The Unico System®

TECHNICAL NOTE

High Altitude Applications

Air density decreases with elevation. In addition, the humidity ratio is usually much lower. Both of these together reduce the ***UNICOSYSTEM***® capacity. To compensate for this, you must increase the airflow and number of outlets, where the amount of increase is dependent on the type of heating and cooling system used.

Refrigerant Systems

For refrigerant cooling systems, including heat pumps, the low humidity is the primary concern as it can cause the indoor coil to frost. Increasing the airflow and consequently the number of outlets will eliminate the frosting. In addition a head pressure control (low ambient control kit) should be used. Since the outdoor condensing unit cannot typically be modified, the system capacity will be derated. Consult the outdoor condensing unit manufacturer for the amount of derate and apply this factor to the UnicoSystem ratings.

Table 1. System Requirements for different Altitudes

Unico Model	Matching Condenser, tons	Minimum* Air Flow		Minimum Number of Outlets	
		CFM	m^3/s	1000 to 4000 ft	Over 4000 ft
1218	1	250	0.12	7	7
2430	1.5	375	0.18	10	10
2430	2	500	0.24	13	14
2430	2.5	625	0.29	16	19
3642	3	750	0.35	19	20
3642	3.5	875	0.41	22	24
4860	4	1000	0.47	25	30
4860	5	1250	0.59	32	36

* Refer to hot water capacity tables and equation below for minimum airflow for heating systems

Hydronic Systems

For chilled water- or hot water systems the airflow is dependent on the required capacity. Refer to the chilled water and hot water coil performance tables to determine the proper amount of air. Use the minimum number of outlets as shown in Table 1 for the actual airflow rate required (ACFM). The coil capacity tables list "Standard" airflow rate (SCFM), which is used to determine the actual airflow rate as follows:

ACFM (measured air) = SCFM (required air) / F1

Note the 1218 unit is limited to 300 ACFM, the 2430 unit is limited to 600 ACFM, the 3642 unit is limited to 1000 ACFM, and the 4860 unit is limited to 1250 ACFM. Therefore, the highest capacities shown in the coil capacity tables may be unavailable, depending on the altitude.

System Checkout.

As in all systems, you still must verify the airflow by measuring the motor amperage and voltage, and/or by using a TurboMeter to measure the airflow at each outlet. The amperage table that is supplied with the blower is for air at sea level. Multiply the chart (required) amperage by the Density Ratio (F1) to obtain the desired measured amperage.

Chart Amperage (required) x F1 = Measured Amperage

Example*: A 2430 unit requiring 600 CFM at sea level and 2.2 amps, at 10,000 feet the airflow will need to be 880 CFM, (600 / 0.681) and the measured amperage would need to be 2.18 amps, (3.2 x 0.681), where the 3.2 amps is based upon the blower curve at 880 CFM.*

Table 2. Altitude Factors

Altitude		Pressure		Density		Density Ratio, F1
ft	m	psia	kPa	$lb./ft^3$	kg/m^3	
0	0	14.696	101.3	0.0750	1.200	1.000
1000	305	14.175	97.7	0.0722	1.155	0.963
2000	610	13.664	94.2	0.0696	1.114	0.928
3000	914	13.173	90.8	0.0671	1.074	0.894
4000	1219	12.682	87.4	0.0646	1.034	0.861
5000	1524	12.230	84.3	0.0623	0.997	0.831
6000	1829	11.778	81.2	0.0600	0.960	0.800
7000	2134	11.341	78.2	0.0574	0.918	0.765
8000	2438	10.914	75.3	0.0553	0.885	0.737
9000	2743	10.506	72.4	0.0532	0.851	0.709
10000	3048	10.108	69.7	0.0511	0.818	0.681