Airedale by MODINE

TurboChill EDCS™

Low GWP refrigerant R1234ze

800kW–2MW

The Global Critical Cooling Specialist

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

TurboChill DCS™

Designed for data centers

Data centers have evolved at an unprecedented rate, and so has the technology that cools them.

The data center engineering team at Airedale by Modine has redesigned the TurboChill DCS™ range from the ground up.

Re-evaluating every component for optimal efficiency, reliability and performance, design parameters have been pushed to create a chiller that not only supports the sustainability targets of our clients, but extends the boundaries of cooling technology in the data centers of today, and tomorrow.

Working collaboratively with trusted data center clients, we have listened, developed and pushed the TurboChill™ to operate at higher performance and efficiency levels than ever before.

Developed to support the hyperscale and colocation market, TurboChill DCS offers high capacity cooling up to 2MW.

With Enhanced Free Cooling™ technology for increased efficiency, and low GWP refrigerant R1234ze (GWP: 1.37), TurboChill DCS has been designed to operate in a wide range of ambient temperatures, making it suitable for global application.

Efficiency

- Economizer option for increased capacity for a given footprint.
- Turbocor® compressors offer excellent full and part load performance.
- Each active compressor is paired with its own expansion valve, allowing precise modulation. At full load, all operate in paralell; at reduced load, inactive valves close, enhancing control, stability and efficiency.
- Variable flow controls capability helps to reduce primary pump power draw.

Performance

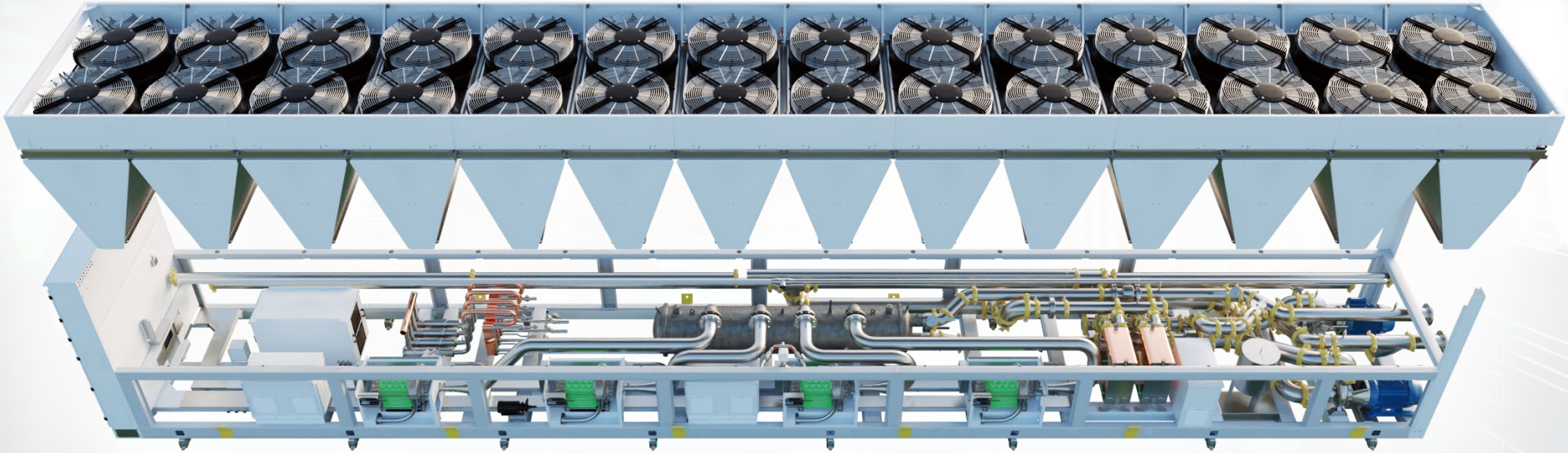
- Variable capacity control.
- Operates effectively at very low-pressure ratios with liquid refrigerant pump installed.
- Supply water temperatures up to 26°C (79°F).
- Oil free system for maximum heat exchanger performance.

Reliability

- High quality components from leading global brands.
- Incredibly strong case construction.
- Powder coated paint process designed to last up to 20 years.
- Epoxy coated coils to maximize lifespan.
- Extensive validation testing in state-of-the-art laboratories up to 55°C (131°F) ambient temperature.

TurboChill DCS™

The story so far…



2005

The first TurboChill air cooled unit launched to the market with high capacity up to 1830kW.

2010

First TurboChill Free Cool unit launched.

2012

First TurboChill water cooled unit launched.

Capacity 500kW–1000kW.

2014

First low GWP R1234ze TurboChill launched.

Capacity 200kW–1360kW.

2018/19

Evaporator and compressor technology updated within the TurboChill range.

2020

TurboChill Hydro launched.

Up to 3000kW.

2022

TurboChill DCS development began.

2025

TurboChill DCS™ launched

New technology developed in close collaboration with data center customers.

Data Center Solutions DCS™

Specialist critical cooling systems designed for hyperscale and colocation data centers.

TurboChill HDCS™

Key benefits, proven features

Enhanced Free Cooling™

- Can deliver up to 36% energy savings over standard free cooling.
- Reconfigured V-block engineered to accommodate a larger free cooling coil.
- Larger fan to improve airflow.
- 3, 4 and 5 row coil options.
- Optional glycol containment provides both direct and indirect free cooling capability.
- Minimizes annual energy usage by reducing mechanical cooling in concurrent mode.
- Concurrent cooling operation allows the chiller to deliver free cooling for the maximum hours per year possible.

Sustainable Refrigerant R1234ze

Low GWP 1.37

Optimized Oil-Free Centrifugal Turbocor® Compressor

High Capacity

800kW–2MW

Low Sound Operation

Active Harmonic Filtration

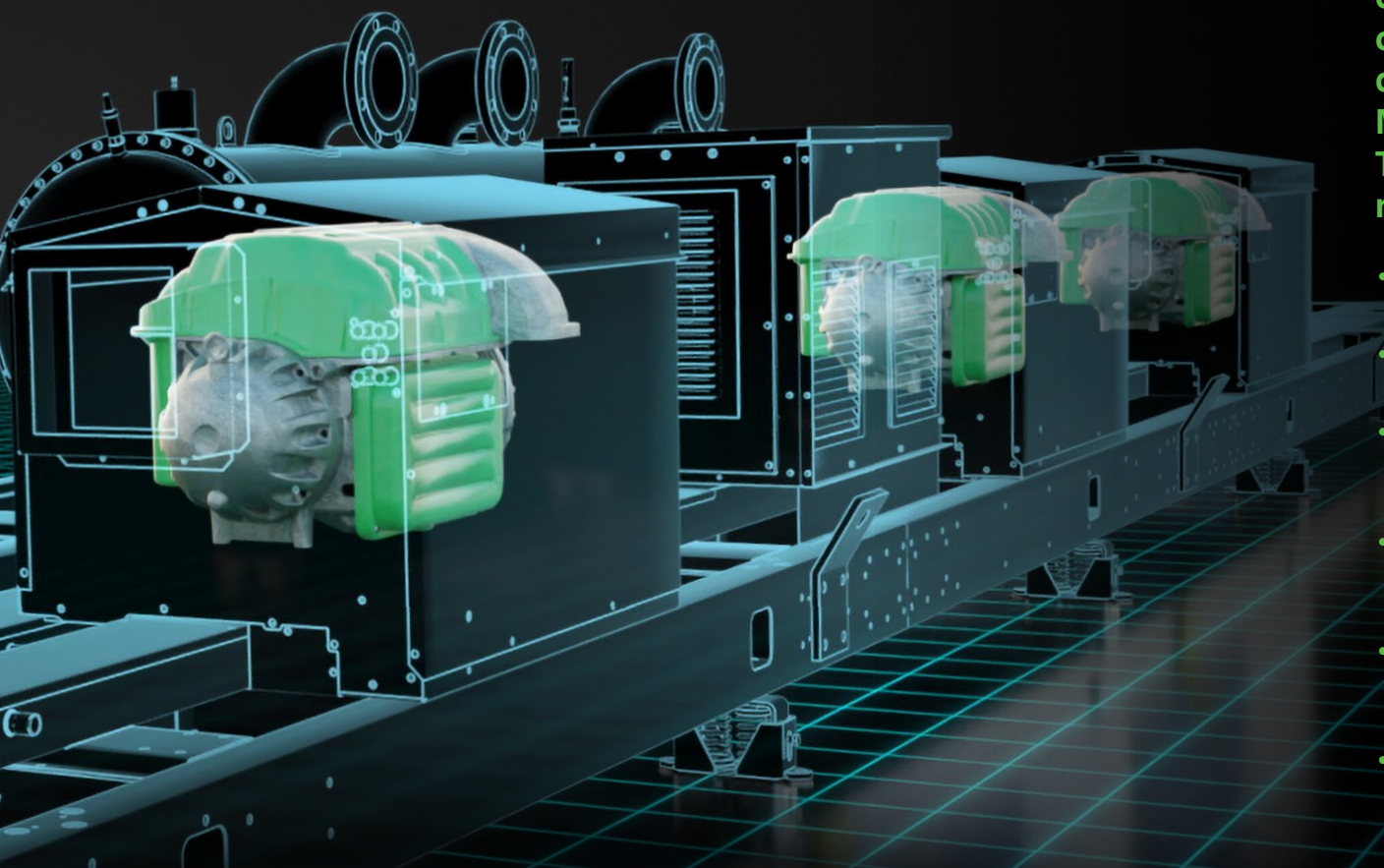
Wide Operating Envelope

–25°C to 55°C (–13°F to 131°F)

Supply Water

up to 26°C (79°F)

18 to 28 Fan Models



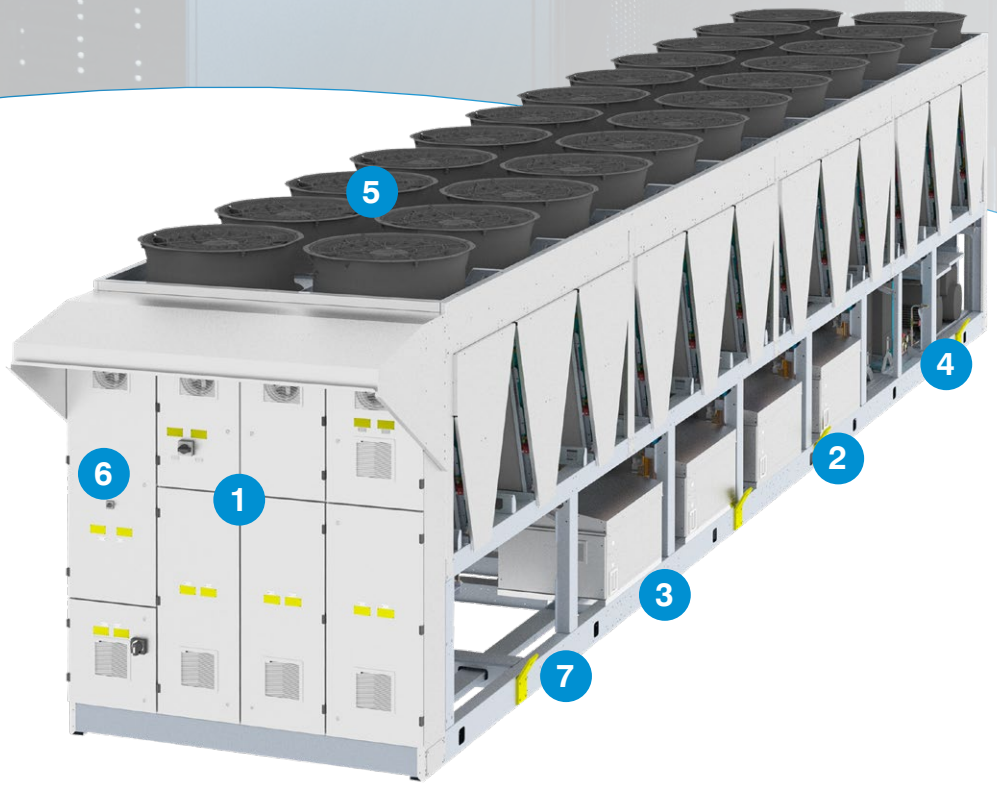
Danfoss Turbocor® compressors are a critical element of TurboChill DCS™. With over 20 years of TurboChill development, design and field experience, Airedale by Modine understands how to optimize the Turbocor compressor to deliver optimal results for your data center.

- Optimized for higher ambient temperatures and water temperatures.
- Oil free refrigerant circuit improves efficiency of all refrigeration cycle heat exchangers.
- Liquid refrigerant pump allows operation in the most efficient area of the envelope, lowering mechanical cooling power draw at lower ambient temperatures.
- Turbocor compressor works with low GWP refrigerant R1234ze, to deliver outstanding efficiency at full and part load, in up to 55°C (131°F) ambient temperature.
- Low noise design – magnetic bearings act as a cushion to eliminate friction and vibration, ensuring that the shaft and impellers run smoothly.
- Compact footprint and lightweight.

The latest compressor technology specifically designed for hyperscale and colocation operating limits

TurboChill EDCS™

In detail



1 Active Control Panel Cooling

- Water based with flow provision handled entirely by the chiller. Easy to maintain without the complexity of additional refrigerant.

2 Refrigeration System

- Enhanced 2-stage refrigerant economizers to deliver unmatched capacity per footprint.
- High ambient temperature operation – designed for and tested up to 55°C (131°F) ambient temperatures to ensure robust operation in the most challenging locations.
- Cooling capacity up to 2MW to meet the requirements of hyperscale and colocation data centers.
- Low GWP refrigerant R1234ze (GWP: 1.37) is rated by the International Panel for Climate Change (IPCC) with a 100-year GWP lower than 1.

3 Turbocor® Compressors Specifically Designed for Data Center Operating Limits

- Optimized for higher ambient temperatures and higher water temperatures.
- Oil free refrigerant circuit improves efficiency of all refrigeration cycle heat exchangers.
- Liquid refrigerant pump allows operation in the most efficient area of the envelope, lowering mechanical cooling power draw at lower ambient temperatures.
- Turbocor compressor works with low GWP refrigerant R1234ze, to deliver outstanding efficiency at full and part load, in up to 55°C (131°F) ambient temperature.

4 Water System

- Pipework sizing optimized to wider delta Ts to assist with reduction in pump power draw.
- On-board variable speed pump enables variable primary flow rate control, delivering energy reductions and increased free cooling.
- Enclosed glycol system separates glycol from indoor systems, protecting against freezing weather conditions, without impacting the performance of indoor units.

5 Heat Rejection

- Enhanced free cooling via larger diameter fans and deeper free cooling coils.
- Low sound operation.
- Modular 'V' frame coil arrangement offers increased heat exchange area and improved air flow for increased efficiency.

6 Control Panel

- Advanced controls platform offers uptime protection and optimized efficiency.
- Fast restart via intelligent controls operation and onboard UPS controller back up, allowing the smoothest management of the system through a power failure.
- Power limiting optimizes the maximum power consumption to allow best use of power available to the site and the IT equipment, all the while ensuring cooling requirements are met.
- Control panel cooling allows operation at high ambient temperatures.
- Harmonic filtration for reduced harmonic distortion to the power grid.

7 Cooling System Optimizer

- Our Cooling System Optimizers integrate individual chiller controllers into a cohesive network, transforming them from isolated devices into an interconnected control system.
- This enables real-time decision-making regarding the chiller's operation, ensuring optimal performance throughout the entire facility.
- Cooling System Optimizer delivers resilience and redundancy to drive down data center operational costs.
- Enables even load sharing across the cooling system.

Optionals

- Direct refrigerant leak detection.
- Seismic ratings for relevant locations.
- Acoustically lined compressor enclosures.
- Plenum for directing air vertically and noise reduction.
- Water flow meter to assist site control and management.
- Spring AV mounts to minimize vibration to the mounting structure.
- Protective rain hood for shielding control panel and technicians from weather conditions.
- Multiple BMS interface protocols for communication of operating parameters and alarms.

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

Our design philosophy prioritizes flexibility over prescriptive solutions. TurboChill DCS reflects a baseline model, showcasing some achievable configurations to serve as a starting point for discussion. Our DCS engineering team collaborates with our clients to develop customized solutions that align precisely with operational parameters and site-specific demands.

Full solution provider

Over 50 years' experience tells us that when a customer invests in a full cooling system encompassing controls and service options, it is more than a transaction – it is a relationship built on trust, with ongoing lifecycle optimization at its core.

TurboChill DCS is designed for easy integration into air, hybrid or all liquid cooling systems. It works seamlessly with a combination of liquid and air cooling solutions, to give the very best efficiency and performance for your data center.

TurboChill HDCS™

Designed for intelligence

helix

- **Power Limiting** – Ensures that the power draw of the chiller does not exceed a client defined level, giving certainty in electrical system sizing and generator capabilities.
- **Fast Restart** – Startup speed is critical to maintaining cooling to the IT equipment and minimizing need for buffer capacity.
- **Intelligent Fan Speed Control to Manage Performance, Efficiency and Acoustics**
- **Variable Primary Flow** – Improves energy efficiency by reducing pump power draw and ensuring return water temperature stays high, delivering more free cooling.
- **High Pressure Unloading** – Ensures that cooling continues and the possibility of shutdown is minimized, even during unforseen circustances.
- **Optimized Head Pressure Control** – Ensures operation of the mechanical cooling circuit is tailored to both demand and operating ambient temperature, to give the lowest possible energy consumption.
- **Compressor Envelope Control via Refrigerant Pump** – Allows the compressor to operate in its most efficient, ultra-low lift zone when operating conditions allow.
- **Refrigerant Migration Protection** – Ensures reliable start up, regardless of ambient temperature by managing the location of refrigerant.

IQity™ Software Framework

Airedale by Modine's software tech stack dedicated to the intelligent control and monitoring of data centers.

SITE

ACIS™

Facility Management System

SYSTEM

Cooling System Optimizer™

Intelligent cooling management

PRODUCT

helix™

Intelligent controls in all Airedale by Modine products

Technical Data

50 Hz	Notes	Units	TCF13R18K	TCF24R24G	TCC14R28K
Capacity					
Nominal cooling (gross)	(1)	kW	985	1600	1850
Nominal EER	(2)		4.8	4.6	4.0
Ambient when free cooling	(3)	°C	2.1	10.8	N/A
Max. cooling (gross)	(1)	kW	1500	1760	2000
Max. cooling EER	(2)		3.7	4.3	3.8
Dimensions					
Depth	H	mm	2844	2900	2844
Height	W	mm	2200	2200	2200
Width	L	mm	10550	14385	16207
Mass – machine/operating		kg	15080/16600	17171/18736	12630/13161
Unit					
Water volume		l	1520	1565	531
Nominal water flow rate		l/s	23.5	25.7	44.2
Nominal airflow		m^3/s	94.8	140.7	176.0
Max. airflow		m^3/s	143.6	169.5	234.8

(1) Nominal cooling capacity and nominal EER is at 20/30°C water and 35°C ambient, 100% water.
(2) Based on total input power of compressors and fans.
(3) Ambient when the total nominal cooling capacity can be met with free cooling alone, free cooling based on 25% Propylene Glycol contained loop.
(3) TCF13R18K based on 2 row free cooling coil data, TCF24R24G based on 4 row. Other coil configurations available please contact Airedale by Modine.

60 Hz	Notes	Units	TCF13R18K	TCF24R24G	TCC14R28K
Capacity					
Nominal cooling (gross)	(1)	TR	280	370	441
Nominal EER	(2)	(Btu/hr)/W	11.9	10.7	11.5
Ambient when free cooling	(3)	°F	35.8	56.2	N/A
Max. cooling (gross)	(1)	(Btu/hr)/W	404	384	530
Max. cooling EER	(2)		10.5	10.8	10.4
Dimensions					
Depth	H	in	112	114	112
Height	W	in	87	87	87
Width	L	in	415	566	638
Mass – machine/operating		lb	33246/36597	37856/41306	27844/29015
Unit					
Water volume		gal	402	413	140
Nominal water flow rate		gpm	372	407	586
Nominal airflow		CFM	200870	298126	369007
Max. airflow		CFM	304271	359150	497606

(1) Nominal cooling capacity and nominal EER is at 68/86°F (20/30°C) water and 115°F (46.1°C) ambient, 100% water.
(2) Based on total input power of compressors and fans.
(3) Ambient when the total nominal cooling capacity can be met with free cooling alone, free cooling based on 25% Propylene Glycol contained loop.
(3) TCF13R18K based on 2 row free cooling coil, TCF24R24G based on 4 row coil. Other coil configurations available please contact Airedale by Modine.

Sustainable by Design

As an industry it is unanimously agreed that data centers have to set the standards, by operating responsibly and sustainably. Optimal energy efficiency and extended equipment lifespan depend on the seamless integration and coordinated performance of all system components.

Airedale by Modine incorporates sustainable values into every project.

Free Cooling Technology

Delivering meaningful energy savings and a longer unit lifespan in the right environmental conditions.

Using Low GWP Refrigerants

R1234ze has a GWP of 1.37 and is one of the least harmful refrigerants used in chillers.

Embodied Carbon Calculations

Using the CIBSE TM65 method to calculate embodied carbons, our calculations are available upon request for the TurboChill DCS range.

Carbon Footprint

Airedale by Modine operates on a global scale and can build in region, minimizing shipping distances between us and our clients.

BREEAM Compliant

BREEAM (Building Research Establishment Environmental Assessment Method) aims to reduce the life cycle impact of new buildings on the environment by awarding points for products used within the building's design, which minimizes the buildings carbon footprint.

Using R1234ze refrigerant with leak detection in place qualifies towards BREEAM points. Please see BREEAM.com for full details.

> *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."

Headquarters

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