. An example with a -40SST R-22 system, the equivalent 2°F change in suction saturation temperature would equal a 0.8 PD.
- A reasonable pressure drop designed into each piping segment is preferred to oversized refrigeration lines which will require an overly excessive amount of refrigerant system charge as well as extra copper cost.
- It is worth repeating that the connection on a compressor service valve, the size of the connection on a condenser, evaporator, accumulator or any other component found in the system does not determine the size of the refrigeration line connected to the component. It is likely that the refrigeration line will be larger or smaller than the actual connection port on the component.
- Designing loop piping, a single pipe size feeding multiple branch circuits should be avoided. Reduction steps on main liquid loops should be designed into piping layouts.
- In addition, inversely, main suction loop designs returning to the compressor rack need to be stepped up in size to properly match the additional BTUH increases and maintain designed velocities and pressure drops.

# R-22 Low Temperature

## Suction Line Sizing

Suction Temp °F	Suction Line Sizing Maximum MBH of Refrigeration per Length of Equivalent Feet @ 105° F Condenser						Tubing Size OD (in)	Vertical Riser MBH	
	50	100	150	200	250	300			
<b>-40</b>	9	6	5	4	3	3	7/8	3	
	18	12	10	8	7	6	1-1/8	6	
	32	22	17	15	13	12	1-3/8	10	
	46	35	28	24	21	19	1-5/8	17	
	81	73	59	50	44	40	2-1/8	35	
	125	125	105	89	79	72	2-5/8	61	
	179	179	168	143	127	115	3-1/8	99	
	242	242	242	214	190	172	3-5/8	147	
	315	315	315	303	269	243	4-1/8	208	
491	491	491	491	482	437	5-1/8	374		
<b>-30</b>	11	8	6	5	4	4	7/8	4	
	24	16	13	11	9	9	1-1/8	8	
	42	28	23	19	17	15	1-3/8	13	
	60	45	36	31	27	25	1-5/8	21	
	105	95	76	65	57	52	2-1/8	45	
	161	161	135	115	102	92	2-5/8	79	
	231	231	216	185	164	148	3-1/8	127	
	312	312	312	275	244	221	3-5/8	189	
	406	406	406	390	345	313	4-1/8	268	
	633	633	633	633	620	562	5-1/8	480	
	<b>-20</b>	15	10	8	7	6	5	7/8	5
		30	20	16	14	12	11	1-1/8	10
53		36	29	25	22	20	1-3/8	17	
76		58	46	39	35	31	1-5/8	27	
133		120	96	82	73	66	2-1/8	57	
206		206	171	146	130	117	2-5/8	101	
294		294	274	234	208	188	3-1/8	161	
397		397	397	349	310	280	3-5/8	240	
517		517	517	493	438	396	4-1/8	340	
805		805	805	805	785	712	5-1/8	609	
<b>-10</b>		18	12	10	8	7	7	7/8	6
	38	26	21	18	15	14	1-1/8	12	
	66	45	36	31	27	25	1-3/8	21	
	96	72	58	49	44	40	1-5/8	34	
	168	151	121	103	92	83	2-1/8	71	
	259	259	215	184	163	147	2-5/8	126	
	370	370	343	294	261	236	3-1/8	202	
	500	500	500	438	388	352	3-5/8	301	
	650	650	650	618	548	497	4-1/8	426	
	1014	1014	1014	1014	982	890	5-1/8	763	

Suction Line Sizing Table is established for Design Conditions of 105°F Condensing Temperature. For other Condensing Temps, use the multiplying factors listed below to determine the maximum MBH capacity of the tubing.

Cond Temp °F	Multiplying Factor
60	1.18
70	1.14
80	1.10
90	1.06
100	1.02
110	.98
120	.93

NOTE:

- This table provides a general multiplier for various condensing temperatures.

NOTE:

- The minimum and maximum refrigeration load conditions on suction lines need to be considered when selecting suction lines.
- For oil control, refrigerant velocities should be considered before pressure drop considerations.
- Line sizing criteria calculations use ASHRAE guidelines, actual field applications will vary.
- Velocity, temperature and pressure drops are unique to each application and will vary.

SIZING CRITERIA:

- Horizontal Line Velocity > 700 FPM, < 2,500 FPM
- Riser Line Velocity > 1,200 FPM
- $\Delta T < 2^\circ\text{F}$
- $\Delta P < 2$  psig

# R-22 Low Temperature

## Circuit Liquid Line

Cond Temp ° F	Circuit Liquid Line Sizing Maximum MBH of Refrigeration per Length of Equivalent Feet						Tubing Size OD (in)
	50	100	150	200	250	300	
<b>80</b>	31	21	16	14	12	11	3/8
	71	48	38	32	29	26	½
	134	91	73	62	55	49	5/8
	308	243	194	165	146	132	7/8
	525	495	396	338	298	270	1-1/8
	800	800	693	591	523	473	1-3/8
	1132	1132	1100	940	831	752	1-5/8
	1970	1970	1970	1958	1735	1569	2-1/8
3039	3039	3039	3039	3039	2786	2-5/8	
<b>90</b>	31	21	17	14	12	11	3/8
	72	49	39	33	29	26	½
	136	103	74	63	55	50	5/8
	291	246	197	168	148	134	7/8
	496	496	401	343	303	274	1-1/8
	756	756	703	600	531	480	1-3/8
	1070	1070	1070	951	842	762	1-5/8
	1861	1861	1861	1861	1755	1589	2-1/8
2871	2871	2871	2871	2871	2824	2-5/8	
<b>100</b>	31	21	17	14	12	11	3/8
	73	49	39	33	29	26	½
	123	93	75	63	56	51	5/8
	274	248	199	169	150	135	7/8
	467	467	404	345	305	276	1-1/8
	711	711	709	604	535	484	1-3/8
	1007	1007	1007	960	850	769	1-5/8
	1752	1752	1752	1752	1752	1604	2-1/8
2702	2702	2702	2702	2702	2702	2-5/8	
<b>110</b>	31	21	17	14	12	11	3/8
	73	50	39	33	29	27	½
	123	94	75	64	56	51	5/8
	257	249	199	170	150	136	7/8
	438	438	406	346	306	277	1-1/8
	667	667	667	607	536	486	1-3/8
	944	944	944	944	851	771	1-5/8
	1643	1643	1643	1643	1643	1606	2-1/8
2533	2533	2533	2533	2533	2533	2-5/8	
<b>120</b>	31	21	17	14	12	11	3/8
	71	49	39	33	29	27	½
	115	94	75	64	56	51	5/8
	239	239	199	169	150	135	7/8
	408	408	404	345	305	276	1-1/8
	622	622	622	604	535	483	1-3/8
	881	881	881	881	848	767	1-5/8
	1532	1532	1532	1532	1532	1532	2-1/8
2363	2363	2363	2363	2363	2363	2-5/8	

**NOTE:**

- Line Velocity < 300 FPM
- $\Delta T < 2^\circ F$
- $\Delta P < 4$  psig
- Not to be used for Main Liquid Condenser Return Line

# R-22 Medium Temperature

## Suction Line Sizing

Suction Temp °F	Suction Line Sizing Maximum MBH of Refrigeration per Length of Equivalent Feet @ 105° F Condenser						Tubing Size OD (in)	Vertical Riser MBH	
	50	100	150	200	250	300			
10	10	7	5	5	-	-	5/8	3	
	28	19	15	13	11	10	7/8	9	
	56	39	31	26	23	21	1-1/8	18	
	98	68	54	46	41	37	1-3/8	32	
	144	107	86	74	65	59	1-5/8	51	
	252	223	179	153	136	123	2-1/8	106	
	388	388	317	272	241	218	2-5/8	187	
	555	555	507	435	386	349	3-1/8	300	
	750	750	750	646	573	520	3-5/8	446	
	975	975	975	912	810	734	4-1/8	629	
20	12	8	7	6	-	-	5/8	4	
	34	23	18	16	14	12	7/8	11	
	68	47	38	32	28	26	1-1/8	22	
	119	82	66	56	50	45	1-3/8	39	
	177	130	105	90	79	72	1-5/8	62	
	308	270	217	186	165	150	2-1/8	128	
	475	475	385	330	293	265	2-5/8	228	
	679	679	614	527	468	424	3-1/8	364	
	918	918	914	783	695	631	3-5/8	541	
	1194	1194	1194	1105	981	891	4-1/8	763	
	30	15	10	8	7	-	-	5/8	5
		41	28	22	19	17	15	7/8	13
82		57	45	39	34	31	1-1/8	27	
143		99	79	68	60	55	1-3/8	47	
215		157	126	108	96	87	1-5/8	74	
374		325	262	224	199	180	2-1/8	155	
577		574	462	397	352	319	2-5/8	274	
824		824	738	634	563	510	3-1/8	438	
1115		1115	1096	941	835	759	3-5/8	650	
1450		1450	1450	1328	1179	1070	4-1/8	919	
40		18	12	10	8	-	-	5/8	6
		48	33	27	23	20	18	7/8	16
	98	68	54	46	41	37	1-1/8	32	
	171	118	95	81	72	65	1-3/8	56	
	259	187	150	129	114	104	1-5/8	89	
	451	387	312	268	237	215	2-1/8	185	
	696	684	551	473	420	381	2-5/8	327	
	993	993	880	756	671	608	3-1/8	522	
	1334	1334	1306	1122	996	905	3-5/8	777	
	1747	1747	1747	1581	1406	1277	4-1/8	1096	

Suction Line Sizing Table is established for Design Conditions of 105°F Condensing Temperature. For other Condensing Temps, use the multiplying factors listed below to determine the maximum MBH capacity of the tubing.	
Cond Temp °F	Multiplying Factor
60	1.21
70	1.17
80	1.13
90	1.09
100	1.04
110	1.00
120	0.95

NOTE:

- This table provides a general multiplier for various condensing temperatures.

NOTE:

- The minimum and maximum refrigeration load conditions on suction lines need to be considered when selecting suction lines.
- For oil control, refrigerant velocities should be considered before pressure drop considerations.
- Line sizing criteria calculations use ASHRAE guidelines, actual field applications will vary.
- Velocity, temperature and pressure drops are unique to each application and will vary.

SIZING CRITERIA:

- Horizontal Line Velocity > 700 FPM, < 2,500 FPM
- Riser Line Velocity > 1,200 FPM
- $\Delta T < 2^\circ\text{F}$
- $\Delta P < 2$  psig

# R-22 Medium Temperature

## Circuit Liquid Line

Cond Temp ° F	Circuit Liquid Line Sizing Maximum MBH of Refrigeration per Length of Equivalent Feet						Tubing Size OD (in)
	50	100	150	200	250	300	
<b>80</b>	30	20	16	13	12	11	3/8
	70	47	37	32	28	25	1/2
	131	90	71	61	53	48	5/8
	302	238	190	162	143	129	7/8
	515	485	388	331	293	265	1-1/8
	784	784	680	580	513	464	1-3/8
	1110	1110	1079	921	815	737	1-5/8
	1932	1932	1932	1920	1701	1538	2-1/8
2979	2979	2979	2979	2979	2732	2-5/8	
<b>90</b>	30	20	14	14	12	11	3/8
	71	47	37	32	28	26	1/2
	133	91	72	62	54	49	5/8
	285	241	193	164	145	131	7/8
	486	486	393	336	297	268	1-1/8
	740	740	688	588	520	470	1-3/8
	1048	1048	1048	932	825	747	1-5/8
	1824	1824	1824	1824	1720	1557	2-1/8
2812	2812	2812	2812	2812	2767	2-5/8	
<b>100</b>	31	20	16	13	12	11	3/8
	71	47	37	32	28	26	1/2
	129	91	73	62	55	49	5/8
	268	243	194	166	146	132	7/8
	457	457	396	338	299	270	1-1/8
	696	696	694	592	524	474	1-3/8
	986	986	986	940	832	753	1-5/8
	1715	1715	1715	1715	1715	1570	2-1/8
2645	2645	2645	2645	2645	2645	2-5/8	
<b>110</b>	31	21	16	14	12	11	3/8
	71	48	39	33	29	26	1/2
	121	92	73	62	55	50	5/8
	251	243	195	166	147	133	7/8
	428	428	397	339	299	271	1-1/8
	652	652	652	593	524	475	1-3/8
	923	923	923	923	832	754	1-5/8
	1606	1606	1606	1606	1606	1571	2-1/8
2478	2478	2478	2478	2478	2478	2-5/8	
<b>120</b>	31	20	16	13	12	11	3/8
	70	47	37	32	28	26	1/2
	112	91	73	62	55	49	5/8
	234	234	194	165	146	132	7/8
	399	399	394	337	298	270	1-1/8
	608	608	608	590	522	472	1-3/8
	860	860	860	860	829	749	1-5/8
	1497	1497	1497	1497	1497	1497	2-1/8
2309	2309	2309	2309	2309	2309	2-5/8	

**NOTE:**

- Line Velocity < 300 FPM
- $\Delta T < 2^\circ F$
- $\Delta P < 4$  psig
- Not to be used for Main Liquid Condenser Return Line

# R-22 Low and Med Temperature

## Condenser Line

A Condenser Line Sizing chart is established for an equivalent pipe run of 100 feet. For longer runs use the following formula:  
 Table Capacity \*  $\sqrt{100/\text{Longer Length}}$  =  
 Longer Line Capacity

### Discharge Supply Condenser Line Sizing – Low Temperature –

Condensing Temperature °F								Line Size
60	70	80	90	100	110	120		
Discharge – Maximum Allowable MBH								
37	42	46	50	53	57	60	7/8	
76	85	94	102	109	116	123	1-1/8	
131	147	163	177	189	200	212	1-3/8	
209	234	259	281	300	319	338	1-5/8	
432	483	535	580	619	657	696	2-1/8	
779	873	966	1047	1117	1187	1257	2-5/8	
1280	1377	1523	1652	1762	1872	1982	3-1/8	

**NOTE:**

- SUCTION -40° to 0°                      -  $\Delta T < 2^\circ F$
- Velocity < 2,950 FPM                      -  $\Delta P < 5$  psig

### Liquid Return (Drop Leg) Sizing – Low Temperature –

Condensing Temperature °F								Line Size
60	70	80	90	100	110	120		
Maximum Allowable MBH								
98	92	88	82	78	73	68	5/8	
205	193	184	173	163	154	143	7/8	
349	330	314	295	279	262	243	1-1/8	
532	503	479	450	425	400	371	1-3/8	
754	713	678	637	602	567	526	1-5/8	
1313	1241	1180	1109	1048	987	916	2-1/8	
2026	1916	1822	1712	1618	1523	1413	2-5/8	
2892	2735	2600	2443	2309	2174	2017	3-1/8	

**NOTE:**

- Equivalent Run = 100'
- SUCTION -40° to 0°
- \* Velocity < 180 FPM (used with 7/8" equalizing vent line)
- $\Delta T < 2^\circ F$
- $\Delta P < 2$  psig
- \* In order to achieve proper condenser drainage, the 7/8" equalizing vent line from the receiver to condenser, **must** be used.
- If the 7/8" rack equalizing vent line is not utilized and unable to be installed, than the next larger size liquid drain line **must** be used in order to reduce the velocity to 100 FPM.
- On systems that are > 85% loaded, the highside piping is typically sized to compressor capacities.
- On systems that are 70% to 85% loaded the highside piping design should consider both the evaporator and compressor capacities.
- Systems < 70% loaded may require special piping selections, current and future load conditions will need to be considered during pipe selections.

A Condenser Line Sizing chart is established for an equivalent pipe run of 100 feet. For longer runs use the following formula:  
 Table Capacity \*  $\sqrt{100/\text{Longer Length}}$  =  
 Longer Line Capacity

### Discharge Supply Condenser Line Sizing – Medium Temperature –

Condensing Temperature °F								Line Size
60	70	80	90	100	110	120		
Discharge – Maximum Allowable MBH								
35	40	44	48	53	59	63	7/8	
71	80	88	97	107	118	127	1-1/8	
125	139	153	170	186	205	221	1-3/8	
197	220	243	268	294	324	349	1-5/8	
408	454	501	555	608	669	722	2-1/8	
719	802	885	979	1073	1180	1274	2-5/8	
971	1082	1194	1321	1449	1592	1720	3-1/8	

**NOTE:**

- SUCTION 0° to 40°                      -  $\Delta T < 2^\circ F$
- Velocity < 2,950 FPM                      -  $\Delta P < 5$  psig

### Liquid Return (Drop Leg) Sizing – Medium Temperature –

Condensing Temperature °F								Line Size
60	70	80	90	100	110	120		
Maximum Allowable MBH								
96	91	86	82	77	72	66	5/8	
201	190	180	171	160	150	139	7/8	
344	326	308	292	274	257	239	1-1/8	
523	496	469	445	418	391	363	1-3/8	
742	703	664	631	592	554	515	1-5/8	
1291	1224	1156	1098	1031	964	896	2-1/8	
1991	1887	1783	1694	1590	1486	1381	2-5/8	
2843	2694	2546	2419	2270	2122	1973	3-1/8	

**NOTE:**

- Equivalent Run = 100'
- SUCTION 0° to 40°
- \* Velocity < 180 FPM (used with 7/8" equalizing vent line)
- $\Delta T < 2^\circ F$
- $\Delta P < 2$  psig
- \* In order to achieve proper condenser drainage, the 7/8" equalizing vent line from the receiver to condenser, **must** be used.
- If the 7/8" rack equalizing vent line is not utilized and unable to be installed, than the next larger size liquid drain line **must** be used in order to reduce the velocity to 100 FPM.
- On systems that are > 85% loaded, the highside piping is typically sized to compressor capacities.
- On systems that are 70% to 85% loaded the highside piping design should consider both the evaporator and compressor capacities.
- Systems < 70% loaded may require special piping selections, current and future load conditions will need to be considered during pipe selections.



# R-22 Low and Med Temperature

## Remote Header Line Sizing

---

<b>Remote Header Line Sizing – Low Temperature –</b>			
Max. Allowable MBH	Liquid Main	Max. Allowable MBH	Suction Main
224	1-1/8	77	1-5/8
372	1-3/8	135	2-1/8
526	1-5/8	207	2-5/8
915	2-1/8	296	3-1/8
1411	2-5/8	401	3-5/8
		521	4-1/8
		812	5-1/8

**NOTE:**

- Equivalent Run = 150'
- Condensing Temperature = 110°F
- Liquid Temperature = 110°F
- SUCTION -30° to 0°
- Suction Velocity < 2,750 FPM
- Liquid Velocity < 170 FPM
- $\Delta T < 2.0^\circ F$
- $\Delta P < 2.0$  psig

<b>Remote Header Line Sizing – Medium Temperature –</b>			
Max. Allowable MBH	Liquid Main	Max. Allowable MBH	Suction Main
342	1-1/8	176	1-5/8
521	1-3/8	306	2-1/8
738	1-5/8	472	2-5/8
1284	2-1/8	673	3-1/8
1980	2-5/8	911	3-5/8
		1184	4-1/8

**NOTE:**

- Equivalent Run = 150'
- Condensing Temperature = 110°F
- Liquid Temperature = 110°F
- SUCTION 0° to 40°
- Suction Velocity < 2,750 FPM
- Liquid Velocity < 170 FPM
- $\Delta T < 2.0^\circ F$
- $\Delta P < 2.0$  psig

# R-404A / R-507A Low Temperature

## Suction Line Sizing

Suction Temp °F	Suction Line Sizing Maximum MBH of Refrigeration per Length of Equivalent Feet @ 105° F Condenser						Tubing Size OD (in)	Vertical Riser MBH	
	50	100	150	200	250	300			
<b>-40</b>	7	5	4	3	3	3	7/8	2	
	15	10	8	7	6	5	1-1/8	5	
	26	18	14	12	11	10	1-3/8	8	
	38	28	22	19	17	15	1-5/8	13	
	67	58	46	40	35	32	2-1/8	27	
	103	103	82	71	62	57	2-5/8	48	
	140	140	132	113	100	91	3-1/8	77	
	199	199	196	168	149	135	3-5/8	115	
	259	259	259	237	211	191	4-1/8	163	
	403	403	403	403	377	342	5-1/8	294	
<b>-30</b>	9	6	5	4	4	4	7/8	3	
	19	13	11	9	8	7	1-1/8	6	
	34	23	18	16	14	13	1-3/8	11	
	50	36	29	25	22	20	1-5/8	17	
	88	76	61	52	46	42	2-1/8	36	
	136	134	108	92	82	74	2-5/8	69	
	194	194	172	148	131	119	3-1/8	101	
	262	262	256	219	195	177	3-5/8	151	
	340	340	340	310	275	249	4-1/8	213	
	530	530	530	530	493	446	5-1/8	383	
	<b>-20</b>	12	8	7	6	5	5	7/8	4
		25	17	14	12	10	9	1-1/8	8
		43	30	24	20	18	16	1-3/8	14
66		47	38	32	29	26	1-5/8	22	
115		98	79	67	60	54	2-1/8	46	
177		173	139	119	106	96	2-5/8	82	
252		252	222	190	169	153	3-1/8	131	
341		341	330	283	251	227	3-5/8	195	
443		443	443	399	354	322	4-1/8	275	
690		690	690	690	634	576	5-1/8	493	
<b>-10</b>		16	11	9	7	6	6	7/8	5
	32	22	17	15	13	12	1-1/8	10	
	55	38	30	26	23	21	1-3/8	18	
	84	60	48	41	37	33	1-5/8	28	
	147	125	100	86	76	69	2-1/8	59	
	226	220	177	152	134	122	2-5/8	104	
	323	323	283	242	215	195	3-1/8	167	
	437	437	420	360	320	290	3-5/8	248	
	568	556	568	508	451	410	4-1/8	351	
	886	886	886	886	807	733	5-1/8	629	

Suction Line Sizing Table is established for Design Conditions of 105°F Condensing Temperature. For other Condensing Temps, use the multiplying factors listed below to determine the maximum MBH capacity of the tubing.	
Cond Temp °F	Multiplying Factor
60	1.49
70	1.39
80	1.28
90	1.17
100	1.06
110	0.94
120	0.81

NOTE:

- This table provides a general multiplier for various condensing temperatures.

NOTE:

- The minimum and maximum refrigeration load conditions on suction lines need to be considered when selecting suction lines.
- For oil control, refrigerant velocities should be considered before pressure drop considerations.
- Line sizing criteria calculations use ASHRAE guidelines, actual field applications will vary.
- Velocity, temperature and pressure drops are unique to each application and will vary.

SIZING CRITERIA:

- Horizontal Line Velocity > 700 FPM, < 2,500 FPM
- Riser Line Velocity > 1,200 FPM
- $\Delta T < 2^\circ\text{F}$
- $\Delta P < 2$  psig

# R-404A / R-507A Low Temperature

## Circuit Liquid Line

Cond Temp ° F	Circuit Liquid Line Sizing Maximum MBH of Refrigeration per Length of Equivalent Feet						Tubing Size OD (in)
	50	100	150	200	250	300	
<b>80</b>	26	18	14	12	11	10	3/8
	59	41	32	28	24	22	1/2
	102	77	61	52	46	42	5/8
	211	202	162	138	122	111	7/8
	359	359	329	281	249	225	1-1/8
	547	547	547	491	435	393	1-3/8
	774	774	774	774	689	624	1-5/8
	1347	1347	1347	1347	1347	1298	2-1/8
	2077	2077	2077	2077	2077	2077	2-5/8
<b>90</b>	25	17	14	12	10	9	3/8
	58	40	32	27	24	22	1/2
	93	75	60	51	45	41	5/8
	192	192	159	136	120	109	7/8
	327	327	323	276	244	221	1-1/8
	499	499	499	483	427	387	1-3/8
	706	706	706	706	677	613	1-5/8
	1228	1228	1228	1228	1228	1228	2-1/8
	1894	1894	1894	1894	1894	1894	2-5/8
<b>100</b>	25	17	14	12	10	9	3/8
	48	39	32	27	24	22	1/2
	77	73	60	51	45	41	5/8
	159	159	157	135	119	108	7/8
	271	271	271	271	242	219	1-1/8
	413	413	413	413	413	382	1-3/8
	585	585	585	585	585	585	1-5/8
	1018	1018	1018	1018	1018	1018	2-1/8
	1569	1569	1569	1569	1569	1894	2-5/8
<b>110</b>	24	16	13	11	10	9	3/8
	46	37	30	25	22	20	1/2
	74	70	56	48	42	38	5/8
	153	153	148	127	112	101	7/8
	262	262	262	257	228	206	1-1/8
	399	399	399	399	399	360	1-3/8
	564	564	564	564	564	564	1-5/8
	981	981	981	981	981	981	2-1/8
	1513	1513	1513	1513	1513	1513	2-5/8
<b>120</b>	21	15	12	10	9	8	3/8
	40	35	28	24	21	19	1/2
	64	64	53	45	40	36	5/8
	133	133	133	120	106	61	7/8
	227	227	227	227	215	195	1-1/8
	346	346	346	346	346	340	1-3/8
	490	490	490	490	490	490	1-5/8
	853	853	853	853	853	853	2-1/8
	1315	1315	1315	1315	1315	1315	2-5/8

**NOTE:**

- Line Velocity < 300 FPM
- $\Delta T < 2^\circ F$
- $\Delta P < 4$  psig
- Not to be used for Main Liquid Condenser Return Line

# R-404A / R-507A Med Temperature

## Suction Line Sizing

Suction Temp °F	Suction Line Sizing Maximum MBH of Refrigeration per Length of Equivalent Feet @ 110° F Condenser						Tubing Size OD (in)	Vertical Riser MBH	
	50	100	150	200	250	300			
10	9	6	5	4	4	-	5/8	3	
	23	16	13	11	10	9	7/8	8	
	47	32	26	22	20	18	1-1/8	15	
	82	57	46	39	35	31	1-3/8	27	
	127	89	72	62	55	50	1-5/8	42	
	222	185	149	128	114	103	2-1/8	88	
	342	326	264	226	201	182	2-5/8	156	
	488	488	421	360	320	291	3-1/8	249	
	660	660	625	536	476	432	3-5/8	370	
	858	858	858	755	672	610	4-1/8	523	
20	11	8	6	5	5	-	5/8	4	
	29	20	16	14	12	11	7/8	9	
	58	40	32	28	25	22	1-1/8	19	
	101	70	56	48	43	39	1-3/8	33	
	159	110	89	76	68	61	1-5/8	52	
	277	229	184	158	140	127	2-1/8	109	
	427	403	325	279	248	225	2-5/8	193	
	609	609	578	446	396	359	3-1/8	308	
	824	824	770	662	588	534	3-5/8	458	
	1071	1071	1071	933	830	753	4-1/8	646	
	30	13	9	7	6	6	5	5/8	4
		35	24	20	17	15	13	7/8	11
		71	49	39	34	30	27	1-1/8	23
123		85	69	59	52	47	1-3/8	41	
194		135	109	93	83	75	1-5/8	64	
342		279	225	193	171	155	2-1/8	133	
528		491	396	340	302	275	2-5/8	235	
753		753	632	542	482	428	3-1/8	375	
1019		1019	937	806	717	651	3-5/8	558	
1324		1324	1321	1136	1010	917	4-1/8	786	
40		16	11	9	8	7	6	5/8	5
		43	29	24	20	18	16	7/8	14
	86	59	48	41	36	33	1-1/8	28	
	149	103	83	71	63	57	1-3/8	49	
	235	163	131	113	100	91	1-5/8	78	
	421	337	272	233	207	188	2-1/8	161	
	648	594	480	412	366	333	2-5/8	285	
	926	926	765	656	584	530	3-1/8	455	
	1252	1252	1135	975	867	787	3-5/8	676	
	1627	1627	1597	1372	1220	1110	4-1/8	934	

Suction Line Sizing Table is established for Design Conditions of 110°F Condensing Temperature. For other Condensing Temps, use the multiplying factors listed below to determine the maximum MBH capacity of the tubing.

Cond Temp °F	Multiplying Factor
60	1.50
70	1.41
80	1.31
90	1.21
100	1.11
110	1.00
120	0.89

NOTE:

- This table provides a general multiplier for various condensing temperatures.

NOTE:

- The minimum and maximum refrigeration load conditions on suction lines need to be considered when selecting suction lines.
- For oil control, refrigerant velocities should be considered before pressure drop considerations.
- Line sizing criteria calculations use ASHRAE guidelines, actual field applications will vary.
- Velocity, temperature and pressure drops are unique to each application and will vary.

SIZING CRITERIA:

- Horizontal Line Velocity > 700 FPM, < 2,500 FPM
- Riser Line Velocity > 1,200 FPM
- $\Delta T < 2^\circ\text{F}$
- $\Delta P < 2$  psig

# R-404A / R-507A Med Temperature

## Circuit Liquid Line

Cond Temp ° F	Circuit Liquid Line Sizing Maximum MBH of Refrigeration per Length of Equivalent Feet						Tubing Size OD (in)
	50	100	150	200	250	300	
<b>80</b>	25	17	14	12	10	9	3/8
	58	40	32	27	24	21	1/2
	99	75	60	51	45	41	5/8
	205	197	158	135	119	108	7/8
	350	350	321	274	242	219	1-1/8
	533	533	533	478	424	384	1-3/8
	755	755	755	755	672	609	1-5/8
	1313	1313	1313	1313	1313	1266	2-1/8
	2025	2025	2025	2025	2025	2025	2-5/8
<b>90</b>	25	17	13	11	10	9	3/8
	56	39	31	26	23	21	1/2
	90	73	59	50	44	40	5/8
	187	187	155	132	117	106	7/8
	319	319	314	269	238	215	1-1/8
	485	485	485	470	416	377	1-3/8
	687	687	687	687	659	597	1-5/8
	1195	1195	1195	1195	1195	1195	2-1/8
	1843	1843	1843	1843	1843	1843	2-5/8
<b>100</b>	24	16	13	11	10	9	3/8
	50	38	30	26	23	21	1/2
	81	71	57	49	43	39	5/8
	168	168	150	129	114	103	7/8
	286	286	286	261	231	209	1-1/8
	436	436	436	436	403	365	1-3/8
	618	618	618	618	618	580	1-5/8
	1074	1074	1074	1074	1074	1074	2-1/8
	1657	1657	1657	1657	1657	1657	2-5/8
<b>110</b>	23	16	13	11	9	9	3/8
	45	36	29	25	22	20	1/2
	72	68	54	46	41	37	5/8
	149	149	144	123	109	98	7/8
	254	254	254	249	221	200	1-1/8
	386	386	386	386	386	349	1-3/8
	547	547	547	547	547	547	1-5/8
	951	951	951	951	951	951	2-1/8
	1466	1466	1466	1466	1466	1466	2-5/8
<b>120</b>	21	15	12	10	9	8	3/8
	39	34	27	23	21	19	1/2
	62	62	51	44	39	35	5/8
	129	129	129	116	102	93	7/8
	220	220	220	220	208	188	1-1/8
	334	334	334	334	334	329	1-3/8
	473	473	473	473	473	473	1-5/8
	824	824	824	824	824	824	2-1/8
	1270	1270	1270	1270	1270	1270	2-5/8

**NOTE:**

- Line Velocity < 300 FPM
- $\Delta T < 2^\circ F$
- $\Delta P < 4$  psig
- Not to be used for Main Liquid Condenser Return Line



# R-404A / R-507A Low and Med Temp

## Remote Header Line Sizing

---

<b>Remote Header Line Sizing – Low Temperature –</b>			
Max. Allowable MBH	Liquid Main	Max. Allowable MBH	Suction Main
223	1-1/8	66	1-5/8
339	1-3/8	115	2-1/8
480	1-5/8	177	2-5/8
835	2-1/8	252	3-1/8
1287	2-5/8	341	3-5/8
1837	3-1/8	443	4-1/8
		690	5-1/8

**NOTE:**

- Equivalent Run = 150'
- Condensing Temperature = 110°F
- Liquid Temperature = 110°F
- SUCTION -30° to 0°
- Suction Velocity < 2,750 FPM
- Liquid Velocity < 170 FPM
- $\Delta T < 2.0^\circ\text{F}$
- $\Delta P < 2.0$  psig

<b>Remote Header Line Sizing – Medium Temperature –</b>			
Max. Allowable MBH	Liquid Main	Max. Allowable MBH	Suction Main
203	1-1/8	159	1-5/8
309	1-3/8	277	2-1/8
437	1-5/8	427	2-5/8
761	2-1/8	609	3-1/8
1173	2-5/8	824	3-5/8
		1071	4-1/8

**NOTE:**

- Equivalent Run = 150'
- Condensing Temperature = 110°F
- Liquid Temperature = 110°F
- SUCTION 0° to 40°
- Suction Velocity < 2,750 FPM
- Liquid Velocity < 170 FPM
- $\Delta T < 2.0^\circ\text{F}$
- $\Delta P < 2.0$  psig

# R-407A Low Temperature

## Suction Line Sizing

Suction Temp °F	Suction Line Sizing Maximum MBH of Refrigeration per Length of Equivalent Feet @ 110° F Condenser						Tubing Size OD (in)	Vertical Riser MBH
	50	100	150	200	250	300		
<b>-40</b>	7.2	4.8	4.0	3.2	2.4	2.4	7/8	3
	14.4	9.6	8.0	6.4	5.6	4.8	1-1/8	6
	25.6	17.6	13.6	12.0	10.4	9.6	1-3/8	10
	36.8	28.0	22.4	19.2	16.8	15.2	1-5/8	17
	64.8	58.4	47.2	40.0	35.2	32.0	2-1/8	35
	100.0	100.0	84.0	71.2	63.2	57.6	2-5/8	61
	143.2	143.2	134.4	114.4	101.6	92.0	3-1/8	99
	193.6	193.6	193.6	171.2	152.0	137.6	3-5/8	147
	252.0	252.0	252.0	242.4	215.2	194.4	4-1/8	208
	392.8	392.8	392.8	392.8	385.6	349.6	5-1/8	374
<b>-30</b>	8.8	6.4	4.8	4.0	3.2	3.2	7/8	3
	19.2	12.8	10.4	8.8	7.8	7.2	1-1/8	7
	33.6	22.4	18.4	15.2	14.2	12.0	1-3/8	12
	48.0	36.0	28.8	24.8	21.6	20.0	1-5/8	20
	84.0	76.0	60.8	52.0	45.6	41.6	2-1/8	35
	128.8	128.8	108.0	92.0	81.6	73.6	2-5/8	59
	184.8	184.8	172.8	148.0	131.2	118.4	3-1/8	81
	249.6	249.6	249.6	220.0	195.2	176.8	3-5/8	140
	324.8	324.8	324.8	312.0	276.0	250.4	4-1/8	195
	460.0	450.0	440.0	430.0	410.0	400.0	5-1/8	280
<b>-20</b>	12.0	8.0	6.8	5.8	5.0	4.5	7/8	5
	24.0	16.0	12.8	11.2	9.6	8.8	1-1/8	9
	42.4	28.8	23.2	20.0	17.6	16.0	1-3/8	16
	60.8	46.4	36.8	31.2	28.0	24.8	1-5/8	25
	106.4	96.0	76.8	65.6	58.4	52.8	2-1/8	53
	164.8	164.8	136.8	116.8	104.0	93.6	2-5/8	94
	235.2	235.2	219.2	187.2	166.4	150.4	3-1/8	150
	317.6	317.6	317.6	279.2	248.0	224.0	3-5/8	224
	413.6	413.6	413.6	394.4	350.4	316.8	4-1/8	317
	644.0	644.0	644.0	644.0	628.0	569.6	5-1/8	570
<b>-10</b>	14.4	9.6	8.0	6.4	5.6	5.6	7/8	6
	30.4	20.8	16.8	14.4	12.0	11.2	1-1/8	11
	52.8	36.0	28.8	24.8	21.6	20.0	1-3/8	20
	76.8	57.6	46.4	39.2	35.2	32.0	1-5/8	32
	134.4	120.8	96.8	82.4	73.6	66.4	2-1/8	66
	207.2	207.2	172.0	147.2	130.4	117.6	2-5/8	118
	296.0	296.0	274.4	235.2	208.8	188.8	3-1/8	189
	400.0	400.0	400.0	350.4	310.4	281.6	3-5/8	282
	520.0	520.0	520.0	494.4	438.4	397.6	4-1/8	398
	811.2	811.2	811.2	811.2	785.6	712.0	5-1/8	712

Suction Line Sizing Table is established for Design Conditions of 110°F Condensing Temperature. For other Condensing Temps, use the multiplying factors listed below to determine the maximum MBH capacity of the tubing.	
Cond Temp °F	Multiplying Factor
60	1.22
70	1.18
80	1.14
90	1.10
100	1.06
110	1.00
120	0.96

**NOTE:**

- This table provides a general multiplier for various condensing temperatures.

**NOTE:**

- The minimum and maximum refrigeration load conditions on suction lines need to be considered when selecting suction lines.
- For oil control, refrigerant velocities should be considered before pressure drop considerations.
- Line sizing criteria calculations use ASHRAE guidelines, actual field applications will vary.
- Velocity, temperature and pressure drops are unique to each application and will vary.

**SIZING CRITERIA:**

- Horizontal Line Velocity > 700 FPM, < 2,500 FPM
- Riser Line Velocity > 1,200 FPM
- $\Delta T < 2^\circ\text{F}$
- $\Delta P < 2 \text{ psig}$



# R-407A Low and Med Temperature

## Circuit Liquid Line Sizing

Cond Temp ° F	Circuit Liquid Line Sizing Maximum MBH of Refrigeration per Length of Equivalent Feet						Tubing Size OD (in)
	50	100	150	200	250	300	
<b>80</b>	24.8	16.8	12.8	11.2	9.6	8.8	3/8
	56.8	38.4	30.4	25.6	23.2	20.8	1/2
	107.2	72.8	58.4	49.6	44.0	39.2	5/8
	246.4	194.4	155.2	132.0	116.8	105.6	7/8
	420.0	396.0	316.8	270.4	238.4	216.0	1-1/8
	640.0	640.0	554.4	472.8	418.4	378.4	1-3/8
	905.6	905.6	880.0	752.0	664.8	601.6	1-5/8
	1576.0	1576.0	1576.0	1566.4	1388.0	1255.2	2-1/8
2431.2	2431.2	2431.2	2431.2	2431.2	2228.8	2-5/8	
<b>90</b>	24.8	16.8	13.6	11.2	9.6	8.8	3/8
	57.6	39.2	31.2	26.4	23.2	20.8	1/2
	108.8	82.4	59.2	50.4	44.0	40.0	5/8
	232.8	196.8	157.6	134.4	118.4	107.2	7/8
	396.8	396.8	320.8	274.4	242.4	219.2	1-1/8
	604.8	604.8	562.4	480.0	424.8	384.0	1-3/8
	856.0	856.0	856.0	760.8	673.6	609.6	1-5/8
	1488.8	1488.8	1488.8	1488.8	1404.0	1271.2	2-1/8
2296.8	2296.8	2296.8	2296.8	2296.8	2259.2	2-5/8	
<b>100</b>	24.8	16.8	13.6	11.2	9.6	8.8	3/8
	58.4	39.2	31.2	26.4	23.2	20.8	1/2
	98.4	74.4	60.0	50.4	44.8	40.8	5/8
	219.2	198.4	159.2	135.2	120.0	108.0	7/8
	373.6	373.6	323.2	276.0	244.0	220.8	1-1/8
	568.8	568.8	567.2	483.2	428.0	387.2	1-3/8
	805.6	805.6	805.6	768.0	680.0	615.2	1-5/8
	1401.6	1401.6	1401.6	1401.6	1401.6	1283.2	2-1/8
2161.6	2161.6	2161.6	2161.6	2161.6	2161.6	2-5/8	
<b>110</b>	24.8	16.8	13.6	11.2	9.6	8.8	3/8
	58.4	40.0	31.2	26.4	23.2	21.6	1/2
	98.4	75.2	60.0	51.2	44.8	40.8	5/8
	205.6	199.2	159.2	136.0	120.0	108.8	7/8
	350.4	350.4	324.8	276.8	244.8	221.6	1-1/8
	533.6	533.6	533.6	485.6	428.8	388.8	1-3/8
	755.2	755.2	755.2	755.2	680.8	616.8	1-5/8
	1314.4	1314.4	1314.4	1314.4	1314.4	1284.8	2-1/8
2026.4	2026.4	2026.4	2026.4	2026.4	2026.4	2-5/8	
<b>120</b>	24.8	16.8	13.6	11.2	9.6	8.8	3/8
	56.8	39.2	31.2	26.4	23.2	21.6	1/2
	92.0	75.2	60.0	51.2	44.8	40.8	5/8
	191.2	191.2	159.2	135.2	120.0	108.0	7/8
	326.4	326.4	323.2	276.0	244.0	220.8	1-1/8
	497.6	497.6	497.6	483.2	428.0	386.4	1-3/8
	704.8	704.8	704.8	704.8	678.4	613.6	1-5/8
	1225.6	1225.6	1225.6	1225.6	1225.6	1225.6	2-1/8
1890.4	1890.4	1890.4	1890.4	1890.4	1890.4	2-5/8	

**NOTE:**

- Line Velocity < 300 FPM
- $\Delta T < 2^\circ F$
- $\Delta P < 4$  psig
- Not to be used for Main Liquid Condenser Return Line



# R-407A Low and Med Temperature

## Remote Header Line Sizing

---

<b>Remote Header Line Sizing – Low Temperature –</b>			
Max. Allowable MBH	Liquid Main	Max. Allowable MBH	Suction Main
106.1	7/8	46.2	1-5/8
179.2	1-1/8	81.0	2-1/8
272.9	1-3/8	124.2	2-5/8
420.8	1-5/8	177.6	3-1/8
732.0	2-1/8	240.6	3-5/8
1128.8	2-5/8	312.6	4-1/8
		487.2	5-1/8

**NOTE:**

- Equivalent Run = 150'
- Condensing Temperature = 110°F
- Liquid Temperature = 110°F
- SUCTION -30° to 0°
- Suction Velocity < 2,750 FPM
- Liquid Velocity < 170 FPM
- $\Delta T < 2.0^\circ F$
- $\Delta P < 2.0$  psig

<b>Remote Header Line Sizing – Medium Temperature –</b>			
Max. Allowable MBH	Liquid Main	Max. Allowable MBH	Suction Main
120.1	7/8	84.5	1-5/8
209.1	1-1/8	171.9	2-1/8
320.1	1-3/8	302.5	2-5/8
476.3	1-5/8	475.5	3-1/8
828.6	2-1/8	621.5	3-5/8
1277.8	2-5/8	821.5	4-1/8
		1256.0	5-1/8

**NOTE:**

- Equivalent Run = 150'
- Condensing Temperature = 110°F
- Liquid Temperature = 110°F
- SUCTION 0° to 40°
- Suction Velocity < 2,750 FPM
- Liquid Velocity < 170 FPM
- $\Delta T < 2.0^\circ F$
- $\Delta P < 2.0$  psig

# R-407A Med Temperature

## Suction Line Sizing

Suction Temp °F	Suction Line Sizing Maximum MBH of Refrigeration per Length of Equivalent Feet @ 110° F Condenser						Tubing Size OD (in)	Vertical Riser MBH	
	50	100	150	200	250	300			
<b>10</b>	9.0	6.3	4.5	4.5	-	-	5/8	3	
	25.2	17.1	13.5	11.7	9.9	9.0	7/8	9	
	50.4	35.1	27.9	23.4	20.7	18.9	1-1/8	18	
	88.2	61.2	48.6	41.4	36.9	33.3	1-3/8	32	
	129.6	96.3	77.4	66.6	58.5	53.1	1-5/8	51	
	226.8	200.7	161.1	137.7	122.4	110.7	2-1/8	106	
	349.2	349.2	285.3	244.8	216.9	196.2	2-5/8	187	
	499.5	499.5	456.3	391.5	347.4	314.1	3-1/8	300	
	675.0	675.0	675.0	581.4	515.7	468.0	3-5/8	446	
	877.5	877.5	877.5	820.8	729.0	660.6	4-1/8	629	
	<b>20</b>	9.7	6.5	5.7	4.9	-	-	5/8	4
		27.5	20.0	16.1	13.9	12.1	11.1	7/8	11
55.1		38.1	30.8	27.7	24.5	22.5	1-1/8	22	
96.4		69.9	56.3	47.8	42.6	38.4	1-3/8	38	
143.4		110.9	89.6	76.8	67.4	61.4	1-5/8	60	
249.5		230.3	185.1	158.6	140.7	127.9	2-1/8	126	
342.5		332.0	328.4	281.5	249.9	226.0	2-5/8	220	
550.0		579.1	523.7	449.5	399.2	361.6	3-1/8	359	
743.6		783.0	779.6	667.8	592.8	538.2	3-5/8	535	
967.1		1018.4	1018.4	942.5	836.7	760.0	4-1/8	755	
<b>30</b>		13.5	9.0	7.2	6.3	-	-	5/8	5
		36.9	25.2	19.8	17.1	15.3	13.5	7/8	13
	73.8	51.3	40.5	35.1	30.6	27.9	1-1/8	27	
	128.7	89.1	71.1	61.2	54.0	49.5	1-3/8	47	
	193.5	141.3	113.4	97.2	86.4	78.3	1-5/8	74	
	336.6	292.5	235.8	201.6	179.1	162.0	2-1/8	155	
	519.3	516.6	415.8	357.3	316.8	287.1	2-5/8	274	
	741.6	741.6	664.2	570.6	506.7	459.0	3-1/8	438	
	1003.5	1003.5	986.4	846.9	751.5	683.1	3-5/8	650	
	1305.0	1305.0	1305.0	1195.2	1061.1	963.0	4-1/8	919	
	<b>40</b>	16.2	10.8	9.0	7.2	-	-	5/8	6
		43.2	29.7	24.3	20.7	18.0	16.2	7/8	16
88.2		61.2	48.6	41.4	36.9	33.3	1-1/8	32	
153.9		106.2	85.5	72.9	64.8	58.5	1-3/8	56	
233.1		168.3	135.0	116.1	102.6	93.6	1-5/8	89	
405.9		348.3	280.8	241.2	213.3	193.5	2-1/8	185	
626.4		615.6	495.9	425.7	378.0	342.9	2-5/8	327	
893.7		893.7	792.0	680.4	603.9	547.2	3-1/8	522	
1200.6		1200.6	1175.4	1009.8	896.4	814.5	3-5/8	777	
1572.3		1572.3	1572.3	1422.9	1265.4	1149.3	4-1/8	1096	

Suction Line Sizing Table is established for Design Conditions of 110°F Condensing Temperature. For other Condensing Temps, use the multiplying factors listed below to determine the maximum MBH capacity of the tubing.	
Cond Temp °F	Multiplying Factor
60	1.25
70	1.20
80	1.15
90	1.12
100	1.07
110	1.00
120	0.93

NOTE:

- This table provides a general multiplier for various condensing temperatures.

NOTE:

- The minimum and maximum refrigeration load conditions on suction lines need to be considered when selecting suction lines.
- For oil control, refrigerant velocities should be considered before pressure drop considerations.
- Line sizing criteria calculations use ASHRAE guidelines, actual field applications will vary.
- Velocity, temperature and pressure drops are unique to each application and will vary.

SIZING CRITERIA:

- Horizontal Line Velocity > 700 FPM, < 2,500 FPM
- Riser Line Velocity > 1,200 FPM
- $\Delta T < 2^\circ\text{F}$
- $\Delta P < 2$  psig

# R-407F Low Temperature

## Suction Line Sizing

Suction Temp ° F	Suction Line Sizing Maximum MBH of Refrigeration per Length of Equivalent Feet @ 110° F Condenser						Tubing Size OD (in)	Vertical Riser MBH
	50	100	150	200	250	300		
<b>-40</b>	8.1	5.4	4.5	3.6	3.2	3.0	7/8	5
	16.3	10.8	9.0	7.2	6.3	5.4	1-1/8	5
	28.9	19.9	15.4	13.6	11.8	10.8	1-3/8	10
	41.6	31.6	25.3	21.7	19.0	17.2	1-5/8	17
	73.2	66.0	53.3	45.2	39.8	36.2	2-1/8	35
	90.4	90.4	75.9	64.4	57.1	52.1	2-5/8	51
	129.5	129.5	121.5	103.4	91.8	83.2	3-1/8	78
	175.0	175.0	175.0	154.8	137.4	124.4	3-5/8	105
	227.8	227.8	227.8	219.1	194.5	175.7	4-1/8	121
	355.1	355.1	355.1	355.1	348.6	316.0	5-1/8	210
<b>-30</b>	9.9	7.2	5.4	4.5	3.6	3.6	7/8	4
	21.7	14.5	11.8	9.9	8.1	8.1	1-1/8	8
	38.0	25.3	20.8	17.2	15.4	13.6	1-3/8	13
	54.2	40.7	32.5	28.0	24.4	22.6	1-5/8	21
	94.9	85.9	68.7	58.8	51.5	47.0	2-1/8	40
	116.4	116.4	97.6	83.2	73.8	66.5	2-5/8	58
	167.1	167.1	156.2	133.8	118.6	107.0	3-1/8	90
	225.6	225.6	225.6	198.9	176.5	159.8	3-5/8	140
	293.6	293.6	293.6	282.0	249.5	226.4	4-1/8	190
	457.8	457.8	457.8	457.8	448.4	406.4	5-1/8	285
<b>-20</b>	13.6	9.0	7.2	6.3	5.4	4.5	7/8	5
	27.1	18.1	14.5	12.7	10.8	9.9	1-1/8	10
	47.9	32.5	26.2	22.6	19.9	18.1	1-3/8	17
	68.7	52.4	41.6	35.3	31.6	28.0	1-5/8	27
	96.2	86.8	69.4	59.3	52.8	47.7	2-1/8	48
	149.0	149.0	123.7	105.6	94.0	84.6	2-5/8	79
	212.6	212.6	198.2	169.2	150.4	136.0	3-1/8	111
	287.1	287.1	287.1	252.4	224.2	202.5	3-5/8	170
	373.9	373.9	373.9	356.5	316.8	286.4	4-1/8	210
	582.2	582.2	582.2	582.2	567.7	514.9	5-1/8	385
<b>-10</b>	19.2	12.8	10.6	8.5	7.4	7.4	7/8	7
	40.4	27.7	22.3	19.2	16.0	14.9	1-1/8	15
	48.7	40.7	32.6	28.0	24.4	22.6	1-3/8	21
	70.8	65.1	52.5	44.3	39.8	36.2	1-5/8	34
	123.9	125.7	109.5	93.2	83.2	75.1	2-1/8	58
	190.9	194.0	190.6	166.4	147.4	133.0	2-5/8	94
	272.8	244.0	260.6	265.9	236.1	213.5	3-1/8	150
	368.6	329.7	379.9	364.5	351.0	318.4	3-5/8	185
	479.2	476.3	493.9	497.5	495.7	449.6	4-1/8	280
	747.5	743.0	770.5	816.3	759.0	730.2	5-1/8	480

Suction Line Sizing Table is established for Design Conditions of 110°F Condensing Temperature. For other Condensing Temps, use the multiplying factors listed below to determine the maximum MBH capacity of the tubing.

Cond Temp °F	Multiplying Factor
60	1.45
70	1.32
80	1.22
90	1.08
100	1.05
110	1.00
120	0.95

**NOTE:**

- This table provides a general multiplier for various condensing temperatures.

**NOTE:**

- The minimum and maximum refrigeration load conditions on suction lines need to be considered when selecting suction lines.
- For oil control, refrigerant velocities should be considered before pressure drop considerations.
- Line sizing criteria calculations use ASHRAE guidelines, actual field applications will vary.
- Velocity, temperature and pressure drops are unique to each application and will vary.

**SIZING CRITERIA:**

- Horizontal Line Velocity > 700 FPM, < 2,500 FPM
- Riser Line Velocity > 1,200 FPM
- ΔT < 2°F
- ΔP < 2 psig

# R-407F Low and Med Temperature

## Circuit Liquid Line Sizing

Cond Temp ° F	Circuit Liquid Line Sizing Maximum MBH of Refrigeration per Length of Equivalent Feet						Tubing Size OD (in)
	50	100	150	200	250	300	
80	24.8	16.8	12.8	11.2	9.6	8.8	3/8
	56.8	38.4	30.4	25.6	23.2	20.8	1/2
	107.2	72.8	58.4	49.6	44.0	39.2	5/8
	246.4	194.4	155.2	132.0	116.8	105.6	7/8
	420.0	396.0	316.8	270.4	238.4	216.0	1-1/8
	640.0	640.0	554.4	472.8	418.4	378.4	1-3/8
	905.6	905.6	880.0	752.0	664.8	601.6	1-5/8
	1576.0	1576.0	1576.0	1566.4	1388.0	1255.2	2-1/8
	2431.2	2431.2	2431.2	2431.2	2431.2	2228.8	2-5/8
90	28.8	19.5	15.8	13.0	11.1	10.2	3/8
	66.8	45.5	36.2	30.6	26.9	24.1	1/2
	126.2	95.6	68.7	58.5	51.0	46.4	5/8
	270.0	228.3	182.8	155.9	137.3	124.4	7/8
	460.3	460.3	372.1	318.3	281.2	254.3	1-1/8
	725.8	725.8	674.9	576.0	509.8	460.8	1-3/8
	1027.2	1027.2	1027.2	913.0	808.3	731.5	1-5/8
	1786.6	1786.6	1786.6	1786.6	1684.8	1525.4	2-1/8
	2756.2	2756.2	2756.2	2756.2	2756.2	2711.0	2-5/8
100	29.5	20.0	16.2	13.3	11.4	10.5	3/8
	69.5	46.6	37.1	31.4	27.6	24.8	1/2
	117.1	88.5	71.4	60.0	53.3	48.6	5/8
	260.8	236.1	189.4	160.9	142.8	128.5	7/8
	433.4	433.4	374.9	320.2	283.0	256.1	1-1/8
	659.8	659.8	658.0	560.5	496.5	449.2	1-3/8
	934.5	934.5	934.5	890.9	788.8	713.6	1-5/8
	1625.9	1625.9	1625.9	1625.9	1625.9	1488.5	2-1/8
	2507.5	2507.5	2507.5	2507.5	2507.5	2507.5	2-5/8
110	29.5	20.0	16.2	13.3	11.4	10.5	3/8
	69.5	47.6	37.1	31.4	27.6	25.7	1/2
	117.1	89.5	71.4	60.9	53.3	48.6	5/8
	226.2	219.1	175.1	149.6	132.0	119.7	7/8
	385.4	385.4	357.3	304.5	269.3	243.8	1-1/8
	587.0	587.0	587.0	534.2	471.7	427.7	1-3/8
	830.7	830.7	830.7	830.7	748.9	678.5	1-5/8
	1445.8	1445.8	1445.8	1445.8	1445.8	1413.3	2-1/8
	2229.0	2229.0	2229.0	2229.0	2229.0	2229.0	2-5/8
120	24.8	16.8	13.6	11.2	9.6	8.8	3/8
	56.8	39.2	31.2	26.4	23.2	21.6	1/2
	92.0	75.2	60.0	51.2	44.8	40.8	5/8
	191.2	191.2	159.2	135.2	120.0	108.0	7/8
	326.4	326.4	323.2	276.0	244.0	220.8	1-1/8
	497.6	497.6	497.6	483.2	428.0	386.4	1-3/8
	704.8	704.8	704.8	704.8	678.4	613.6	1-5/8
	1225.6	1225.6	1225.6	1225.6	1225.6	1225.6	2-1/8
	1890.4	1890.4	1890.4	1890.4	1890.4	1890.4	2-5/8

NOTE:

- Line Velocity < 300 FPM
- $\Delta T < 2^\circ\text{F}$
- $\Delta P < 4$  psig
- Not to be used for Main Liquid Condenser Return Line

# R-407F Low and Med Temperature

## Condenser Line Sizing

A Condenser Line Sizing chart is established for an equivalent pipe run of 100 feet. For longer runs use the following formula:  
 Table Capacity \*  $\sqrt{100/\text{Longer Length}}$  =  
 Longer Line Capacity

### Discharge Supply Condenser Line Sizing - Low Temperature -

Condensing Temperature °F								Line Size
60	70	80	90	100	110	120		
Discharge - Maximum Allowable MBH								
53.0	60.1	61.3	62.9	63.1	63.1	63.1	7/8	
108.8	121.7	125.3	128.4	128.6	128.6	128.6	1-1/8	
187.6	210.5	217.3	222.8	223.0	223.0	223.0	1-3/8	
294.7	330.0	339.5	347.9	348.0	348.0	348.0	1-5/8	
533.0	595.9	660.1	675.8	693.3	693.3	693.3	2-1/8	
858.1	961.7	1064.1	1089.3	1117.0	1117.0	1117.0	2-5/8	
1128.0	1213.5	1342.2	1375.0	1409.6	1409.6	1409.6	3-1/8	

**NOTE:**

- SUCTION -40° to 0°                      -  $\Delta T < 2^\circ\text{F}$
- Velocity < 2,950 FPM                      -  $\Delta P < 5$  psig
- For this line sizing exercise the Liquid Temp is assumed to be equal to Condensing Temps.

### Liquid Return (Drop Leg) Sizing - Low Temperature -

Condensing Temperature °F								Line Size
60	70	80	90	100	110	120		
Maximum Allowable MBH								
89.7	82.5	77.2	70.0	64.6	59.2	52.0	5/8	
188.4	174.0	159.7	145.3	132.8	125.6	109.5	7/8	
314.0	294.3	272.7	247.6	226.1	204.6	183.0	1-1/8	
480.9	446.8	410.9	380.4	346.3	314.0	276.3	1-3/8	
683.6	637.0	586.7	538.3	486.3	445.0	403.7	1-5/8	
1180.7	1098.1	1021.0	936.6	846.9	773.3	683.6	2-1/8	
1808.7	1715.4	1577.2	1431.9	1318.8	1186.0	1065.8	2-5/8	
2621.5	2440.3	2260.8	2081.4	1884.0	1695.6	1525.2	3-1/8	

**NOTE:**

- Equivalent Run = 100'
- SUCTION -40° to 0°
- \* Velocity < 180 FPM (used with 7/8" equalizing vent line)
- $\Delta T < 2^\circ\text{F}$
- $\Delta P < 2$  psig
- \* In order to achieve proper condenser drainage, the 7/8" equalizing vent line from the receiver to condenser, **must** be used.
- If the 7/8" rack equalizing vent line is not utilized and unable to be installed, than the next larger size liquid drain line **must** be used in order to reduce the velocity to 100 FPM.
- On systems that are > 85% loaded, the highside piping is typically sized to compressor capacities.
- On systems that are 70% to 85% loaded the highside piping design should consider both the evaporator and compressor capacities.
- Systems < 70% loaded may require special piping selections, current and future load conditions will need to be considered during pipe selections.

A Condenser Line Sizing chart is established for an equivalent pipe run of 100 feet. For longer runs use the following formula:  
 Table Capacity \*  $\sqrt{100/\text{Longer Length}}$  =  
 Longer Line Capacity

### Discharge Supply Condenser Line Sizing - Medium Temperature -

Condensing Temperature °F								Line Size
60	70	80	90	100	110	120		
Discharge - Maximum Allowable MBH								
55.3	62.8	63.9	65.6	66.9	66.5	66.7	7/8	
113.6	127.0	130.6	133.9	137.5	135.3	136.7	1-1/8	
195.8	219.7	226.5	232.3	238.4	233.2	235.5	1-3/8	
301.8	337.9	347.8	356.4	365.7	372.0	375.5	1-5/8	
602.0	673.1	745.5	763.3	783.0	795.0	795.0	2-1/8	
810.9	908.8	1005.6	1029.4	1156.1	1089.7	1153.9	2-5/8	
1332.5	1433.5	1585.5	1624.2	1744.4	1718.5	1819.5	3-1/8	

**NOTE:**

- SUCTION 0° to 40°                      -  $\Delta T < 2^\circ\text{F}$
- Velocity < 2,950 FPM                      -  $\Delta P < 5$  psig

### Liquid Return (Drop Leg) Sizing - Medium Temperature -

Condensing Temperature °F								Line Size
60	70	80	90	100	110	120		
Maximum Allowable MBH								
92.2	90.8	84.1	76.3	70.4	64.5	58.3	5/8	
192.2	177.5	162.9	148.2	135.4	128.1	114.8	7/8	
320.3	300.2	278.2	252.6	230.6	208.6	191.9	1-1/8	
490.5	455.7	419.1	388.0	353.2	320.3	289.8	1-3/8	
697.3	649.7	598.5	549.1	496.0	453.9	423.3	1-5/8	
1204.3	1120.1	1041.4	955.4	863.9	788.8	716.9	2-1/8	
1844.8	1749.7	1608.7	1460.5	1345.2	1209.8	1117.6	2-5/8	
2673.9	2489.1	2306.0	2123.0	1921.7	1729.5	1599.3	3-1/8	

**NOTE:**

- Equivalent Run = 100'
- SUCTION 0° to 40°
- \* Velocity < 180 FPM (used with 7/8" equalizing vent line)
- $\Delta T < 2^\circ\text{F}$
- $\Delta P < 2$  psig
- \* In order to achieve proper condenser drainage, the 7/8" equalizing vent line from the receiver to condenser, **must** be used.
- If the 7/8" rack equalizing vent line is not utilized and unable to be installed, than the next larger size liquid drain line **must** be used in order to reduce the velocity to 100 FPM.
- On systems that are > 85% loaded, the highside piping is typically sized to compressor capacities.
- On systems that are 70% to 85% loaded the highside piping design should consider both the evaporator and compressor capacities.
- Systems < 70% loaded may require special piping selections, current and future load conditions will need to be considered during pipe selections.

# R-407F Low and Med Temperature

## Remote Header Line Sizing

---

<b>Remote Header Line Sizing - Low Temperature -</b>			
Max. Allowable MBH	Liquid Main	Max. Allowable MBH	Suction Main
120.0	7/8	40.5	1-5/8
209.7	1-1/8	81.0	2-1/8
319.3	1-3/8	146.0	2-5/8
455.1	1-5/8	198.5	3-1/8
790.1	2-1/8	269.6	3-5/8
1225.5	2-5/8	350.0	4-1/8
		510.9	5-1/8

**NOTE:**

- Equivalent Run = 150'
- Condensing Temperature = 110°F
- Liquid Temperature = 110°F
- SUCTION -30° to 0°
- Suction Velocity < 2,750 FPM
- Liquid Velocity < 170 FPM
- $\Delta T < 2.0^\circ\text{F}$
- $\Delta P < 2.0$  psig

<b>Remote Header Line Sizing - Medium Temperature -</b>			
Max. Allowable MBH	Liquid Main	Max. Allowable MBH	Suction Main
130.1	7/8	96.5	1-5/8
230.0	1-1/8	196.0	2-1/8
348.6	1-3/8	339.0	2-5/8
495.8	1-5/8	525.1	3-1/8
865.2	2-1/8	685.1	3-5/8
1340.0	2-5/8	865.9	4-1/8
		1400.0	5-1/8

**NOTE:**

- Equivalent Run = 150'
- Condensing Temperature = 110°F
- Liquid Temperature = 110°F
- SUCTION 0° to 40°
- Suction Velocity < 2,750 FPM
- Liquid Velocity < 170 FPM
- $\Delta T < 2.0^\circ\text{F}$
- $\Delta P < 2.0$  psig



# R-407F Med Temperature

## Suction Line Sizing

Suction Temp °F	Suction Line Sizing Maximum MBH of Refrigeration per Length of Equivalent Feet @ 110° F Condenser						Tubing Size OD (in)	Vertical Riser MBH
	50	100	150	200	250	300		
10	9.9	6.9	5.0	5.0	-	-	5/8	3
	27.7	18.8	14.9	12.9	10.9	9.9	7/8	9
	55.4	38.6	30.7	25.7	22.8	20.8	1-1/8	18
	97.0	67.3	53.5	45.5	40.6	36.6	1-3/8	32
	142.6	105.9	85.1	73.3	64.4	58.4	1-5/8	51
	226.8	200.7	161.1	137.7	122.4	110.7	2-1/8	106
	349.2	349.2	285.3	244.8	216.9	196.2	2-5/8	187
	499.5	499.5	456.3	391.5	347.4	314.1	3-1/8	300
	675.0	675.0	675.0	581.4	515.7	468.0	3-5/8	446
	877.5	877.5	877.5	820.8	729.0	660.6	4-1/8	629
20	10.7	7.1	6.2	5.3	-	-	5/8	4
	30.3	20.5	16.0	14.3	12.5	10.7	7/8	10
	60.6	41.9	33.9	28.5	24.9	23.2	1-1/8	22
	106.0	73.1	58.8	49.9	44.6	40.1	1-3/8	39
	157.7	115.8	93.6	80.2	70.4	64.2	1-5/8	62
	249.5	218.7	175.8	150.7	133.7	121.5	2-1/8	120
	384.8	384.8	311.9	267.3	237.3	214.7	2-5/8	228
	550.0	550.0	497.3	426.9	379.1	343.4	3-1/8	341
	743.6	743.6	740.3	634.2	563.0	511.1	3-5/8	510
	967.1	967.1	967.1	895.1	794.6	721.7	4-1/8	719
30	13.5	9.0	7.2	6.3	-	-	5/8	5
	36.9	25.2	19.8	17.1	15.3	13.5	7/8	13
	73.8	51.3	40.5	35.1	30.6	27.9	1-1/8	27
	128.7	89.1	71.1	61.2	54.0	49.5	1-3/8	47
	193.5	141.3	113.4	97.2	86.4	78.3	1-5/8	74
	336.6	292.5	235.8	201.6	179.1	162.0	2-1/8	155
	519.3	516.6	415.8	357.3	316.8	287.1	2-5/8	274
	741.6	741.6	664.2	570.6	506.7	459.0	3-1/8	438
	1003.5	1003.5	986.4	846.9	751.5	683.1	3-5/8	650
	1305.0	1305.0	1305.0	1195.2	1061.1	963.0	4-1/8	919
40	15.0	10.0	8.5	8.1	-	-	5/8	6
	40.0	27.5	22.5	21.4	16.7	16.7	7/8	16
	81.7	56.7	45.0	42.7	34.2	34.2	1-1/8	32
	142.5	98.3	79.2	75.2	60.0	60.0	1-3/8	56
	215.8	155.8	125.0	118.7	95.0	95.0	1-5/8	89
	375.8	322.5	260.0	234.0	197.5	197.5	2-1/8	185
	580.0	570.0	459.2	413.2	350.0	350.0	2-5/8	327
	827.5	827.5	733.3	660.0	559.2	559.2	3-1/8	522
	1111.6	1111.6	1088.3	979.5	830.0	830.0	3-5/8	777
	1455.8	1455.8	1455.8	1310.2	1171.6	1171.6	4-1/8	1096

Suction Line Sizing Table is established for Design Conditions of 110°F Condensing Temperature. For other Condensing Temps, use the multiplying factors listed below to determine the maximum MBH capacity of the tubing.

Cond Temp °F	Multiplying Factor
60	1.35
70	1.27
80	1.21
90	1.18
100	1.14
110	1.00
120	0.96

### NOTE:

- This table provides a general multiplier for various condensing temperatures.

### NOTE:

- The minimum and maximum refrigeration load conditions on suction lines need to be considered when selecting suction lines.
- For oil control, refrigerant velocities should be considered before pressure drop considerations.
- Line sizing criteria calculations use ASHRAE guidelines, actual field applications will vary.
- Velocity, temperature and pressure drops are unique to each application and will vary.

### SIZING CRITERIA:

- Horizontal Line Velocity > 700 FPM, < 2,500 FPM
- Riser Line Velocity > 1,200 FPM
- $\Delta T < 2^\circ F$
- $\Delta P < 2$  psig

# R-448A / R-449A Low Temperature

## Suction Line Sizing

Suction Temp °F	Suction Line Sizing Maximum MBH of Refrigeration per Length of Equivalent Feet @ 110° F Condenser						Tubing Size OD (in)	Vertical Riser MBH	
	50	100	150	200	250	300			
<b>-40</b>	7.3	4.9	4.1	3.3	2.4	2.4	7/8	3	
	14.7	9.8	8.2	6.5	5.7	5.7	1-1/8	6	
	26.1	18.0	13.9	12.2	10.6	10.6	1-3/8	10	
	37.5	28.6	22.8	19.6	17.1	17.1	1-5/8	17	
	66.1	59.6	48.1	40.8	35.9	35.9	2-1/8	35	
	102.0	102.0	85.7	72.6	64.5	64.5	2-5/8	62	
	146.1	146.1	137.1	116.7	103.6	103.6	3-1/8	101	
	197.5	197.5	197.5	174.6	155.0	155.0	3-5/8	150	
	257.0	257.0	257.0	247.2	219.5	219.5	4-1/8	216	
	400.7	400.7	400.7	400.7	393.3	393.3	5-1/8	381	
<b>-30</b>	9.0	6.5	4.9	4.1	4.7	4.7	7/8	4	
	19.6	13.1	10.6	9.0	8.5	8.2	1-1/8	8	
	34.3	22.8	18.8	15.5	16.1	13.7	1-3/8	13	
	49.0	36.7	29.4	25.3	25.6	22.8	1-5/8	20	
	85.7	77.5	62.0	53.0	54.0	47.5	2-1/8	36	
	131.4	131.4	110.2	93.8	96.5	84.1	2-5/8	53	
	188.5	188.5	176.3	151.0	155.2	135.3	3-1/8	130	
	254.6	254.6	254.6	224.4	231.0	202.0	3-5/8	135	
	331.3	331.3	331.3	318.2	326.6	286.1	4-1/8	273	
	516.5	516.5	516.5	516.5	586.9	513.6	5-1/8	490	
	<b>-20</b>	12.2	8.2	6.5	7.9	5.8	5.2	7/8	5
		24.5	16.3	13.1	15.3	11.4	10.2	1-1/8	10
43.2		29.4	23.7	28.0	20.8	18.6	1-3/8	17	
62.0		47.3	37.5	44.6	33.1	28.8	1-5/8	28	
108.5		97.9	78.3	93.0	69.1	61.4	2-1/8	52	
168.1		168.1	139.5	165.6	123.1	108.8	2-5/8	93	
239.9		239.9	223.6	242.6	188.4	174.9	3-1/8	148	
324.0		324.0	324.0	348.6	280.8	260.5	3-5/8	220	
421.9		421.9	421.9	492.6	396.7	368.4	4-1/8	312	
656.9		656.9	656.9	882.8	711.0	662.3	5-1/8	559	
<b>-10</b>	14.7	9.8	9.5	7.6	6.6	6.7	7/8	6	
	31.0	21.2	19.9	17.0	14.2	13.5	1-1/8	12	
	53.9	36.7	34.1	29.3	25.6	24.1	1-3/8	21	
	78.3	58.8	54.9	46.4	41.6	38.5	1-5/8	35	
	137.1	123.2	114.5	97.5	87.1	79.9	2-1/8	62	
	211.3	211.3	175.4	174.2	154.3	141.5	2-5/8	101	
	301.9	301.9	279.9	239.9	247.1	227.2	3-1/8	136	
	408.0	408.0	408.0	357.4	367.3	338.9	3-5/8	181	
	530.4	530.4	530.4	504.3	518.7	405.6	4-1/8	302	
	827.4	827.4	827.4	827.4	801.3	726.2	5-1/8	778	

Suction Line Sizing Table is established for Design Conditions of 110°F Condensing Temperature. For other Condensing Temps, use the multiplying factors listed below to determine the maximum MBH capacity of the tubing.	
Cond Temp °F	Multiplying Factor
60	1.22
70	1.18
80	1.14
90	1.10
100	1.06
110	1.00
120	0.96

**NOTE:**

- This table provides a general multiplier for various condensing temperatures.

**NOTE:**

- The minimum and maximum refrigeration load conditions on suction lines need to be considered when selecting suction lines.
- For oil control, refrigerant velocities should be considered before pressure drop considerations.
- Line sizing criteria calculations use ASHRAE guidelines, actual field applications will vary.
- Velocity, temperature and pressure drops are unique to each application and will vary.

**SIZING CRITERIA:**

- Horizontal Line Velocity > 700 FPM, < 2,500 FPM
- Riser Line Velocity > 1,200 FPM
- ΔT < 2°F
- ΔP < 2 psig

# R-448A / R-449A Low and Med Temp

## Circuit Liquid Line Sizing

Cond Temp ° F	Circuit Liquid Line Sizing Maximum MBH of Refrigeration per Length of Equivalent Feet						Tubing Size OD (in)
	50	100	150	200	250	300	
<b>80</b>	25.3	17.1	13.1	11.4	9.8	9.0	3/8
	57.9	39.2	31.0	26.1	23.7	21.2	1/2
	109.3	74.3	59.6	50.6	44.9	40.0	5/8
	251.3	198.3	158.3	134.6	119.1	107.7	7/8
	428.4	403.9	323.1	275.8	243.2	220.3	1-1/8
	652.8	652.8	565.5	482.3	426.8	386.0	1-3/8
	923.7	923.7	897.6	767.0	678.1	613.6	1-5/8
	1607.5	1607.5	1607.5	1597.7	1415.8	1280.3	2-1/8
	2479.8	2479.8	2479.8	2479.8	2479.8	2273.4	2-5/8
<b>90</b>	25.3	17.1	13.9	11.4	9.8	9.0	3/8
	58.8	40.0	31.8	26.9	23.7	21.2	1/2
	111.0	84.0	60.4	51.4	44.9	40.8	5/8
	237.5	200.7	160.8	137.1	120.8	109.3	7/8
	404.7	404.7	327.2	279.9	247.2	223.6	1-1/8
	616.9	616.9	573.6	489.6	433.3	391.7	1-3/8
	873.1	873.1	873.1	776.0	687.1	621.8	1-5/8
	1518.6	1518.6	1518.6	1518.6	1432.1	1296.6	2-1/8
	2342.7	2342.7	2342.7	2342.7	2342.7	2304.4	2-5/8
<b>100</b>	25.3	17.1	13.9	11.4	9.8	9.0	3/8
	59.6	40.0	31.8	26.9	23.7	21.2	1/2
	100.4	75.9	61.2	51.4	45.7	41.6	5/8
	223.6	202.4	162.4	137.9	122.4	110.2	7/8
	381.1	381.1	329.7	281.5	248.9	225.2	1-1/8
	580.2	580.2	578.5	492.9	436.6	394.9	1-3/8
	821.7	821.7	821.7	783.4	693.6	627.5	1-5/8
	1429.6	1429.6	1429.6	1429.6	1429.6	1308.9	2-1/8
	2204.8	2204.8	2204.8	2204.8	2204.8	2204.8	2-5/8
<b>110</b>	25.3	17.1	13.9	11.4	9.8	9.0	3/8
	59.6	40.8	31.8	26.9	23.7	22.0	1/2
	100.4	76.7	61.2	52.2	45.7	41.6	5/8
	209.7	203.2	162.4	138.7	122.4	111.0	7/8
	357.4	357.4	331.3	282.3	249.7	226.0	1-1/8
	544.3	544.3	544.3	495.3	437.4	396.6	1-3/8
	770.3	770.3	770.3	770.3	694.4	629.1	1-5/8
	1340.7	1340.7	1340.7	1340.7	1340.7	1310.5	2-1/8
	2066.9	2066.9	2066.9	2066.9	2066.9	2066.9	2-5/8
<b>120</b>	25.3	17.1	13.9	11.4	9.8	9.0	3/8
	57.9	40.0	31.8	26.9	23.7	22.0	1/2
	93.8	76.7	61.2	52.2	45.7	41.6	5/8
	195.0	195.0	162.4	137.9	122.4	110.2	7/8
	332.9	332.9	329.7	281.5	248.9	225.2	1-1/8
	507.6	507.6	507.6	492.9	436.6	394.1	1-3/8
	718.9	718.9	718.9	718.9	692.0	625.9	1-5/8
	1250.1	1250.1	1250.1	1250.1	1250.1	1250.1	2-1/8
	1928.2	1928.2	1928.2	1928.2	1928.2	1928.2	2-5/8

**NOTE:**

- Line Velocity < 300 FPM
- $\Delta T < 2^\circ F$
- $\Delta P < 4$  psig
- Not to be used for Main Liquid Condenser Return Line



# R-448A / R-449A Low and Med Temp

## Remote Header Line Sizing

---

<b>Remote Header Line Sizing – Low Temperature –</b>			
Max. Allowable MBH	Liquid Main	Max. Allowable MBH	Suction Main
107.7	7/8	46.9	1-5/8
181.9	1-1/8	82.2	2-1/8
277.0	1-3/8	126.1	2-5/8
427.1	1-5/8	180.3	3-1/8
743.0	2-1/8	244.2	3-5/8
1145.7	2-5/8	317.3	4-1/8
		494.5	5-1/8

**NOTE:**

- Equivalent Run = 150'
- Condensing Temperature = 110°F
- Liquid Temperature = 110°F
- SUCTION -30° to 0°
- Suction Velocity < 2,750 FPM
- Liquid Velocity < 170 FPM
- $\Delta T < 2.0^\circ F$
- $\Delta P < 2.0$  psig

<b>Remote Header Line Sizing – Medium Temperature –</b>			
Max. Allowable MBH	Liquid Main	Max. Allowable MBH	Suction Main
121.9	7/8	85.8	1-5/8
212.2	1-1/8	174.4	2-1/8
324.9	1-3/8	307.0	2-5/8
483.5	1-5/8	482.6	3-1/8
841.0	2-1/8	630.8	3-5/8
1297.0	2-5/8	833.8	4-1/8
		1274.8	5-1/8

**NOTE:**

- Equivalent Run = 150'
- Condensing Temperature = 110°F
- Liquid Temperature = 110°F
- SUCTION 0° to 40°
- Suction Velocity < 2,750 FPM
- Liquid Velocity < 170 FPM
- $\Delta T < 2.0^\circ F$
- $\Delta P < 2.0$  psig

# R-448A / R-449A Med Temperature

## Suction Line Sizing

Suction Temp °F	Suction Line Sizing Maximum MBH of Refrigeration per Length of Equivalent Feet @ 110° F Condenser						Tubing Size OD (in)	Vertical Riser MBH	
	50	100	150	200	250	300			
<b>10</b>	9.2	6.4	6.3	4.6	-	-	5/8	3	
	25.7	17.4	13.8	11.9	11.1	9.2	7/8	9	
	51.4	35.8	28.5	23.9	21.1	19.3	1-1/8	18	
	90.0	62.4	49.6	42.2	37.6	34.0	1-3/8	33	
	132.2	98.2	78.9	67.9	59.7	54.2	1-5/8	47	
	231.3	204.7	164.3	140.5	124.8	112.9	2-1/8	89	
	356.2	356.2	291.0	249.7	221.2	200.1	2-5/8	130	
	509.5	509.5	465.4	399.3	354.3	320.4	3-1/8	306	
	688.5	688.5	595.0	593.0	526.0	477.4	3-5/8	455	
	895.1	895.1	765.0	735.6	743.6	673.8	4-1/8	642	
	<b>20</b>	10.6	7.1	6.2	5.3	-	-	5/8	5
		30.1	20.3	15.9	14.1	12.4	10.6	7/8	11
60.1		41.5	33.6	28.3	24.8	23.0	1-1/8	22	
105.2		72.5	58.3	49.5	44.2	39.8	1-3/8	40	
156.5		114.9	92.8	79.6	69.8	63.7	1-5/8	63	
254.5		223.1	179.3	153.7	136.3	123.9	2-1/8	116	
392.4		392.4	318.1	272.6	242.1	218.9	2-5/8	181	
561.0		561.0	507.3	435.4	386.7	350.3	3-1/8	256	
758.5		758.5	755.1	646.9	574.2	521.3	3-5/8	376	
986.5		986.5	986.5	913.0	810.5	736.1	4-1/8	526	
<b>30</b>		13.8	9.2	7.3	6.4	-	-	5/8	5
		37.6	25.7	20.2	17.4	15.6	13.8	7/8	13
	75.3	52.3	41.3	35.8	31.2	28.5	1-1/8	28	
	131.3	90.9	72.5	62.4	55.1	50.5	1-3/8	48	
	197.4	144.1	115.7	99.1	88.1	79.9	1-5/8	75	
	343.3	298.4	240.5	205.6	182.7	165.2	2-1/8	158	
	529.7	526.9	424.1	364.4	323.1	292.8	2-5/8	279	
	756.4	756.4	677.5	582.0	516.8	468.2	3-1/8	447	
	1023.6	1023.6	1006.1	863.8	766.5	696.8	3-5/8	663	
	1331.1	1331.1	1331.1	1219.1	1082.3	982.3	4-1/8	937	
	<b>40</b>	16.5	11.0	9.2	7.3	-	-	5/8	6
		44.1	30.3	24.8	21.1	18.4	16.5	7/8	16
90.0		62.4	49.6	42.2	37.6	34.0	1-1/8	33	
157.0		108.3	87.2	74.4	66.1	59.7	1-3/8	57	
237.8		171.7	137.7	118.4	104.7	95.5	1-5/8	91	
414.0		355.3	286.4	246.0	217.6	197.4	2-1/8	189	
638.9		627.9	505.8	434.2	385.6	349.8	2-5/8	334	
911.6		911.6	807.8	694.0	616.0	558.1	3-1/8	532	
1224.6		1224.6	1198.9	1030.0	914.3	830.8	3-5/8	793	
1603.7		1603.7	1603.7	1451.4	1290.7	1172.3	4-1/8	1118	

Suction Line Sizing Table is established for Design Conditions of 110°F Condensing Temperature. For other Condensing Temps, use the multiplying factors listed below to determine the maximum MBH capacity of the tubing.

Cond Temp °F	Multiplying Factor
60	1.25
70	1.20
80	1.15
90	1.12
100	1.07
110	1.00
120	0.93

NOTE:

- This table provides a general multiplier for various condensing temperatures.

NOTE:

- The minimum and maximum refrigeration load conditions on suction lines need to be considered when selecting suction lines.
- For oil control, refrigerant velocities should be considered before pressure drop considerations.
- Line sizing criteria calculations use ASHRAE guidelines, actual field applications will vary.
- Velocity, temperature and pressure drops are unique to each application and will vary.

SIZING CRITERIA:

- Horizontal Line Velocity > 700 FPM, < 2,500 FPM
- Riser Line Velocity > 1,200 FPM
- $\Delta T < 2^\circ\text{F}$
- $\Delta P < 2 \text{ psi}$



---

[www.husmann.com](http://www.husmann.com)

**HUSSMANN®**

**Husmann Corporation**  
12999 St. Charles Rock Rd.  
Bridgeton, MO 63044-2483  
PH: 314.291.2000  
FAX: 314.298.4756