



Rotron / Airscrew



Rotron Thermal Management Systems

Systems Information

AMETEK Rotron has been a supplier of airmoving and cooling systems since 1983. Since 2003, the expertise has been expanded to include a diverse collection of Vapor Cycle Environmental Control Systems for commercial as well as Military applications. The Ametek Rotron systems are used on various airborne, shipboard, Military vehicle and land based applications.

Currently we design and build systems in three distinct categories:

Value Added - Engineered product to integrate customer-defined components into a finished sub-system

Passive System – AMETEK engineered to a Performance Specification. Non-refrigerant based cooling, heating and humidity control

Active System – AMETEK engineered to a Performance Specification. Refrigerant based cooling, heating and humidity control

The AMETEK Rotron systems are designed to meet the customer's unique requirements for size, weight, shock, vibration, EMI, acoustic noise, performance, materials, etc. Many of the systems are designed to meet Mil-S-901 shock, Mil-Std-167 vibration, Mil-Std-461 EMI, etc. Temperature ranges from -54F up to 131F or higher are typical.

The AMETEK Rotron systems can be designed to operate on various power sources including 28VDC, 48VDC, 270VDC, or 600VDC as well as 50/60 Hz, 400 Hz or variable frequency AC.

The passive and active system cooling capacities range from a few hundred watts to tens of Kilowatts. Heat exchanger designs can be optimized for the specific applications using plate fin or finned tube designs. In many cases the systems use AMETEK Rotron fans and/or AMETEK Hughes Treitler heat exchangers to provide the customer with the best solution for the application.

Our architecture options are very diverse and vary based on the application. We will work with the customer to provide the best architecture configuration customized for the application whether that means using ambient air as the heat sink, or ship's chilled water or active cooling with a sub-ambient cycle. Active applications are both "direct expansion", or "DX", with cooled air provided to the personnel and/or electrical loads or designed to utilize a secondary cooling circuit, routing chilled liquid (such as Water-Ethylene-Glycol) to the load.

Products shown are representative of what we have built to answer customers thermal management needs; all designs are readily adaptable to meet specific requirements of other applications.



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Value Added Systems

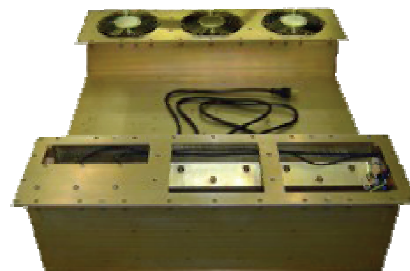
Shown at right are several typical value-added assembly AMETEK builds. These range from a simple mating of a fan with a wiring harness, to adapting a fan assembly to incorporate a silicon-rubber flapper type check valve to a fan, up to a fabricated assembly consisting of an anodized aluminum tray, multiple fans and a control module.

Value Added Systems can include working to customer provided drawings, specifications and processes. We incorporate these as our own and use customer sources of supplies as required. Providing the complete assembly allows our customers to write a single purchase orders versus multiple purchase orders for the components. The customer's incoming inspection load is decreased as well as shop labor and required floor space. The units arrive fully assembled and tested.



Shown at left is an air to water cooling system used onboard US Navy submarines. This compact heat exchanger cools 6kW of electronics through the chilled water system provided by the boat. Units are designed for handling high shock, vibration and other tough environmental requirements in the smallest form factor possible. AMETEK Rotron can also provide super-balanced assemblies to conform to some of the most rigorous structureborne noise requirements typically found on submarines.

Shown to the right is an example of a compact heat exchanger used in a US Army mobile radar application. The unit cools high power components via forced air convection and high efficiency heat sinks. The use of high capacity AMETEK Rotron fans provides the required airflow in the confined space allocation. AMETEK Hughes Trietler provides the compact heat exchanger to provide this total system solution.





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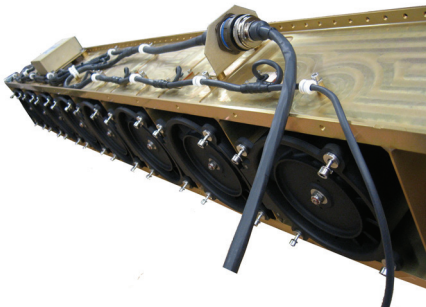


Passive Cooling Systems



Rotron produces a multitude of passive cooling systems. *(Note that in this context we use the term passive to designate any system that does not have sub-ambient cooling within the system. Therefore a shipboard system, utilizing the ships chilled water as a heat sink is passive within this definition as the sub-ambient chilling is external to the system discussed.)*

The system shown on the left is an example of a shipboard passive system (chilled water to air). The system dissipates 60 kW of heat from power transformers and transfers it to the ships chilled water supply. This system is designed to withstand the high shock, vibration, humidity and salt associated with shipboard installations.



The system shown at the left is another example of a radar cooling system. The eight cooling fans and two scavenge fans are all controlled by a common fan controller that can vary the speed to the fans based on temperature inputs. The use of high speed AMETEK Rotron vaneaxial fans allows the customer to achieve extremely efficient cooling in a very small package.



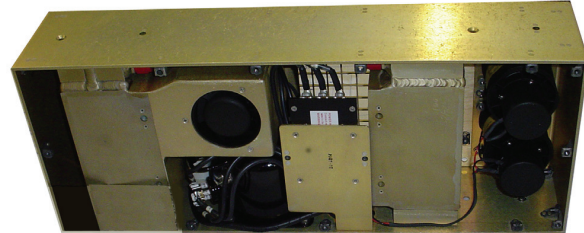
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Active Cooling Systems

Many of the threats faced by coalition forces in Iraq and Afghanistan are countered by an array of computation and communication electronics and sensors. Many of these systems are mounted in transit cases and can be operated from multiple platforms.

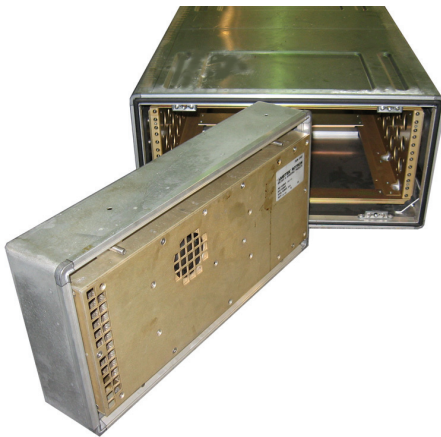
The severe ambient temperatures associated with operation in Iraq or Afghanistan (with temperatures exceeding 130° F) can cause operational and reliability problems with the electronics.



The unit shown here is one of systems AMETEK has fielded. The upper photo shows the Environmental Control Unit (ECU) as a stand-alone assembly; the same unit is installed within the transit case cover in the photo on the left.

Rotron builds several variants of transit case coolers, ranging in capacity from approximately 1 kW (3,500 Btu/hr) to 3 kW (10,500 Btu/hr)

These cooling systems are designed for typical Army environmental applications incorporating various techniques to withstand the harsh environments.



A 3 kW transit case Environmental Control Unit attached to the transit case appears in the photo on the left. The system again includes AMETEK Rotron fans to provide airflow for both the condenser and the evaporator.

AMETEK Rotron is providing an Environmental Control Unit (ECU) in response to the US Army's Tactical Idling Reduction Initiative for Heavy Tactical Vehicles. The unit is shown on the right.

The system architecture provides for dual refrigerant circuits. In most cases a single circuit will provide cooling in all but the most severe ambient condition thereby saving fuel and increasing system reliability.



AMETEK®
AEROSPACE & DEFENSE
Rotron / Airtechnology Products

North America
T: +1 845-679-1361
F: +1 845-679-1870

www.ametekaerodefense.com

United Kingdom
T: +44 (0) 1932 765822
F: +44 (0) 1932 761098

Specifications subject to change without notice

Europe
T: +49 8145 951767
F: +49 8145 951768

Asia Pacific
T: +65 6484 2388
F: +65 6481 6588

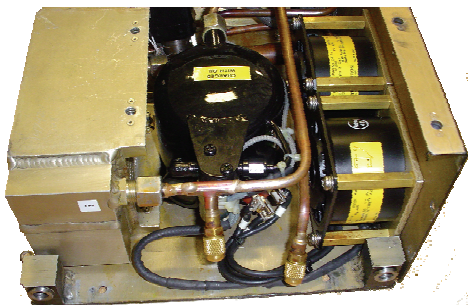
Contact E-mail: mlinqury@ametek.com



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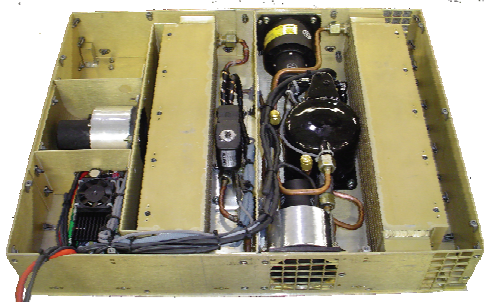
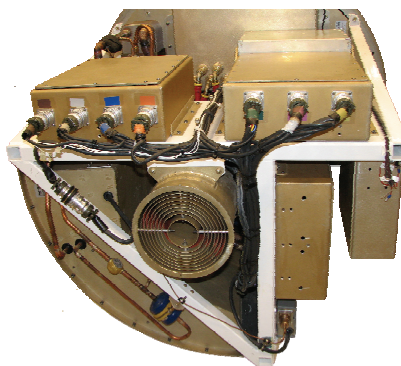
Active Cooling Systems Continued



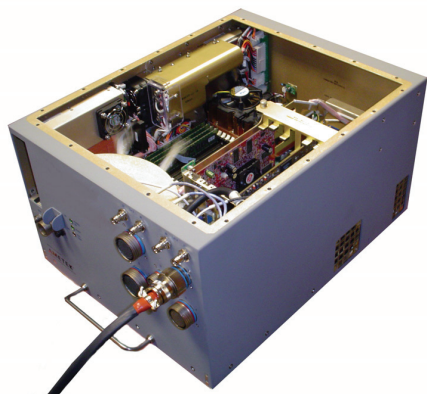
The system shown on the left is an active refrigerant (R134A) based cooling system. The system cools an electronics chassis on an Military aircraft.

The system includes various AMETEK Rotron cooling fans as well as an AMETEK Rotron designed compressor to provide an optimized low weight solution for the application.

The photo on the right shows part of a distributed Water-Ethylene-Glycol (WEG) system. Utilizing distributed liquid provides several potential benefits including a greater capability to localize cooling and an ability to save power by direct chilling of the fluid when the system is operated at low ambient conditions. The system shown is part of a 10 kW WEG system, where the WEG loops bring cooling to a total of eight separate zones. Both cooling and heating (via electric resistance heaters) control critical electronic modules to a precise temperature.



Shown on the left is another example of a refrigerant based active cooling system designed and produced by AMETEK Rotron. The particular unit is integrated into an ATR chassis to provide closed loop active cooling to the chassis electronics. This type of cooling solution provides the customer with a fully enclosed sub-ambient cooling solution allowing for more electronics to be packaged within a given space. These racks are environmentally sealed making them ideal candidates for use in vertical lift applications



The photo on the left shows a typical chassis that this type of system is installed in. The cooling unit is integrated into the bottom 3.5" of the chassis. Cold air is circulated through the electronics. The heat is then exhausted to the atmosphere thru the holes shown on the side the chassis.

The unit provides approximately 1,000 watts of net cooling. Other variants of different physical configuration and thermal capacities are available.



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NOTES:

North America

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F: +44 (0) 1932 761098

www.ametekaerodefense.com

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Europe

T: +49 8145 951767
F: +49 8145 951768

Asia Pacific

T: +65 6484 2388
F: +65 6481 6588

Contact E-mail: mailinquiry@ametek.com