

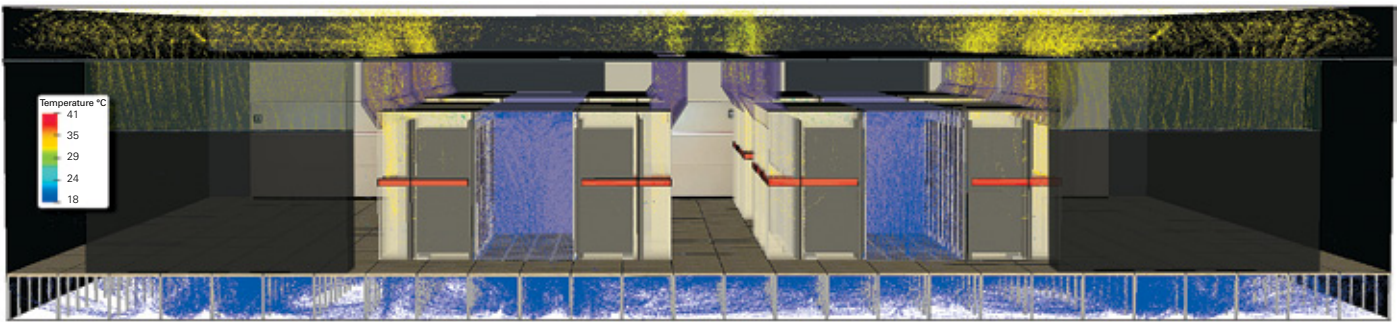
Data Centre Products

# Airflow Management Solutions



*Powering Business Worldwide*





Computational Fluid Dynamics (CFD) model of an optimised data centre illustrating cold-aisle isolation and Eaton's chimney Heat Containment System®. See page 14 for more information on Eaton's CFD services.

# The Optimised Data Centre

Eaton's Airflow Management Solutions (AMS) optimise power and cooling infrastructure, improve information processing density, create a greener data centre and increase spatial flexibility for the data centre manager – all while saving money for our customers.

Eaton's AMS containment solutions will significantly lower data centre energy demands and associated energy costs. Eaton offers a wide range of partial and total containment solutions that can accommodate hot-aisle containment, cold aisle containment and rack-based heat containment. Eaton takes a consultative approach to AMS solutions. Because each data centre has its own unique issues, especially in relation to energy management, we do not advocate one containment concept over another. Rather, we work with data centre professionals to audit current operations and then develop a comprehensive airflow management strategy that delivers the energy management control and savings that make the most sense for the facility in question.

The solution may be heat containment at the rack level, hot-aisle or cold-aisle containment. It might also be a combination of more than one of these approaches, depending on the layout of the data centre. Whatever the need, Eaton has the expertise, flexibility and capacity to work with our customers, to not only provide them with a customised solution, but also to assist them in the stages leading up to total aisle containment. The result is improved data centre operations and reduced energy consumption.

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# Aisle Containment Solutions

Industry studies indicate that an estimated 60 per cent of the cool air supplied to traditional data centres is wasted because it bypasses the intended IT equipment and returns directly to the hot air intake of the Computer Room Air Conditioner (CRAC). Adopting a cold- or hot aisle containment strategy increases air efficiencies, allowing a significant reduction in cold air supply, enabling longer hardware life and valuable energy savings.

Eaton's solutions are equally effective for both hot and cold aisles in the data centre.

## End of row doors

End-of-row doors create more efficient cold aisles by blocking an obvious cold-air escape route and entry for hot air recirculation and air mixing. This allows you to set a higher overall temperature within the data centre, thus saving energy and extending hardware life.

### Features and benefits

- Variety of door models—single or split swing and sliding doors.
- Ease of installation—field-installable, rack-integrated and freestanding options available.
- Rack neutral—flexible enough to install almost anywhere on any manufacturer's brand enclosure.
- Improved efficiency and predictability—increases cold air intake efficiency, from the bottom of the enclosure to the top, within the cold aisle.
- Minimised air re-mixing—cost-effectively minimise air mixing between the hot and cold aisle while keeping the uniform cold air supply in front of the servers for a consistent temperature top to bottom.



Eaton's end-of-row doors help achieve aisle containment. The example above shows split-swing doors.



Our space-efficient, split-sliding end of row doors open with little effort and close on their own. They are the ideal choice when end-of-row space is at a premium and air containment is required.



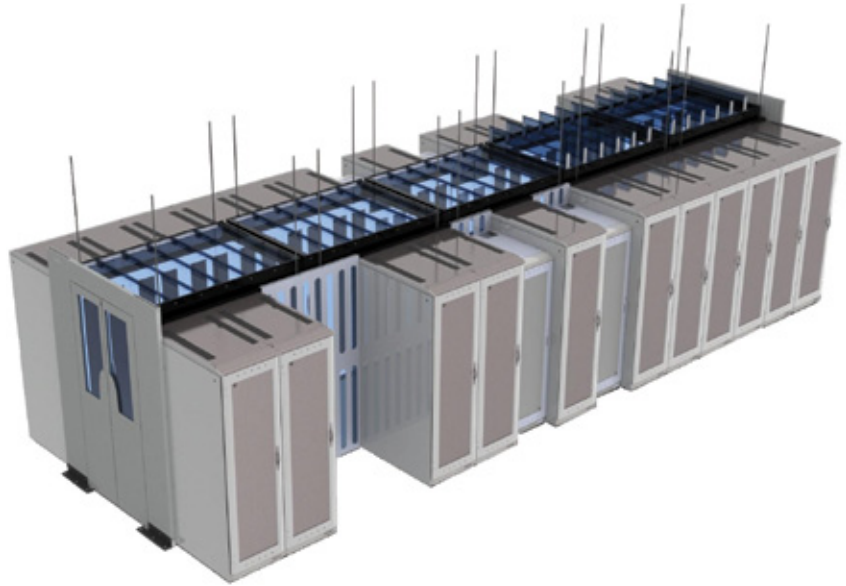
Single-swing end-of-row doors are a simple, cost-effective solution for improving efficiency while lowering overall operating costs.



# Aisle Containment Solutions

## Horizontal ceiling system

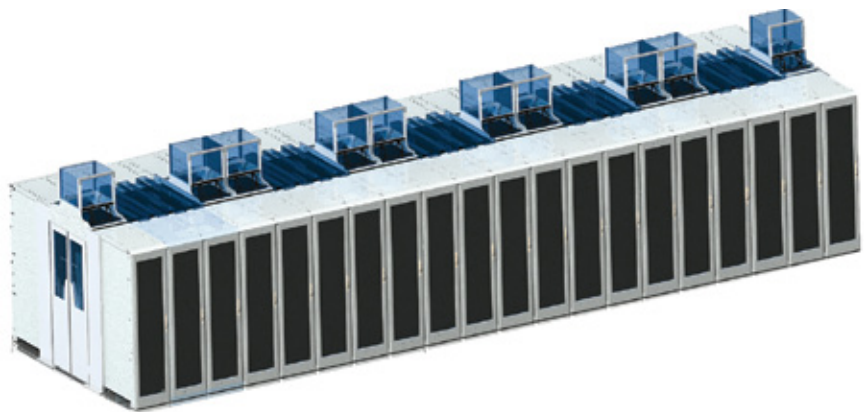
Eaton's ceiling system is comprised of clear panels made from materials with multiple ratings, including V-0 and antistatic. These panels can be easily mounted on top of Eaton or third-party enclosures. The system is modular and scalable to accommodate differences in rack heights and row spacing. Its self-supporting structure allows for easy rack changes within the row. Fire-activated ceiling panels ensure quick row access for critical fire suppression.



The Eaton horizontal ceiling system can be rack, ceiling or floor mounted. Eaton's fire-activated ceiling is shown here in active and non-active mode.

## Aisle ducted system

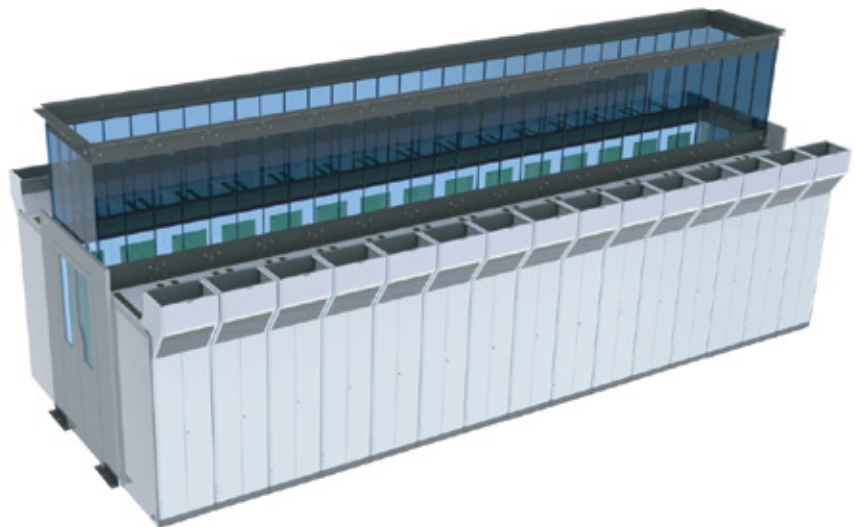
The rack-integrated aisle duct works seamlessly with the horizontal ceiling system. Integration with the air conditioning supply or exhaust is easily achieved thanks to the duct's modular and scalable design.



Ceiling options include horizontal, ducted and vertical wall executions.

## Vertical wall system

The vertical wall system connects the top of the enclosures to the data centre ceiling. It enables greater isolation for either cold- or hot-aisle containment.



All aisle containment variations can be provided in combination with Eaton's chimney Heat Containment System (shown above).

# Aisle Containment Solutions



**Floor-mounted ICS featuring end-of-row, split-swing doors and vertical blanking panels to accommodate third-party enclosures.**

## Floor mounted Independent Containment System

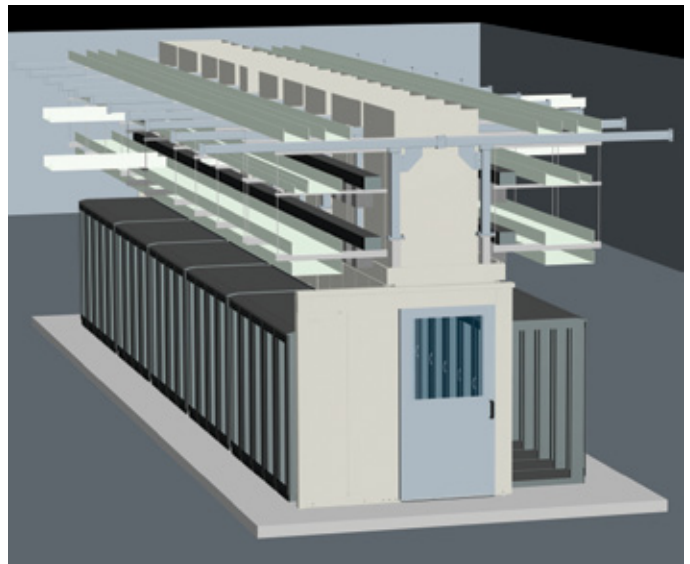
Expanding Eaton's broad containment portfolio is the patent-pending floor-mounted Independent Containment System (ICS), a free-standing, scalable and vendor-neutral containment solution for high-density computing environments.

Designed to provide maximum flexibility in all environments, the ICS, assembled within the footprint of a standard aisle, is constructed with a tubular steel frame. The frame's structure is designed to be free-standing and meets seismic standards. Additionally, it seamlessly integrates with Eaton's end of row doors (see page 4) including split- and single-swing, and sliding models.

Aisle ceilings (see page 5) are constructed from a lightweight steel frame and clear Lexan panels. This allows ambient room light to illuminate the ICS aisle, eliminating the need for energy-consuming supplemental lighting. The ceiling accepts aisle ducts, which can be added anywhere on the ceiling structure as IT loads increase.

### Features and benefits

- Scalable design—the ability to extend aisles with load growth makes the ICS an ideal solution for colocation and other highly evolving data centre environments that require on-the-fly modifications. Design can support an overhead cable tray.
- Containment integrity—vertical blanking panels ensure airflow containment when racks are partially deployed within the row and are easily removed in sections to allow quick installation of new IT racks.
- Rack neutral—ability to support virtually any brand of server or network rack in any depth, height and size with on-demand reconfiguration of the row.
- Cold- and hot-aisle compatible—easily deployed as a cold aisle containment solution with or without a downflow chimney system.
- Increased ROI—modular design offers complete flexibility and room for growth.



**Floor mounted ICS with single-swing end-of-row door providing access to Remote Power Panel (RPPs), featuring vertical containment walls and overhead cable tray support structure.**

# Rack-Based Containment Solutions

## Chimney Heat Containment System®

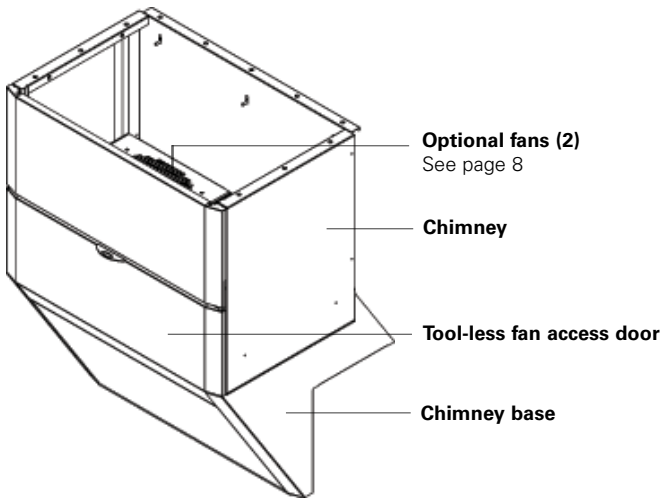
Eaton's chimney Heat Containment System (HCS) is a simple, scalable and low-cost solution for cooling up to 25 kW or more per enclosure without the expense of supplemental CRAC units to your data centre. This patented technology is available on Eaton's rack enclosures and can also be field retrofitted to most manufacturers' enclosures. The chimney HCS contains and directs the heat exhaust of your IT equipment through the chimney that is attached to the top rear of the enclosure. The hot air is then ducted to your existing CRAC units through a plenum ceiling or high air returns.



An Eaton enclosure with integrated chimney HCS.



The chimney HCS accommodates your existing cable management without the interrupting of rerouting or requiring disconnection of cables and power. The system is shown here installed on Eaton's Enclosure System.



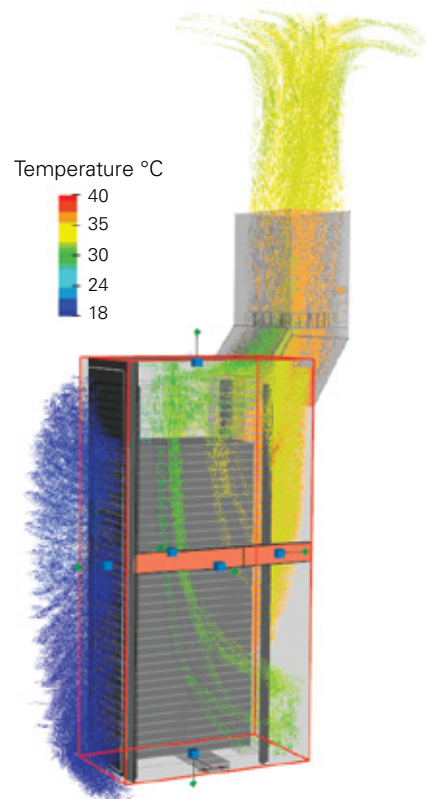
# Rack-Based Containment Solutions

## Chimney Heat Containment System

### Eaton's chimney Heat Containment System (HCS)

#### Features and benefits

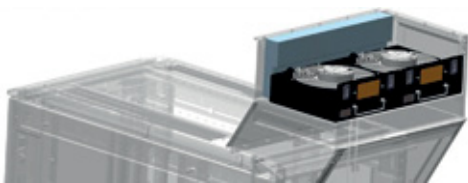
- Scalable—it can be adapted to existing infrastructures to increase rack utilization as your capacity demands grow.
- Predictable—separates hot exhaust air and cold supply air, dramatically increasing data centre reliability.
- Efficient—allows hotter air to return directly to the CRACs, increasing their efficiency by operating at a higher delta T.
- Reliable—extends existing cooling capacity throughout the data centre; freeing up stranded assets and lowering operational costs.
- Flexible—it does not require you to alter existing enclosure locations and is also field installable on third-party enclosures.



Computational Fluid Dynamics (CFD) model showing airflow through an active HCS.

## HCS Active Airflow Manager

Bypass airflow and mixing lead to inefficiencies, shorter equipment life cycles and increased operating costs. Managing airflow to enclosures with varying densities, varying building infrastructure and sporadic hot spots is challenging, but can now be achieved using a simple solution.



The Active Airflow Manager is easily mounted inside the HCS chimney base. This device measures pressure differentials and temperature to regulate fan operation. Airflow can be increased up to maximum of 74m<sup>3</sup>/h (2600 CFM).

When combined with best practices, Eaton's pressure-based system with active airflow, improves performance metrics considerably. Allocating the correct amount of airflow at known intake locations is the key to reducing energy consumption while increasing equipment performance. Best practices such as blanking panels, proper perforated tile placement and the reduction of bypass airflow must be employed to ensure optimal results.

#### Features and benefits

- SNMP-managed device with user-friendly web interface
- Controller continuously monitors pressure differentials to ensure that air entering the enclosure and server is properly removed.
- Local LEDs indicate fan status, including fan fail and overheating. Manage up to 64 Peer Active Airflow Managers via local area network.
- Two integrated temperature sensors with e-mail alert capabilities.
- Redundant power input; C13 plug type is required for each input, 90-240 Vac supplied by enclosure PDU(s).
- Controller is RoHS compliant.



# Rack-Based Containment Solutions

## Chimney HCS for Third Party Enclosure Systems

Converting existing enclosures to the chimney HCS allows you to eliminate the incremental capital expense associated with having to add more CRAC units or other supplemental cooling. The HCS manages the hot air exhaust, which prevents mixing, thereby allowing the available cooling already produced by data centre air conditioning units to be used much more efficiently. Optional fans eliminate the issue of backflow from a pressurized plenum, generally associated with passive-only systems.

### Features and benefits

- Scalable heat containment—implement heat containment with minimal interruption to operations by building up from existing enclosures without having to reroute or disconnect cables and power.
- Increased rack capacity—by isolating the hot exhaust air from the cold supply air, you can load over 25 kW of equipment in a single enclosure.
- Save white space—no additional air conditioners or other space-consuming supplemental equipment is required at the perimeter of the data centre, either in-row or overhead.
- Increased CRAC cooling efficiency—hot exhaust air is directed back to the CRAC intake at a higher delta T, allowing your AC units to operate more efficiently. Great for your green initiatives.
- A more predictable environment—eliminating chaotic airflow will result in a more predictable operating environment, allowing you to drive efficient energy use while creating a reliable infrastructure for constant technology moves, additions and changes.



By adding Eaton's chimney Heat Containment System to your existing enclosures, you realise significant equipment and cost savings while saving valuable data centre space. The Eaton HCS is shown here on APC®, CPI®, Rittal®, Compaq®, HP® and Knurr® enclosures.

# Additional Airflow Management Solutions

## Side-to-Side Airflow Management

Properly cooling network devices that require side-to-side airflow in an enclosure can present many challenges. The air recirculation that occurs in an enclosure can cause temperatures to rise significantly, resulting in overheating of devices. Eaton's Cisco Conversion Kit and Airflow Manager draws air into the enclosure, directs the air to the side intake of the device, and allows the removal of the hot air from the enclosure. These solutions extend equipment life by providing proper inlet temperatures and eliminating harmful recirculation within the rack.

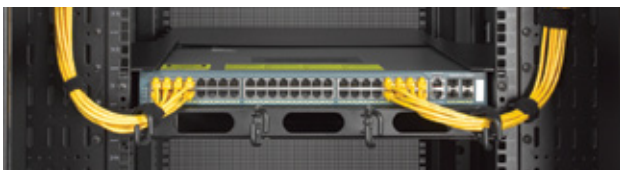


Eaton rack with integrated Cisco Conversion Kit

## Cisco Airflow Manager

The Airflow Manager is designed to be used on Cisco Catalyst 4948 switches. It can be used in most enclosures that meet the EIA-310-D specification.

The Airflow Manager kit includes everything needed to mount the switch, control airflow and manage cabling. This 2U device can be mounted to face either the hot or cold aisle while properly directing airflow.



Airflow Manager for Cisco 4948 switch.

### Features and benefits

- Helps eliminate overheating of network racks and other nearby equipment by allowing front-to-rear airflow through the switch.
- Improves efficiency by preventing hot exhaust air from mixing with cold intake air.
- Resolves the difficult issue of how to mount a switch with unique airflow requirements.



Overhead view of Airflow Manager with optional cable manager.

## Cisco Conversion kits

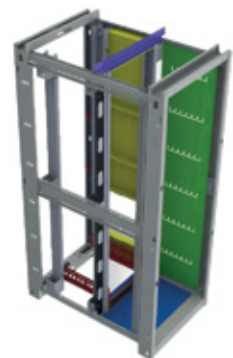
The Cisco Conversion Kit allows standard 800mm-wide Eaton enclosure configurations to be used for side airflow Cisco Switch applications. The design allows managed airflow and provides cable management and support. Cisco® models supported: Catalyst 6509-E, Catalyst 6513, MDS 9513 and Nexus 7010. The kit can be preinstalled at the factory or installed on site as a retrofit.

### Features

- Specialised airflow containment design compliant with Cisco guidelines
- Includes switch support brackets
- Integrated cable management



Mounted Cisco Conversion Kit with cable management.



Eaton Rack highlighting Cisco Conversion Kit components including baffles and cable management lacing bar.

# Additional Airflow Management Solutions

## Blanking panels

In today's dynamic data centre environment, IT equipment is frequently refreshed. These changes often leave open U-space in the enclosure which can allow recirculation of hot exhaust air back to the equipment inlet. This can cause overheating of the equipment and subsequent shutdown of servers when the maximum temperature threshold is reached.

Blanking panels provide a quick, easy and cost-effective solution for optimising air circulation within an enclosure while maintaining high aesthetics. Eaton offers blanking panels in a variety of styles including tool-less, mechanically fastened, and with cable pass-through options in steel or plastic. The panels come in various widths and heights, and meet EIA-310-D standards (depending on style). Most panels are bulk packed in quantities of 10 or 100.



**Tool-less plastic blanking panels are a highly effective and low-cost solution for preventing re-circulation and optimising airflow in your rack.**



**Brush strip models allow routing of cables through the panel.**



**Vertical blanking panels seal open spaces and prevent bypass airflow in areas that are traditionally difficult to seal. They can also be adapted for cable management.**



### Features and benefits

- Significantly reduces recirculation of hot exhaust air to the equipment inlet
- Adds to the overall aesthetics of the data centre
- Available in 1U, 2U, 3U, 4U, 5U, 6U, 7U, 8U and 20U (depending on style)
- EIA-310-D compliant for 19" equipment
- Colours: black steel, black plastic, clear plastic
- Available in tool-less, mechanically fastened, clear and cable pass-through styles



**Adjustable blanking panels, offered in two sizes (7-12U, 12-22U) easily adapt to your hardware requirements.**



# Additional Airflow Management Solutions

## Eaton high-flow doors

Eaton's high flow doors offer exceptional airflow with 75 per cent perforation, —19 per cent higher than the industry standard. In addition to increased performance, the unique perforation pattern enables a 60 per cent reduction in raw material consumption, which means less waste in the manufacturing process—a great green benefit.

Doors are available as left or right hinged and are also field reversible. The high-flow perforation is also available for the rear door and can be ordered as full or split. The doors feature tool-less door removal, a brushed aluminium door pull and a variety of lock types.

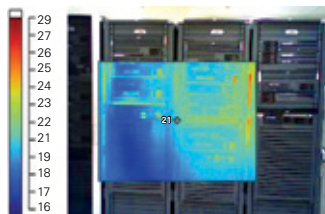


## Universal air seal kit

Stop cold air from escaping through small openings in the doors, sides, bottom or top of your enclosure. This low-cost, adaptable foam solution can quickly be sized to fit into any crack or opening. The air seal kit can easily be retrofitted to an existing rack, regardless of manufacturer, and will allow more efficient cooling of the equipment in your enclosure.

### Features and benefits

- Easy to install and fits into spaces that are traditionally difficult to seal
- An integral component of Eaton's Airflow Management Solutions, this product reinforces the company's commitment to cost-effective green solutions



Eaton's air seal kit is a simple, inexpensive solution for preventing bypass airflow in gaps around or within enclosures.



Reducing bypass airflow and particulate matter is critical to maximising efficiency, controlling cost and minimising carbon footprint in any data centre.





# Additional Airflow Management Solutions

## Chimney HCS flexible return duct

For data centres that are unable to accommodate steel chimneys, an alternative solution for controlling underfloor is Eaton's flexible return duct. A simple interface easily connects to the top of the Heat Containment System chimney. Flexible HCS run from the fan Chimney HCS to the plenum creating a closed loop-system.

### Features and benefits

- Ducting is V-0 rated and self extinguishing
- Ducting can be cut in the field for custom fits
- Each duct comes with four clamps
- Ducts are positioned directly over the fan for maximum airflow



Eaton's flexible return duct is the ideal solution for clients having enclosures that are off-grid from drop ceilings, where obstacles preclude the use of sheet metal chimneys or where the ceilings throughout the data centre are uneven.

## CRAC collars

The CRAC collar for downflow systems, used in conjunction with data centre containment strategies, can be integrated to Eaton's total containment solution. By containing and directing the warm plenum air to your air conditioning system, you increase efficiency and equipment performance while reducing overall energy consumption.

The CRAC collar features an integrated design, comprised of steel panels that can be easily mounted to the top of any CRAC unit. Collars allow front-filter installation and service and integrate fully with optional airflow-dampening devices. This closed-loop integration of the air conditioning supply or exhaust completes the modular airflow containment strategy in the data centre, resulting in more energy-efficient operation.



Tool-less access panels allow quick and easy installation on your existing CRAC units. Hinged access panels allow for easy cleaning, filter replacement and maintenance. CRAC collars are also available with optional backflow baffle.

## Raised floor grommets

By installing Eaton's raised floor grommets, you can optimise the effectiveness of existing cooling equipment and manage increasing heat loads. The raised floor sealing system specifically addresses bypass airflow and its detrimental effect on data centre cooling. Laboratory testing has demonstrated the raised floor grommet's superior performance compared to brush strip and membrane-based solutions.



Non-permeable material allows maximum pressure to be maintained in the subfloor plenum when cables are installed; minimising bypass airflow.

### Features and benefits

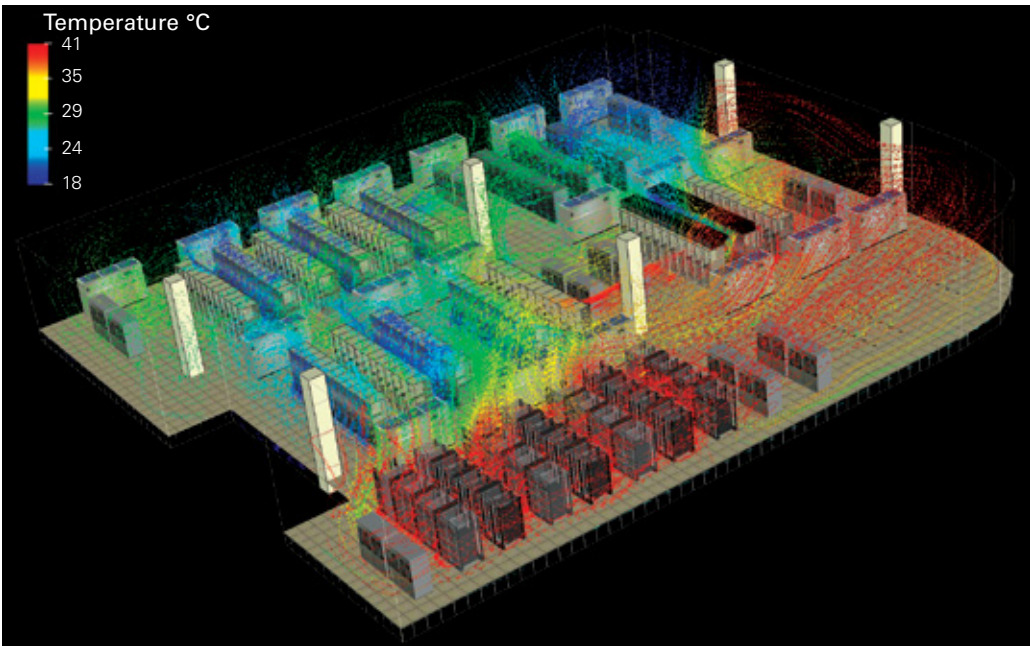
- Increased energy efficiency & predictability—eliminates bypass airflow while maintaining a consistent subfloor plenum pressure.
- Flexible design—overlapping serrated fingers and optional elastomer ties adapt to cable bundles of any size or shape. Ties ensure a complete and lasting seal by providing tension against the cabling.
- Superior performance—delivers a faster and greater ROI than any other solution on the market

# Computational Fluid Dynamics Modelling

Eaton's innovative Computational Fluid Dynamics (CFD) Modelling Service provides a comprehensive approach to modelling the airflow, temperature, static pressure and energy profile of dynamic, critical environments. Using Future Facilities' 6SigmaDC software, we construct a virtual representation of your data centre. This representation models the impact of load distribution within the facility, as well as the flow of hot and cold air within the space. It also illustrates how to increase rack densities and server installations without creating additional hot spots and airflow issues.

Providing fact-based decisions aimed at improving operational efficiency and reliability, the CFD modelling analysis is essential for creating and operating a more predictable data centre.

The service compares and substantiates which design decisions will maximise your data centre flexibility, scalability and resilience. It gives you the opportunity to explore the best possible options for IT and facility growth, create a calculated plan and avoid major capital commitments and costly design and implementation.



Streamline plot showing temperature of air as it flows through the data centre. Plots can be animated to illustrate direction of flow.

Pricing for Eaton's CFD Service is based on specific customer requirements and there are several levels of customised service available. A pre-quote consultation and/or walk-through by an Eaton CFD team member is advised to determine the scope and level of CFD service required.

### Features

- Four levels of service
- State-of-the-art software and tools
- Certified technicians
- Detailed reporting

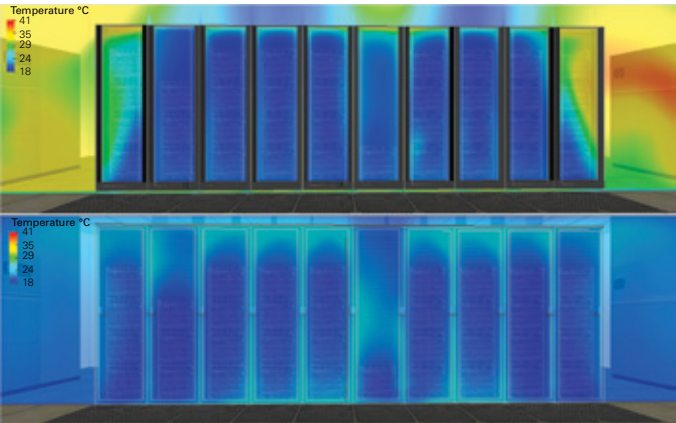
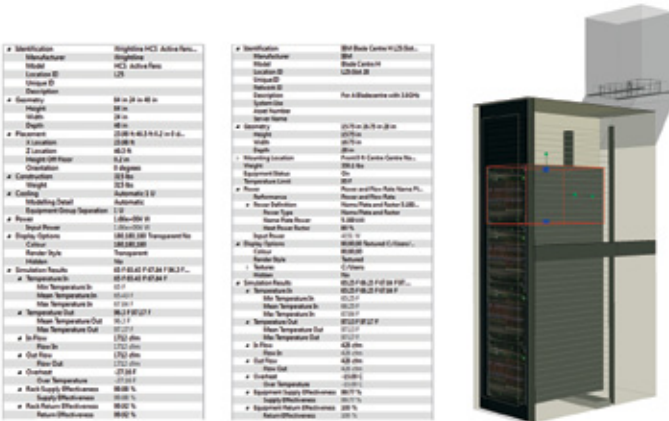
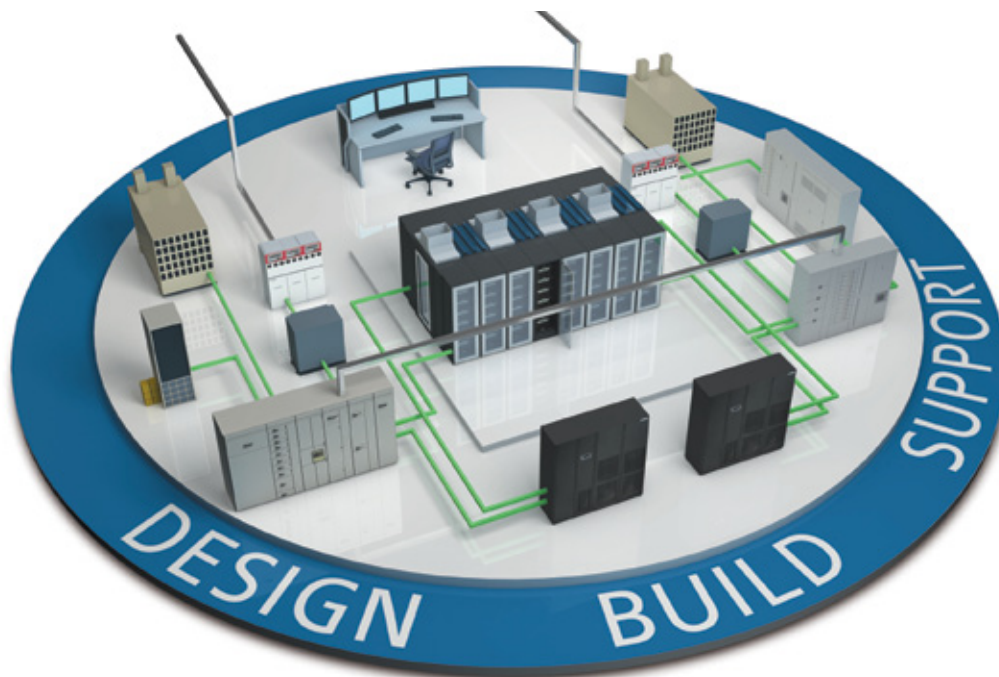


Illustration shows comparison of rack inlet temperatures before and after chimney HCS deployment.



Eaton can provide extensive performance details for your entire data centre down to specific devices at the rack level.

# Eaton Data Centre Solutions



Your data centre and the network it supports forms the backbone of your enterprise. If there's a problem with the power to your data centre, every part of your enterprise can be impacted. When the stakes are this high, you need exceptional power management capabilities throughout your power system. Every link in the system that supplies power to your data centre must be strong and reliable.

Eaton can help you build a power system that delivers the reliable, high-quality power your data centre needs. We help enterprises find competitive advantages by seeing every power system as a

strategic asset to be measured and managed as an integrated system throughout its life cycle. Taking a broader view of a power system as an integrated system leads to powerful results: greater reliability, operating cost efficiencies, effective use of capital, enhanced safety and risk mitigation.

Call on our experienced data centre specialists to manage a construction project from start to finish, to recondition or upgrade equipment or to modernise a power system. In addition, our support services will help you make the most of your existing electrical equipment by optimising performance and longevity.

## Power Distribution



Distribution products provide the backbone of your electrical system. They need to perform. We have developed our industry-leading solutions in medium and low voltage power distribution to ensure a reliable, safe and efficient supply of power to critical data centre applications.

## Power Quality



How do you locate problems before they develop, avert them before they grow, increase reliability and decrease downtime and costs? Eaton's power quality solutions maximise clean, safe and reliable power to critical applications, giving you continuous uptime and keeping your business running without interruption.

## Heat Management



A range of solutions that protect critical infrastructures by maintaining a predictable environment, offering the ability to direct and separate hot and cold air, as well as the ability to accurately measure performance.

## Monitoring



Increasingly populated server racks mean increased heat levels, and increasingly complex and diverse systems. All of these factors need managing. We offer one of the broadest ranges of automation and enclosed electrical control devices available for managing your data centre environment. Additionally, at the forefront of lean connectivity and lean automation technologies, we're working towards optimising processes while reducing costs.

## Services



Our experienced data centre specialists will help you design, build and maintain data centre power and airflow management infrastructure, allowing you to manage power systems as a strategic resource that brings competitive advantage.

Eaton is dedicated to ensuring that reliable, efficient and safe power is available when it's needed most. With unparalleled knowledge of electrical power management across industries, experts at Eaton deliver customised, integrated solutions to solve our customers' most critical challenges.

Our focus is on delivering the right solution for the application. But, decision makers demand more than just innovative products. They turn to Eaton for an unwavering commitment to personal support that makes customer success a top priority. For more information, visit [www.eaton.com/electrical](http://www.eaton.com/electrical).

For assistance with your heat management needs, contact your local Eaton service and sales representatives.

**[www.eaton.eu/datacentres](http://www.eaton.eu/datacentres)**



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