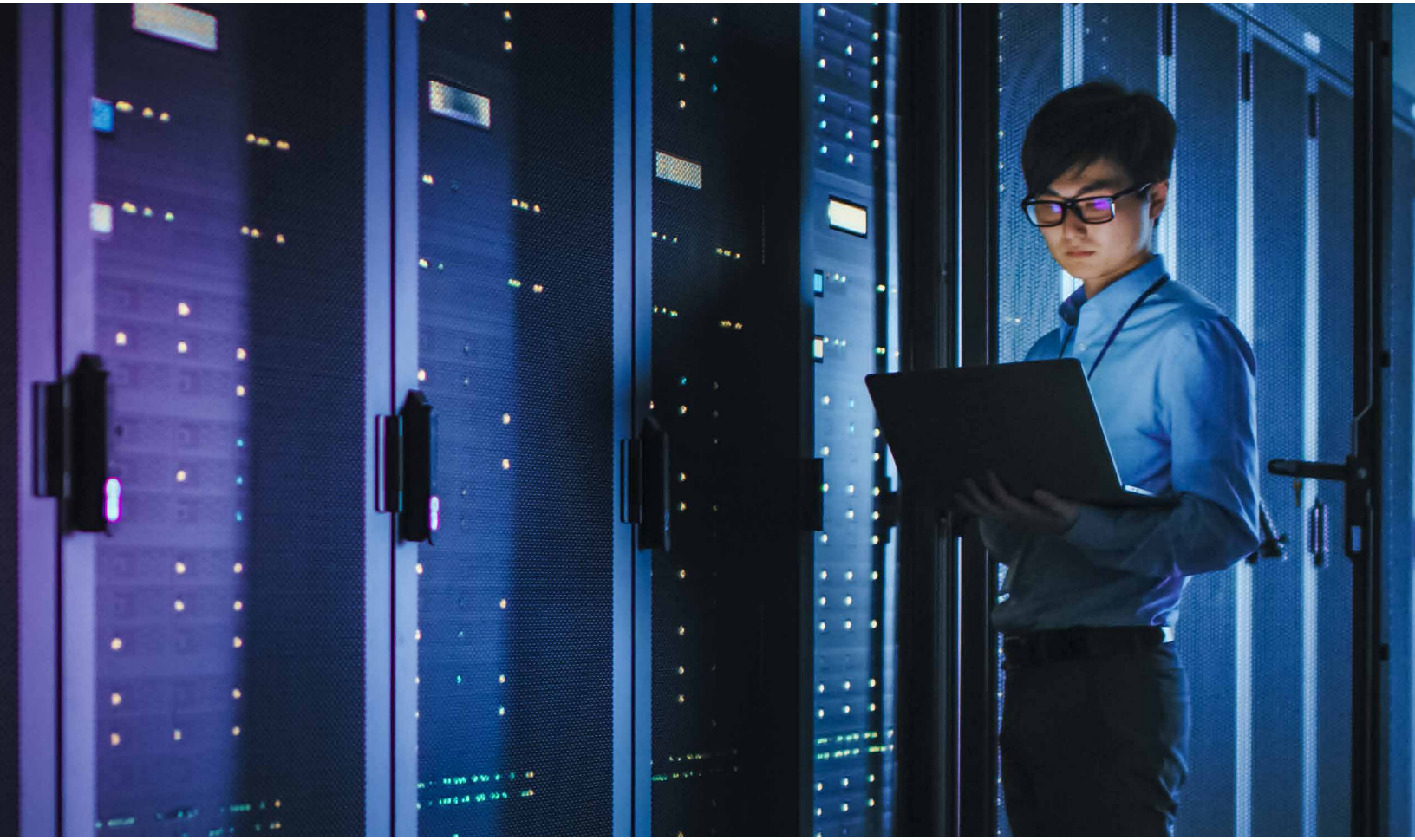
M&M CARNOT

Aquilon DC computer room air conditioner



Unlock data center cooling efficiency with M&M Carnot's patented RainCycle

The power behind **your mission**

Johnson Controls

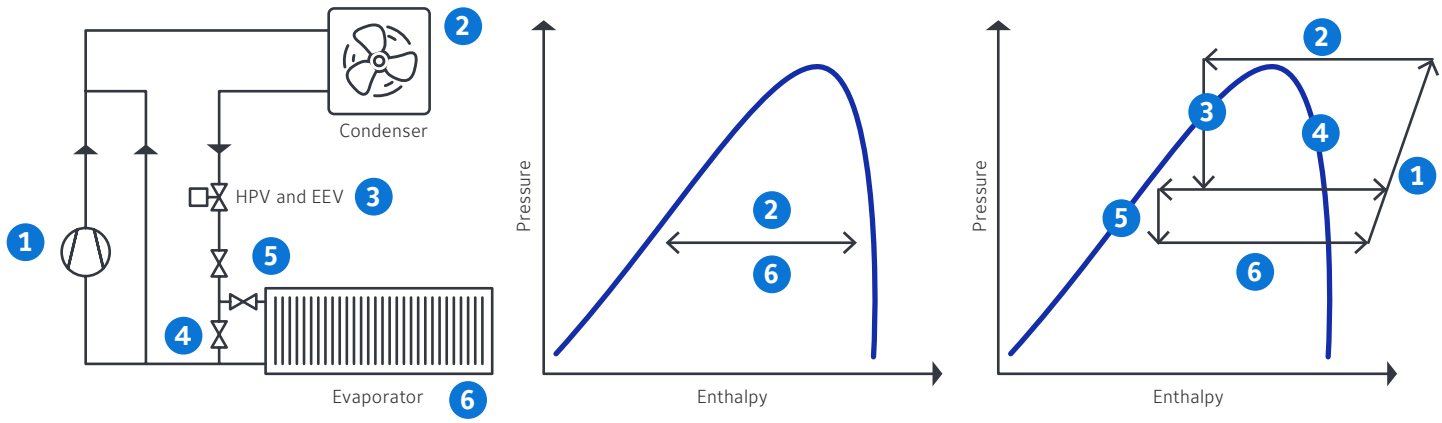
Aquilon CRAC

The Aquilon DC CRAC unit is a natural refrigerant in-room air conditioner designed for data center operating conditions.

Complete with onboard system controls and coupled with matching remote gas cooler(s) providing a long-term, efficient and future-proof solution for computer room cooling.

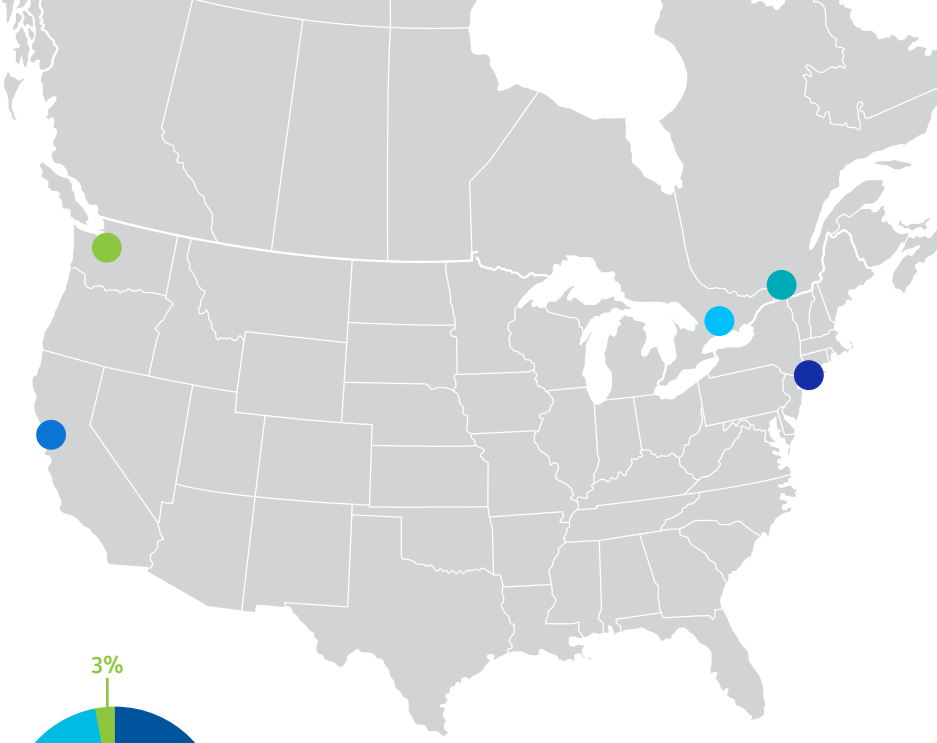
Aquilon RainCycle technology uses the natural properties of carbon dioxide (CO_2) to cool data center computer rooms as efficiently as possible. Mechanical cooling vapor compression is only used when needed and only when ambient conditions make it necessary, thus generating annual operating savings year after year.

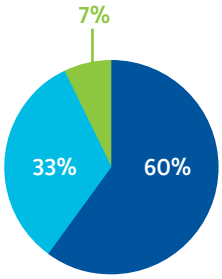
Patented RainCycle free cooling in pH diagram



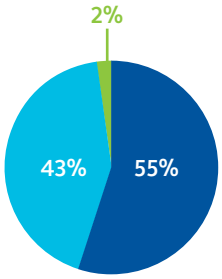
1. Vapor compression
2. Heat rejection – gas cooling or vapor condensing
3. High-pressure refrigerant pressure reduction
4. Vapor by-pass
5. DX refrigerant feed to evaporator
6. Refrigerant evaporization for air cooling

Regional efficiency examples

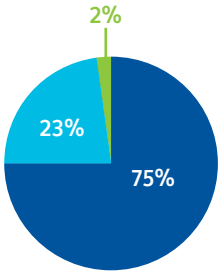




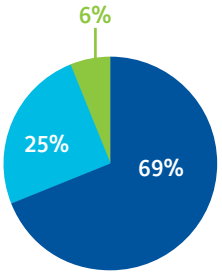
New York, NY



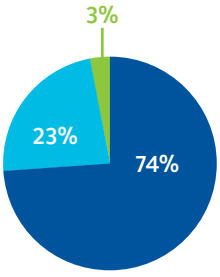
San Francisco, CA



Montreal, QC



Seattle, WA

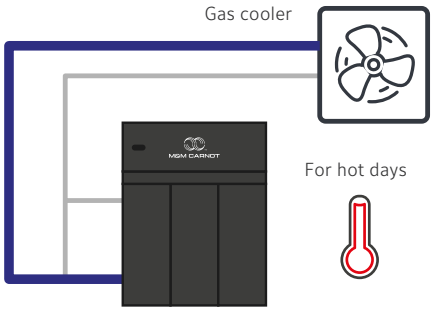


Toronto, ON

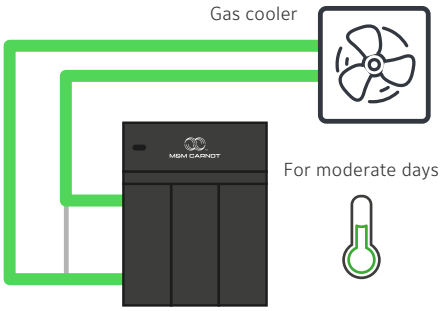
- Free cooling
- Mechanical modulation (partial compressor and free cooling)
- Mechanical (full compressor)

Estimated hours based on historical temperature data.

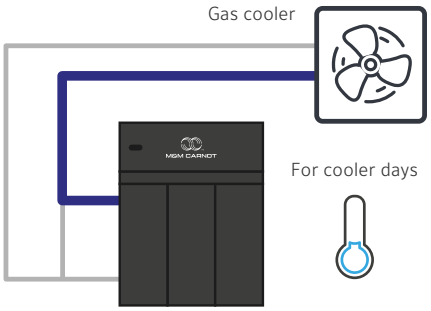
Mechanical mode



Mechanical modulation mode



Free cooling mode



Mode A: Mechanical full compression

- Ambient temperature of 95°F
- Full cooling capacity
- Full compression mode for warmer ambient temperatures
- Total energy consumption 30.33kW*

Mode B: Partial compression and free cooling

- Ambient temperature of 64.4°F
- Full cooling capacity
- One circuit with compressor in subcritical compression mode and one circuit in free cooling mode
- Total energy consumption 18.2kW*

Mode C: No compression required, RainCycle free cooling

- Ambient temperature of 53.6°F
- Max. cooling capacity of full heat load
- Both circuits in free cooling mode – no compression
- Total energy consumption 6.1kW*

Partial compression with free cooling is available for models 30 and 48 that have multiple compressors.

* Total energy shown represents the CRAC model 30.

M&M CARNOT

Design features

- Patented RainCycle economizer mode using thermosiphon standard on all units
- Smaller piping required compared to synthetic refrigerants
- Adiabatic condenser option available when required
- Available in upflow, downflow and other configurations
- Readily available standard components
- BMS interfaces available are MODBUS, BACnet MS/TP, BACnet IP and CAN bus
- EC fans

Benefits

- 100% free cooling with CO_2 thermosiphon, removes need for recirculation pump
- Significant reduction in footprint compared to synthetic systems
- Less energy consumption during compression mode with CO_2
- Utilizes future-proof natural refrigerant with GWP-1 compared to heavily regulated synthetic alternatives
- CO_2 is a safe and sustainable refrigerant
- Higher heat capacity compared to synthetics, requiring smaller components and providing higher efficiency
- Condenser install elevation is not restricted with CO_2, unlike synthetic solutions with minimum elevation requirements
- Higher heat capacity equals lower charge and smaller piping
- Higher free cooling capacity during free cooling mode

Models

	Model AQ15			
	Weight (lbs.)	Length (in.)	Width (in.)	Height (in.)
Aquilon CRAC	2,500 (1,135kg)	71 (1,794mm)	39 (991mm)	81 (2,058mm)
Gas cooler	975 (445kg)	95 (2,391mm)	52 (1,321mm)	75 (1,888mm)

	Model AQ24			
	Weight (lbs.)	Length (in.)	Width (in.)	Height (in.)
Aquilon CRAC	3,500 (1,590kg)	97 (2,454mm)	39 (991mm)	81 (2,058mm)
Gas cooler	2,175 (990kg)	157 (3,970mm)	53 (1,342mm)	74.5 (1,893mm)

	Model AQ30			
	Weight (lbs.)	Length (in.)	Width (in.)	Height (in.)
Aquilon CRAC	4,250 (1,930kg)	123 (3,112mm)	48 (1,212mm)	100 (2,540mm)
Gas cooler	1,950 (890kg)	95 (2,391mm)	104 (2,642mm)	75 (1,888mm)

	Model AQ48			
	Weight (lbs.)	Length (in.)	Width (in.)	Height (in.)
Aquilon CRAC	5,500 (2,500kg)	144 (3,658mm)	48 (1,207mm)	100 (2,540mm)
Gas cooler	4,350 (1,980kg)	157 (3,970mm)	106 (2,683mm)	75 (1,893mm)

Note: Flat-type gas cooler with different options of legs – 22in., 36in. and 72in.

2024 ATMO Approved Natural Refrigerants

Associated standards for CO_2 refrigeration systems

- Construction per ASME B31.5 "Refrigeration Piping and Heat Transfer Components"
- Stainless steel tubing per ASTM A249 TP304
- Compliance with ASHRAE 90.4 standards ensuring energy efficiency and performance reliability in data center cooling
- Nitrogen pressure test per ASME B31.5 Edition 2019, Article 53.8
- Ability to meet Title 24 requirements
- UL/CSA approved

Visit **www.johnsoncontrols.com** for more information and follow **@johnsoncontrols** on social platforms.

Form 900.100 SG1 (2025-02) supersedes M&M Carnot 1022 publication · Subject to change without notice · Printed in USA · 02/25 · PDF

The power behind **your mission**

Johnson Controls