

What are the cooling calculation basics?

Typically building heat gain is calculated in tons of refrigeration needed:

- 1 ton of cooling is the amount of cooling provided by melting 1 ton of ice over a 24-hour period.
- 1 ton of cooling equals 12,000 British Thermal Units (BTU) per hour.
- It takes 1 BTU to raise 1 pound of water 1°F.
- It takes approximately 1160 BTU to evaporate 1 pound of water.
- It takes 0.24 BTU to raise 1 pound of air 1°F.
- One pound of air occupies 13.7 cubic feet of space at sea level when the temperature is 75°F.
- Removing 1 ton of building heat requires cooling 570 cubic feet per minute (CFM) of room air from 75°F to 55°F at sea level.
- Removing 1 ton of building heat requires cooling 660 CFM of room air from 75°F to 55°F at 5,000 feet in elevation.

How much *total* cooling is provided by a Coolerado air conditioner in a 100 percent make-up air application?

100 percent make-up air means that no building air is re-circulated to the air conditioner, and all the air is brought in from the outside. 100 percent makeup air applications include meeting spaces, commercial kitchens, and other residential, commercial and industrial processes. The *total* amount of cooling provided by a Coolerado air conditioner is:

- Outside air in the western USA at 100°F on a dry day is cooled down to about 55°F, a 45 °F temperature drop. With 570 CFM of airflow and a temperature drop of 45°F, total cooling is 2.25 tons. A Coolerado air conditioner with two Coolerado Heat and Mass Exchangers (HMXs) will deliver approximately 570 CFM of conditioned air.
- Outside air in the western USA at 100°F on a high humidity day is cooled down to about 68°F, a 38 °F temperature drop. With 570 CFM of airflow the total cooling is 1.9 tons.

So the amount of cooling two Coolerado HMXs will provide in western USA is roughly 2 tons, or roughly 1 ton per HMX (we use .9 tons per HMX as a rule of thumb to be conservative).

A Coolerado model M50 has 5 HMXs, so it provides about 4.5 tons of total cooling in the western USA.



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COOLERADO M50 FAN AND PERFORMANCE TABLE

Intake air temperature °C	External Static pressure Pa	Relative Humidity %	Absolute Humidity g/kg	Product air temperature °C	Absolute Humidity g/kg	Full speed product air flow m ³ /h
20	0	30	4,5	11,5	4,5	2.460
20	100	30	4,5	11,0	4,5	1.970
20	200	30	4,5	9,8	4,5	1.495
20	250	30	4,5	9,2	4,5	1.260
20	0	40	6,0	12,9	6,0	2.460
20	100	40	6,0	12,5	6,0	1.970
20	200	40	6,0	11,5	6,0	1.495
20	250	40	6,0	11,0	6,0	1.260
20	0	50	7,5	13,8	7,5	2.460
20	100	50	7,5	13,5	7,5	1.970
20	200	50	7,5	12,6	7,5	1.495
20	250	50	7,5	12,2	7,5	1.260
20	0	60	9,0	15,3	9,0	2.460
20	100	60	9,0	15,0	9,0	1.970
20	200	60	9,0	14,3	9,0	1.495
20	250	60	9,0	14,0	9,0	1.260
20	0	70	10,5	16,7	10,5	2.460
20	100	70	10,5	16,5	10,5	1.970
20	200	70	10,5	16,0	10,5	1.495
20	250	70	10,5	15,8	10,5	1.260



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22	0	30	4,5	12,6	4,5	2.460
22	100	30	4,5	12,0	4,5	1.970
22	200	30	4,5	10,7	4,5	1.495
22	250	30	4,5	10,0	4,5	1.260
22	0	40	6,5	14,0	6,5	2.460
22	100	40	6,5	13,5	6,5	1.970
22	200	40	6,5	12,4	6,5	1.495
22	250	40	6,5	11,8	6,5	1.260
22	0	50	8,0	15,4	8,0	2.460
22	100	50	8,0	15,0	8,0	1.970
22	200	50	8,0	14,0	8,0	1.495
22	250	50	8,0	13,6	8,0	1.260
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22	100	60	10,0	16,5	10,0	1.970
22	200	60	10,0	15,7	10,0	1.495
22	250	60	10,0	15,4	10,0	1.260
22	0	70	11,5	18,2	11,5	2.460
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24	0	30	5,5	14,1	5,5	2.460
24	100	30	5,5	13,5	5,5	1.970
24	200	30	5,5	12,1	5,5	1.495
24	250	30	5,5	11,4	5,5	1.260
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Intake air temperature °C	External Static pressure Pa	Relative Humidity %	Absolute Humidity g/kg	Product air temperature °C	Absolute Humidity g/kg	Full speed product air flow m ³ /h
26	0	30	6,5	15,6	6,5	2.460
26	100	30	6,5	15,0	6,5	1.970
26	200	30	6,5	13,5	6,5	1.495
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28	0	30	7,0	17,1	7,0	2.460
28	100	30	7,0	16,5	7,0	1.970
28	200	30	7,0	15,0	7,0	1.495
28	250	30	7,0	14,2	7,0	1.260
28	0	40	9,5	19,0	9,5	2.460
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36	200	30	10,5	20,8	10,5	1.495
36	250	30	10,5	19,2	10,5	1.260
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36	200	60	22,5	28,0	22,5	1.495
36	250	60	22,5	27,6	22,5	1.260
36	0	70	26,5	31,3	26,5	2.460
36	100	70	26,5	31,0	26,5	1.970
36	200	70	26,5	30,3	26,5	1.495
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