

ChilledDoor®

Rack Cooling System



motivair®
COOLING SOLUTIONS

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Server heat densities are increasing rapidly in government, institutional, financial and co-location applications, while HPC systems are designed to provide increased computational speeds within limited rack space. The Motivair Chilled Door® Rack Cooling System manages the critical cooling requirements of higher density server racks which cannot be effectively cooled with traditional air conditioning, in-row coolers or passive rear door coolers - and at the lowest possible energy cost.

The latest Motivair Chilled Door® is an “active” hinged door that replaces the rear door of any standard or OEM server rack via an interface frame. The Chilled Door® is capable of removing up to 45 kW per rack while using up to 65°F supply water, using less than 840 watts of fan power. Options now available for up to 60 kW. Over 50 different variables are constantly monitored and controlled via a custom PLC to ensure that the Chilled Door® is actively adjusting to conditions inside the data center and the server rack. By actively removing 100% of the heat load at its source, the Motivair Chilled Door® system results in a “Heat Neutral” white space that requires little or no air conditioning. Hot aisle/cold aisle configurations are eliminated, data center square footage is reduced, raised floors are optional and energy efficiency can be increased by up to 90% compared to legacy cooling systems. The Motivair Chilled Door® always operates above the dew point of the data center, which eliminates the possibility of condensation near critical electrical equipment. 100% sensible cooling eliminates wasted energy by CRAC units or in-row coolers via accidental de-humidification and re-humidification. As a result, no condensate pumps or piping are required. The Chilled Door® was designed with an aluminum coil frame to reduce weight and eliminate zinc whiskers”.

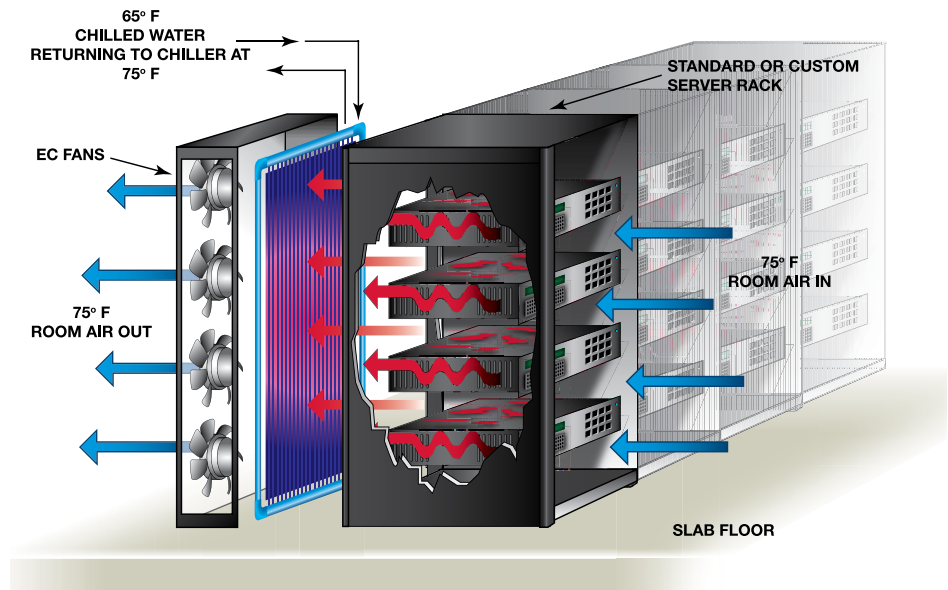


Motivair Chilled Door®

How It Works

The Motivair Chilled Door® removes heat generated by the servers and other IT equipment directly at its source thus preventing hot exhaust air from entering the white space; ensuring optimum data center thermal and energy performance.

Room temperature air, typically 68°F-80°F, enters the front of the server rack and passes over the servers, picking up heat as it moves towards the back of the rack or IT enclosure. Centrifugal fans with EC motors located inside the Chilled Door® then draw the heated air through the Chilled Door® heat exchanger where 100% of the server heat load is removed and transferred to the cooling water. The conditioned air is returned to the room at the same temperature it entered the rack, while the heated water flows to the chiller plant, radiator or cooling tower outside, where the heat is rejected.



Exploded View of Chilled Door®

Elevated cooling water temperature (65°F) allows any chiller to operate more efficiently, or permits the use of tower water, aquifer water or other low cost cooling sources. The Chilled Door® PLC continuously monitors fan speed, server entering air, Chilled Door® discharge air, entering and leaving cooling water temperatures. The fan speed and water flow rate are automatically adjusted in real time to provide the lowest operating cost at any heat load or configuration.

Motivair Chilled Doors are designed for control of the complete data center environment populated by higher density server racks. They can also be used for retrofit applications where high density server racks are added to an existing data center and cannot be effectively cooled by traditional means. The self-contained Chilled Door® design lends itself to simple and effective application in any data center with minimal disruption.

Maximum Cooling with Minimum Energy

A Chilled Door® System eliminates “Hot Spots” in the data center by removing 100% of the server heat at its source using minimum fan power and will “actively” respond to changing configurations of individual server racks, assuring ultimate operator flexibility. Cooling capacities up to 60 kW per ChilledDoor® using up to 65°F water ensures high density loads can be actively cooled and controlled without on-site experimentation or continuous alteration of floor vents, aisle containment or CRAC unit re-location. Leveraging 65°F chilled water guarantees no energy is wasted in accidental latent cooling or re-humidification and eliminates the need for condensate pumps or piping. The Chilled Door® design allows 35% reduction in electrical energy for any new or existing chiller when supplying chilled water at 65°F, compared to 44°F traditional chilled water supply temperature.

Free Cooling

The Motivair Chilled Door® system reaches optimal energy efficiency when applied with a Motivair Free Cooling Chiller. Energy savings up to 90% can be achieved compared with legacy data center cooling systems. The Chilled Door® System utilizes supply water/glycol at 65°F, returning this fluid to the Free Cooling Chiller at 75°F. When outside temperatures fall below 75°F the integrated Free Cooling system automatically pre-cools the return fluid and the compressors unload. At 45°F ambient the Free Cooling Chiller requires only the condenser fans to provide full cooling capacity and the compressors are switched off. Free cooling chillers permit the indirect use of outside ambient air for free cooling without any possibility of data center contamination. A major, added benefit is the compressors in Motivair Free Cooling Chillers, when used with Chilled Doors, are never required to start, or operate below 45°F ambient, which significantly reduces run time and extends compressor life. Geographical areas that were previously considered too warm for water side economizers can now benefit from the merging of Motivair Chilled Door® and Free Cooling technologies. The result is a highly efficient data center capable of reducing overall energy consumption by up to 90% when compared to traditional data center cooling systems. Chilled Door® installations can also benefit by using other low-cost cooling water supplies such as rivers, lakes, aquifers and cooling towers.

Modular, Scalable, and easy to install

A Chilled Door® can be easily installed on any standard or OEM computer rack via an optional Interface Frame, allowing a data center operator to retrofit a Motivair Chilled Door® to any existing rack(s) and saving the expense of decommissioning older cabinets. The Interface Frame has been designed so no additional weight is transferred to the existing rack system. Zero-clearance hinges and nesting doors permit installation in virtually any location. The Chilled Door® system can also be actively applied to systems with problematic hot spots; where the need to reduce the carbon foot print is a driving factor; or in data centers where space has become a premium and higher densities must be created in existing racks. Chilled Doors can be added as an installation grows, without disrupting the DP operation. Minimal installation time is required. With adequate pre-Installation planning the installation of a Chilled Door® can be completed within a 1/2 hour.



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“Packaged” System

The latest generation Chilled Door® has been uniquely designed to address performance & reliability, along with space constraints and security limitations inside the data center. The hinged Chilled Door® is now a completely “packaged” system. In addition to improved efficiency EC fans & cooling coil, this generation includes the PLC, power & control devices all mounted inside the door - truly plug & play, requiring only the customer power & water connections to become fully operational. The front stainless steel hinged “door-within-a-door” affords instant access to all electrical components & controls with no tools required. Fans are hot-swappable in complete safety while the others remain fully operational with the Chilled Door® closed. Safety fuses and terminal connections are all easily accessible through the front access panel. A minimum load safety factor of 375% on the zero clearance hinges and a key lock entry system allow the Chilled Door® to be easily opened & closed safely & securely. Optional, quick-connect hydraulic flex-hose assemblies with reinforced structure & custom lengths are individually tested & tagged for 250 psig (17 Bar) operation for a wide safety margin. The minimum bend radius of 1” without distortion provides extreme flexibility for improved installation & operating convenience.

Controls & Alarms

The Chilled Door® is supplied with a powerful PLC control & alarm system to cover virtually every possibility. The PLC is located in the front face of the Chilled Door® for immediate access to all controls, alarms and history of events. A 5-line LCD Alfa numeric display indicates normal operating conditions with an override display for alarms. Three levels of access code protect secure operation - operator, service technician & factory only. Parameters monitored & controlled include fan speed, water flow, inlet air, outlet air, inlet water, and outlet water temperatures. Standard alarms and response include fan failed (individually identified) high inlet & outlet air temperature, high inlet & outlet water temperature, Leak Prevention System (LPS) and emergency full speed fan operation on PLC failure. The Motivair Leak Prevention System (LPS) shuts off the water supply to the Chilled Door®, increases fan speed to maximum, and sets the alarm. A unique fail-safe sequence shuts off the water supply, even in the unlikely event of simultaneous water detection and power outage. The adjacent Chilled Doors share any surplus heat load providing total operational redundancy. Dual power supply is an available option and remote communication is available via LON, Bacnet or Modbus.

Coolant Distribution Unit (CDU)

The available Motivair Coolant Distribution Unit (CDU) provides an interface between an unsuitable (too cold &/or or dirty) building cooling water supply, and a separate (clean 65F) closed loop water supply for the Chilled Doors. The CDU is enclosed in a rack-type enclosure, physically & aesthetically matching the server racks. It includes a stainless steel heat exchanger, automatic standby pumps, control panel and all necessary piping, valves & PLC control & alarm system. The CDU is also provided with supply & return headers, including quick-connect flex-hose fittings for each Chilled Door®. Standard supply includes a PLC-powered water detection and alarm system with remote communication available via LON BACnet or Modbus.



Chilled Door Management System

	M4*	M8	M12
Max cooling capacity with up to 65°F water (kW):	25	35	45+
Rack size 42U/48U x 600/800 mm**	S	S	S
Fan quantity	2	5	5
PLC with local HMI screen	S	S	S
Variable fan speed	S	S	S
Coolant flow control	S	S	S
Dual power supply	O	O	O
Network remote status monitoring	O	O	O
High/low air & water temperatures	S	S	S
Individual fan fail sensing	S	S	S
Local status indicator alarm	S	S	S
Leak Prevention System	S	S	S
Emergency Fan Operation on PLC failure	S	S	S
Common Alarm	S	S	S

** Other sizes available; S= standard; O= optional

Power Supply

208-230/1/50-60; 7A max current.

Door Performance

Cooling capacity is dependent on a number of variables specific to its application.

Additional Information

ETL tested, approved & labeled to UL & CSA standards

Manufactured in the USA

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