

Coolant Distribution Unit (CDU) Inrow and Skid Design

400kW–2MW+ Liquid-Liquid Heat Exchanger for
Liquid Cooled & Hybrid Data Center Architectures



The Global Critical Cooling Specialist

Calgary, Alberta
Franklin, Wisconsin
Jefferson City, Missouri
Rockbridge, Virginia
Grenada, Mississippi

Consett, UK
Leeds, UK
Bradford, UK
Guadalajara, Spain

Dubai, UAE
Chennai, India

Global Locations:

- **Leeds, UK** – Chiller production; R&D and test laboratories; training center
- **Bradford, UK** – CDU, CRAH, CRAC, fan wall production
- **Consett, UK** – AHU production
- **Guadalajara, ES** – CDU, CRAH, fan wall production; test laboratories
- **Chennai, India** – CRAH, fan wall production
- **Franklin, Wisconsin** – under development
- **Jefferson City, Missouri** – under development
- **Grenada, MS, US** – CDU, CRAH, fan wall production; test laboratories
- **Rockbridge, VA, US** – Chiller and CDU production; R&D and test laboratories
- **Calgary, CN** – AHU production; test laboratories
- **Dubai, UAE** – Sales office

Airedale by Modine is the critical cooling specialist, with the technology and expertise to meet the specific operational demands of data centers worldwide. We take a collaborative approach, delivering customized solutions at scale to colocation and hyperscale data center clients whose network of global facilities demand a more bespoke solution.

Our hybrid cooling solutions encompass high efficiency air and liquid cooling systems, intelligent controls software and comprehensive aftersales support.

Renowned for the expertise of our people, with world class products and plants, Airedale by Modine is proud of its research and development (R&D) ethos being firmly rooted in sustainability and quality. We are committed to deliver best-in-class technical design, energy performance, project delivery and ongoing lifecycle optimization; all of which comes together to support our clients in meeting their performance, efficiency and sustainability goals.

With a global network of facilities, encompassing R&D laboratories, test chambers, production, training and sales offices, Airedale by Modine has sites across three continents, in North America, Europe and Asia.

Airedale by Modine is part of Modine (NYSE:MOD), a diversified global leader in thermal management technology and solutions.

For more information visit www.airedale.com

The Complete Cooling Solution for Global Data Centers

Today's technology, designed for tomorrow

Increasing demand for emerging digital technologies is driving the transformation of colocation and hyperscale data centers, and it is imperative that the cooling technology employed evolves at the same pace.

System design

Airedale by Modine takes a holistic approach to data center cooling; designing units as components of an integrated ecosystem that can flex and grow with the technology demands of the future. Our cooling solutions are designed with built-in redundancy and up to Tier 4 compliance, and work harmoniously with the building and each other, to maximize efficiency and resilience.

Customized solutions

We prioritize flexible design, tailoring high-volume orders to meet the evolving needs of hyperscale, colocation, and neocloud environments. Our CDU configurations offer adaptable options for redundancy, filtration, materials, flow control, temperature, and overall performance. Through close collaboration, our DCS engineering team delivers solutions precisely aligned with each client's operational goals and site-specific requirements.

Full solution provider

With over 50 years of experience, we know a full cooling system investment, complete with controls and service, is more than a purchase; it's a trusted partnership focused on long-term optimization.

The CDU integrates effortlessly into hybrid or liquid cooling systems, optimizing efficiency and performance through seamless liquid-air compatibility.



Coolant Distribution Unit (CDU)

Engineered to accelerate digital transformation and meet the needs of next-generation CPUs and GPUs, Airedale by Modine's CDUs enable liquid cooling in high-density IT applications.

Airedale by Modine's CDUs are designed for direct-to-chip and hybrid cooling environments, including rear door heat exchanger (RDHx) applications that facilitate simplistic, modular, efficient and performance-driven deployments.

Key Features, Proven Benefits:

- Engineered to perform, resilient and reliable with in-built redundant pumps, filtration and intuitive system controls to support load fluctuations with precise coolant delivery.
- Range platform allows configuration flexibility. Custom operator requirements can be engineered with scale and high volume orders.
- Modular and global design, with ability to apply and deliver wherever your projects are.
- Seamless integration into in-rack server profiles or facility rooms, Airedale by Modine's CDU is compatible with your existing infrastructure to create a dynamic, end-to-end, future-proof thermal management system.



Up to 2MW+ Capacity

Compact footprint and maximized power density for liquid/hybrid enablement

Engineered to order options >2MW



Filtration

Extra large filter bodies to maximize filtration area, minimizing risk of contamination.

Standard filtration of 25µm



Redundancy

N+1 pumps, drives and filters allow for the isolation of redundant leg for service/maintenance during operation



Access

Front accessible components (control panel, VSDs, expansion tanks, filter cartridges)

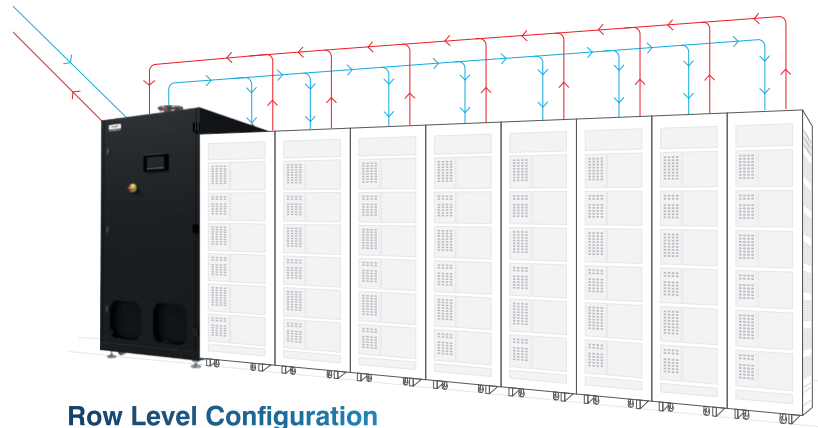
System Configuration

Airedale by Modine's CDU, designed in consultation with industry professionals, provides a technology cooling system (TCS – secondary) fluid cooling loop to achieve heat exchange between the facility (primary) water system (FWS) and the fluid circuits serving the IT equipment (ITE). The loop enables control and separation, allowing the CDU to monitor and regulate fluid flow and temperature to facilitate the adoption of liquid cooling systems, including direct-to-chip cooling and rear-door heat exchangers (RDHxs).

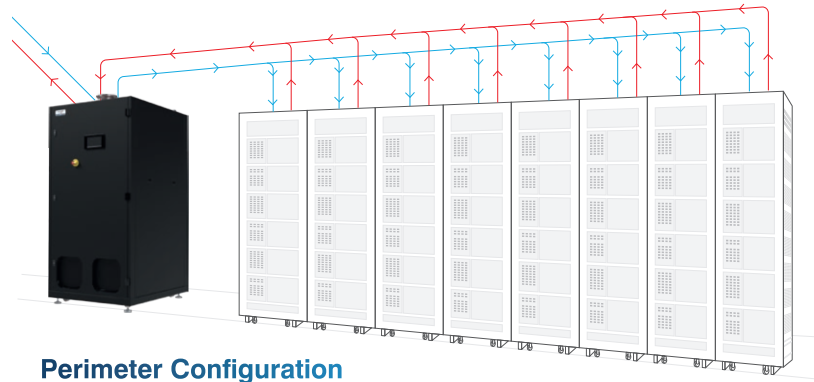
Integrated pumps control coolant flow to the ITE technology loop.

Optimized for space claim, serviceability, efficiency and performance, the CDU can deliver up to 2MW of capacity and be positioned in the server rows, at the facilities perimeter, outside the white space, or in the facility room – via slab or raised floor.

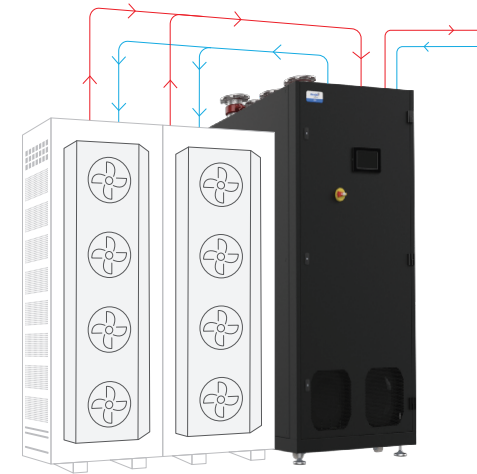
For large scale orders that demand capacities greater than 2MW, we can customize and engineer the CDU for a bespoke solution.



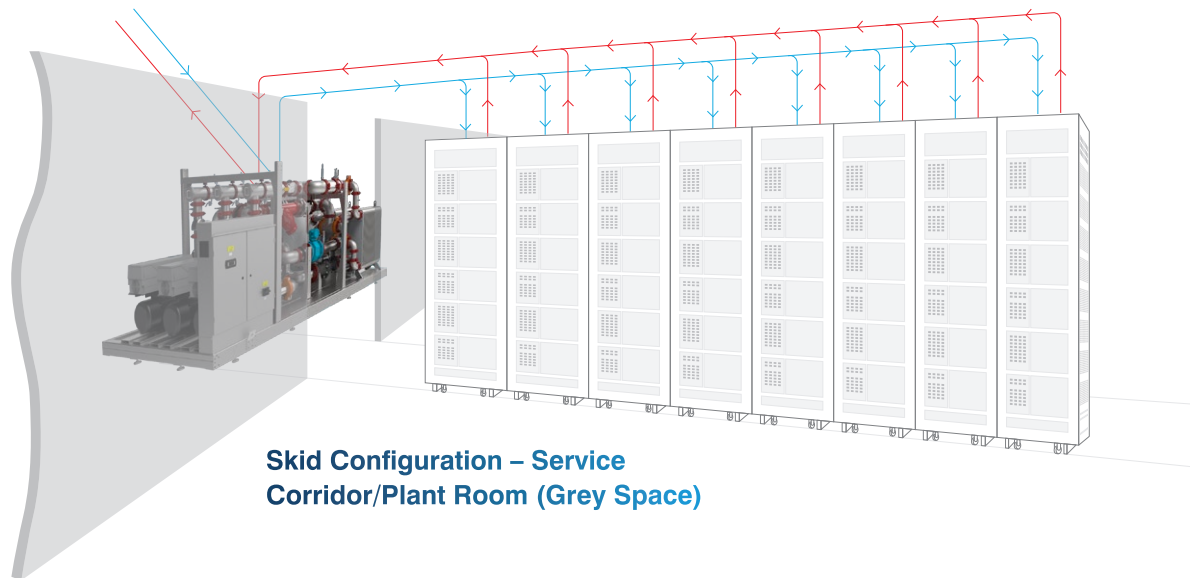
Row Level Configuration



Perimeter Configuration



Row level CDU + RDHX for hybrid Direct-to-Chip Cooling



Skid Configuration – Service Corridor/Plant Room (Grey Space)

Key Features

1 Vu™ Touch Screen HMI

A 7" colour TFT touch screen display, providing a graphical representation of the system process, unit status and diagnosing specific faults including leak detection.

2 Pumps (N+1)

Redundant circulated pumps, including higher efficiency options. Operating in a run/standby configuration or simultaneously.

3 Stainless Steel Pipework

Stainless 304 SCH5S pipework. Complete stainless steel pipelines, including pumps, to eliminate particle generation.

4 Controller & Control Panel

Offering an intuitive user interface. Controller is responsible for ensuring precise control and managing uptime. Able to network up to 8 CDUs. Easy integration to any BMS including Airedale by Modine's ACIS™ and Cooling System Optimizer™.

5 Plate Heat Exchanger (PHX)

Compact PHX customizable to optimize for application. Stainless steel/copper brazed PHX (standard). Fusion bonded stainless steel PHX (option).

6 Variable Speed Drives (N+1)

Integrated, redundant variable speed drives for precise fluid delivery performance.

7 Pipework Connections

Inrow CDU features top connections (standard), bottom connections (option). Flanged (standard), grooved and hygienic connections (option). Isolation valves for supply and return.

8 Filters

Keeps the coolant fluid free from contaminants, protecting the integrity of the cold plate and maintaining cooling performance. Standard filtration of 25µm (50µm option).

9 Motorized Isolation Valves

Motorized isolation valves (standard) can be configured to isolate the CDU from the servers upon remote authorization by the plant operator.

10 Active Harmonic Filter (AHF)

Active harmonic filter integrated to compensate for unwanted harmonics. The AHF improves the system efficiency while reducing harmonic pollution. The AHF device is in compliance with IEEE 519 standard.



Skid-Based CDU

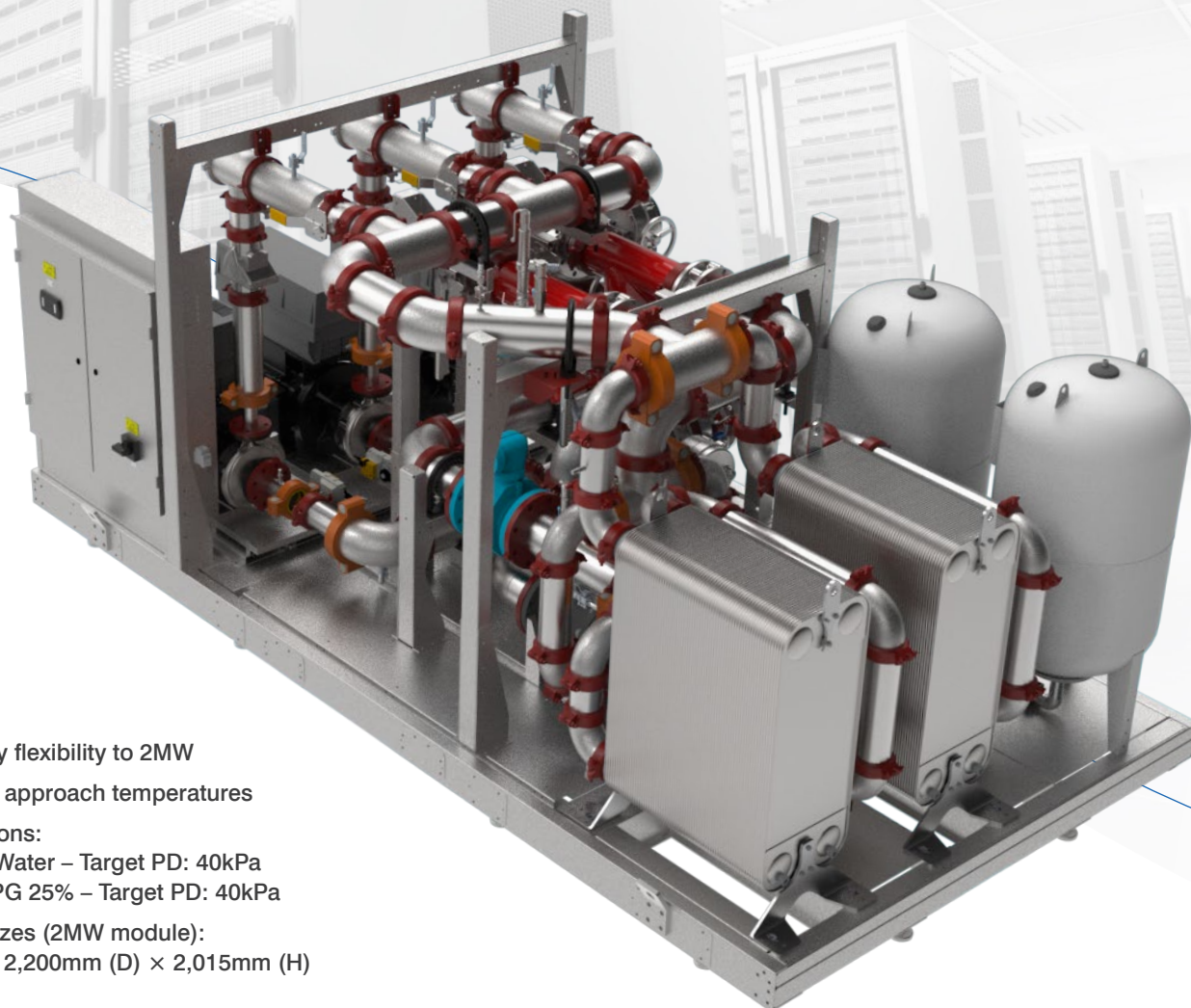
Airedale by Modine's skid-based CDU is a fully integrated, rigorously tested, high-performance solution designed for seamless deployment in grey-space environments, gantries, or plant rooms. Built to handle high-capacity thermal loads, it ensures precision cooling for mission-critical data center operations.

The centralized skid configuration streamlines installation, commissioning and servicing, minimizing on-site disruption while delivering dependable performance and agile scalability to meet fluctuating demands.

Its modular architecture and thoughtfully arranged layout enhance accessibility for preventative maintenance, promoting system resilience, operational efficiency, and maximum uptime.

Key Features & Benefits:

- Modular and global design with a compact footprint and robust framework
- Configurable to specific footprints; suitable for both plant rooms and service corridors
- Pre-manufactured; self-contained and tested off-site
- Increased buffer tanks and storage vessels (full stainless steel)
- Designed for easy access for maintenance and quick connection between FWS and TCS
- Cooling capacity flexibility to 2MW
- 1K to 4K design approach temperatures
- Nominal conditions:
FWS 20/30°C – Water – Target PD: 40kPa
TCS 24/34°C – PG 25% – Target PD: 40kPa
- Standard skid sizes (2MW module):
4,200mm (W) × 2,200mm (D) × 2,015mm (H)



Liquid Courage

Introducing fluid close to critical IT equipment is a risk many data center operators are wary of. Airedale by Modine's CDU has integrated safety features that protect, detect, and mitigate fluid leaks, ensuring unrivaled peace of mind and an efficient, reliant, and resilient safe supply to critical IT equipment.



1. Prevent

The Airedale Quality Management System (AQMS) ensures adherence to highest possible build standards and robust testing protocols in our global manufacturing plants.

Fully welded internal pipework (option).

Actuated isolation valves (external to the inrow CDU/internal to the skid CDU). In the event of a leak, the motorized isolation valves can be configured to isolate the CDU from the servers upon remote authorization by the plant operator, or carry out an immediate emergency shutdown and isolation.



2. Detect

The unit provides water leak detection at both internal and external locations using tape and probe sensors.

Internal sensors are factory-fitted as standard to monitor in the unlikely event of leakage in the unit. Internal detection is possible using a tape sensor to wick any drops of fluid and trigger an alarm when exposed to small volumes of water. An additional tape sensor is fitted in the unit's drip tray to prevent false alarms during servicing.

Optional remote sensors are supplied loose for on-site installation, enabling detection of external leaks as required.



3. Mitigate

The unit control system includes leak mitigation features, including local alarm indication at the unit display and remote indication via the BMS. A "handshake" mechanism requests remote permission before the operation is interrupted and before any isolation of the unit from water circuits.

Fully welded, stainless steel drip tray supplied to confine a leak and direct it towards a drain point.



Other Features

● Standard ● Optional

FWS: Facility Water System (Primary)

TCS: Technology Cooling System (Secondary)

Electrical/Controls

- TCS temperature control
- TCS differential pressure or flow control
- Pump operation
 - 1: Run/standby only
 - 2: Simultaneous operation (on request)
- Dew point offset
- Manual override

Sensors

- Filter change
- FWS inlet/outlet pressure
- TCS inlet/outlet pressure with N+1 redundancy
- TCS supply temperature
- TCS return temperature with N+1 redundancy
- TCS flow meter
- FWS supply temperature
- FWS return temperature
- FWS flow meter
- Leak detection – 2 × internal
- Leak detection – 1 × external

Pipework Connection Locations

- FWS Top/TCS Top
- FWS Bottom/TCS Top

Pipework Terminations

- Flanged
- Grooved & Hygienic

Filtration

- 25 micron
- 50 micron

Valves

- Energy valve – FWS
- PIC valve – FWS
- Supply actuated isolation valve – FWS
- Externally fitted actuated isolation valves – TCS

Power

- Single power supply:
 - 1: 400V/3Ph/50Hz
 - 2: 380V/3Ph/60Hz
 - 3: 460V/3Ph/60Hz
- Dual power supply
- Active harmonic filtration
- Mains isolation switch
- Upgraded SCCR (65kA) (60Hz)

Features (inrow)

- High efficiency brazed plate heat exchanger
- Full stainless steel fusion bonded plate heat exchanger
- Castors
- Anti-vibration feet
- Seismic stabilization feet



Nominal Design Conditions

CDU10–12 (inrow)								
ASHRAE W2 Facility Water Temperature					ASHRAE W3 Facility Water Temperature			
	NA	Global	NA	Global	NA	Global	NA	Global
Technology System	Water		25% Prop. Glycol		Water		25% Prop. Glycol	
Supply Temperature	88°F	31°C	88°F	31°C	97°F	36°C	97°F	36°C
Return Temperature	106°F	41°C	106°F	41°C	115°F	46°C	115°F	46°C
Flowrate	393gpm	24.8/s	394gpm	24.8/s	393gpm	24.8/s	393gpm	24.8/s
l/m/kW Metric	1.5l/m/kW		1.5l/m/kW		1.5l/m/kW		1.5l/m/kW	
External Head	50psi	350kPa	50psi	350kPa	49psi	340kPa	49psi	345kPa
Facility Water System	Water		25% Prop. Glycol		Water		25% Prop. Glycol	
Supply Temperature	81°F	27°C	81°F	27°C	90°F	32°C	90°F	32°C
Return Temperature	99°F	37°C	99°F	37°C	108°F	42°C	108°F	42°C
Flowrate	393gpm	24.8/s	393gpm	24.8/s	393gpm	24.8/s	393gpm	24.8/s
Total								
Total Capacity	1028kW		1000kW		1027kW		1000kW	
Approach	7.2°R	4K	7.2°R	4K	7.2°R	4K	7.2°R	4K

CDU15 (skid)								
ASHRAE W2 Facility Water Temperature					ASHRAE W3 Facility Water Temperature			
	NA	Global	NA	Global	NA	Global	NA	Global
Technology System	Water		25% Prop. Glycol		Water		25% Prop. Glycol	
Supply Temperature	88°F	31°C	88°F	31°C	97°F	36°C	97°F	36°C
Return Temperature	106°F	41°C	106°F	41°C	115°F	46°C	115°F	46°C
Flowrate	825gpm	52.1/s	825gpm	52.1/s	826gpm	52.1/s	825gpm	52.1/s
l/m/kW Metric	1.5l/m/kW		1.5l/m/kW		1.5l/m/kW		1.5l/m/kW	
External Head	50psi	350kPa	50psi	350kPa	50psi	350kPa	50psi	350kPa
Facility Water System	Water		25% Prop. Glycol		Water		25% Prop. Glycol	
Supply Temperature	81°F	27°C	81°F	27°C	90°F	32°C	90°F	32°C
Return Temperature	99°F	37°C	99°F	37°C	108°F	42°C	108°F	42°C
Flowrate	824gpm	52.0/s	824gpm	52.0/s	824gpm	52.0/s	824gpm	52.0/s
Total								
Total Capacity	2160kW		2100kW		2160kW		2100kW	
Approach	7.2°R	4K	7.2°R	4K	7.2°R	4K	7.2°R	4K

	CDU10		CDU12		CDU15	
Dimensions	NA	Global	NA	Global	NA	Global
Height	84.6in*	2150mm*	84.6in*	2150mm*	78.1in	2015mm
Width	38.5in	978mm	47.2in	1200mm	165.4in	4200mm
Depth	47.2in	1200mm	47.2in	1200mm	86.6in	2200mm

*Overall height including the top connections, case height 2000mm (78.7in)



IQity™ is Airedale by Modine's IoT-enabled technology framework, revolutionizing how cooling is connected, controlled and automated in critical facilities at a product, system and site level.

SYSTEM

CW System Optimizer
CRAH Energy Optimizer
Chiller Sequencer
HVAC Controls Suite

Optimizer

SITE

ACIS Facility Management

- BMS
- PMS
- BEMS

ACIS Edge
ACIS Telecoms

ACIS™

PRODUCT

Precision Controls
Chiller Controls
Optimized Head
Pressure Control
Chiller Fast Start
Energy Manager
Refrigerant Manager
Compressor Manager

helix™

Sustainable by Design

CDUs can form part of a strategic approach to sustainability, critical for data centers aiming to balance performance with environmental responsibility.



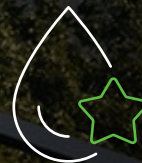
Energy Efficiency

Targeting the heat at source minimizes the risk and opportunity to overcool the entire space, reducing energy waste and improving power usage effectiveness (PUE).



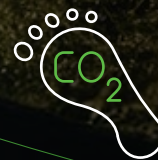
Scalable Deployment

The Airedale by Modine CDU delivers agile scalability to meet fluctuating demands and allow for right-sized cooling deployments, reducing the risk of overprovision and therefore embodied carbon.



Water Efficiency

Closed loop water circuits minimize water waste. Managing water usage is critical for our planet.

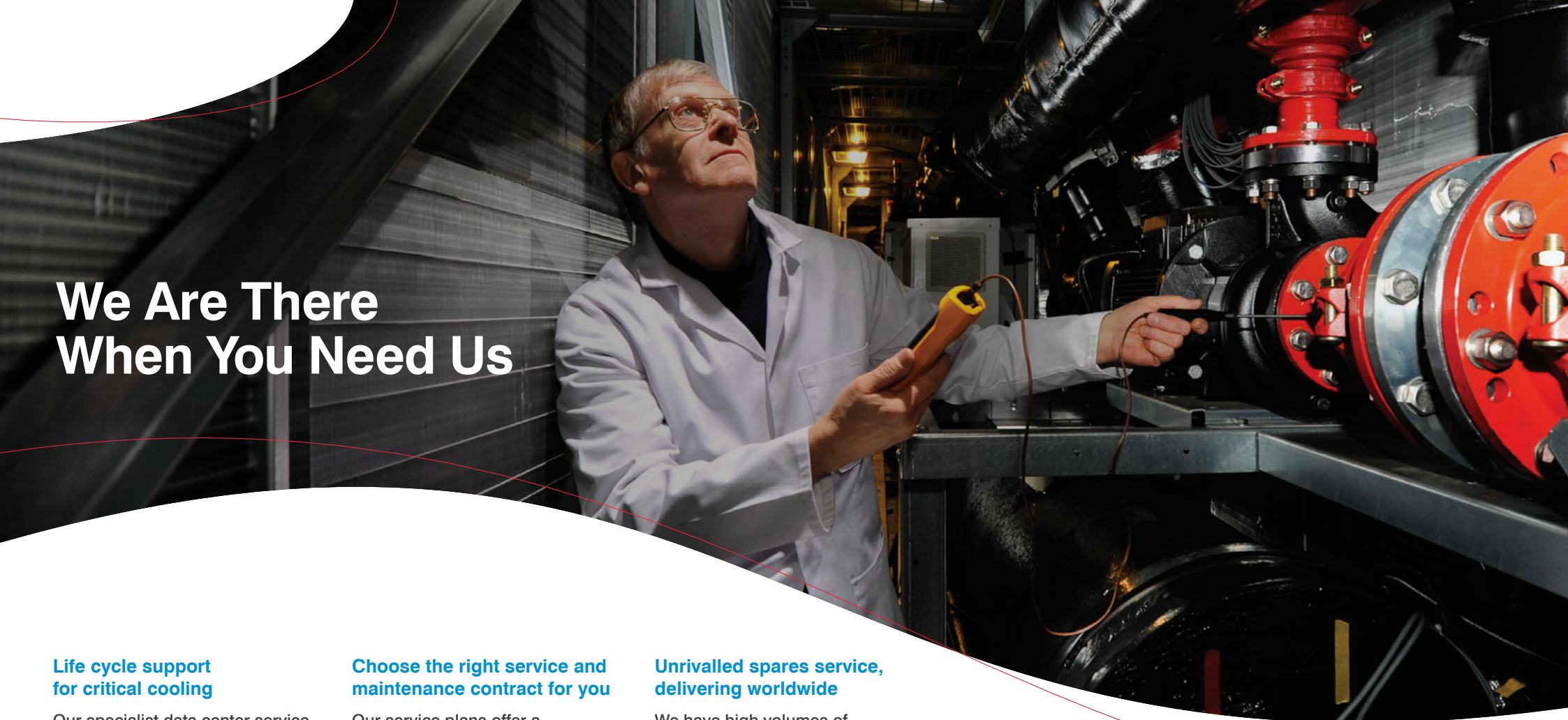


Lower Carbon Footprint

Energy efficiency, scalability and targeted thermal management supports data centers in reducing their carbon footprint, as they move towards more sustainable operation.

Airedale by Modine is a great example of a supplier that is engaged in the sustainability collaboration challenge. They are responsive to our sustainability priorities, and we take the lead from them on areas such as controls optimization to improve energy efficiency, reducing embodied carbon in cooling equipment and sustainability performance metrics relating to our products.

Senior Carbon Accounting Engineer at a data center developer



We Are There When You Need Us

Life cycle support for critical cooling

Our specialist data center service support includes commissioning, planned maintenance, repair, tech support and spares.

We offer a 24/7 emergency helpline and call out service, available 365 days of the year to our contracted service and maintenance clients from the data center industry.

Guaranteed response times means that an accredited Airedale by Modine engineer will be with you in an agreed timeframe, maximizing your system's uptime.

Choose the right service and maintenance contract for you

Our service plans offer a preventative air conditioning maintenance service solution to improve system resilience and increase the longevity of your cooling system.

Planned maintenance not only assists in preventing unit breakdowns in business-critical environments, but also helps to improve energy efficiency and enhance system optimization for improved performance. Over the life cycle of the product this can lead to reduced running costs, improved carbon footprint and quicker returns on investment.

Unrivalled spares service, delivering worldwide

We have high volumes of spares in stock at our global facilities, ready to dispatch to our engineers and customers when they need us most.



Vodafone data
center update

“Reliability and the level of service that Airedale offers are key issues for a business critical location such as this. The project ran very smoothly.”



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