NAVY & MARINE HVAC/R

SHIPBOARD ENVIRONMENTAL CONTROL EQUIPMENT

HEATING, VENTILATING & AIR CONDITIONING
REFRIGERATION
FIRE FIGHTING
POWER & ELECTRONIC COOLING

LEONARDO DRS

RELIABLE SHIPBOARD SOLUTIONS

Leonardo DRS has developed and qualified virtually all U.S. Navy shipboard HVAC&R cooling and heating coils, fan coil units and fan coil assemblies since the 1940s with an unwavering commitment to quality, customer service and product flexibility. Leonardo DRS is the U.S. Navy's largest supplier of product coolers and refrigeration plants, refrigeration systems and water mist fire fighting pumps. We're continuing to expand our offerings in the growing electronics cooling equipment systems as ships become ever more power dense. Our customer base also includes the Military Sealift Command, the U.S. Coast Guard and international navies.

In addition to providing high quality custom engineered equipment for Navy and marine applications, Leonardo DRS also regularly provides custom engineered equipment for pharmaceuticals, clean rooms, hospitals and other applications requiring quality levels higher than commercial grade equipment.

We design our equipment around your project. At Leonardo DRS, we continue a decades long record

From U.S. Navy Aircraft Carriers to Military Sealift Command ships, Leonardo DRS HVAC & refrigeration systems provide conditioned air for sailors, food, equipment and machinery.

Our Leonardo DRS Naval Power Systems - Marlo Coil facility has 185,000 square feet dedicated to manufacturing a range of environmental control equipment. Facility improvements are geared to quality, delivery and value.

of providing unparalleled value, design, test, manufacture and support for military, commercial, industrial and critical process HVAC&R applications.

All of our equipment is manufactured in the heartland of America just outside of St. Louis, Missouri. Our vertically integrated plant allows us to keep tight control of our quality, value and on time delivery.

Balance of Performance and Value

Our ability to design robust military equipment, combined with our need to provide cost effective commercial solutions, makes for an unparalleled combination of performance and value to our customers.

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Leonardo DRS
Naval Power Systems

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LeonardoDRS.com

Made in the U.S.A.

We have been manufacturing coils in High Ridge, Missouri since 1925.

Mission critical refrigeration and cooling

Leonardo DRS provides the Refrigerated Ship Stores and Cooling Coils for Virginia-class and the new Columbia-class submarines.

Dedicated electronic cooling units are becoming more common as ships increase the use of power dense electronic systems. Take advantage of our extensive heat transfer expertise for your power or electronic system.

HEATING, VENTILATING & AIR CONDITIONING

ICON DEFINITIONS


Specification


Qualified Products List


Vibration Qualification


Shock Qualification


Heating/Cooling

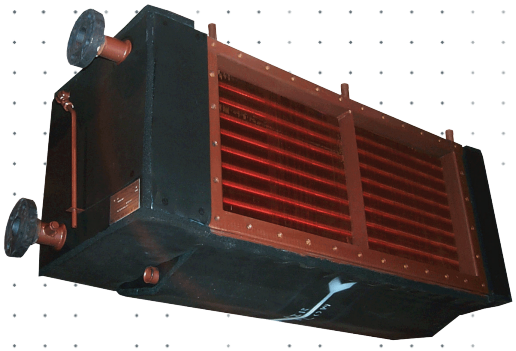

Airborne Noise


Structureborne Noise


EMI

Leonardo DRS has provided over 4000 Cooling Coils for U.S. Navy DDG 51 Arleigh Burke-class Destroyers, over 2500 Ventilation Heaters for Nimitz Aircraft Carriers and over 3000 Fan Coil Units on San Antonio-class LPDs.

DW51-58 COOLING COILS (50 SERIES)



Navy Duct Water Coils (50 Series) use chilled water for the cooling and dehumidification of air. The cooling coils are built as a single unit consisting of supporting framework, cooling element and removable drain pan. Each cooling coil is built ready for installation and connection to the appropriate water supply, return lines and condensate drainage piping.

MECHANICAL CHARACTERISTICS

Model DW Series	Airflow		Capacity MBH	Coil Face Size	
	CFM	Ft/Min		W" x H"	Ft2
51	280	491	14.0	11-3/4 x 7	0.57
52	450	500	23.0	14 x 9-1/4	0.90
53	670	496	34.0	21 x 9-1/4	1.35
54	975	488	50.0	25 x 11-1/2	2.00
55	1500	483	65.0	31-1/2 x 13-3/4	3.00
56	2500	500	121.0	39-1/2 x 18-1/4	5.00
57	3750	507	190.0	39-1/2 x 28-7/16	7.50
58	5000	500	234.0	39-1/2 x 37-7/16	10.00

❶ MBH rating based on the following conditions:
Entering air: 80°F DB, 67°F WB | Entering water: 45°F | Water flowrate: 3.6 GPM per Ton
Ask us about solutions for using 43°F water with our equipment.

APPROXIMATE DIMENSIONS (INCHES AND WEIGHTS)

Model DW Series	Weight (Lbs)		Outside Dimensions W" x H" x D"
	Dry	Wet	
51	152	157	26-1/2 x 12-1/8 x 15
52	176	183	28-3/4 x 14-3/8 x 15
53	225	236	35-3/4 x 14-3/8 x 15
54	301	317	40-1/2 x 16-7/8 x 15
55	390	414	47 x 18-7/8 x 15
56	562	602	55 x 23-3/8 x 15
57	975	1040	56-3/8 x 36-7/8 x 17-5/8
58	1225	1310	56-3/8 x 45-7/8 x 17-5/8

SPECIFICATIONS

- MIL-C-2939-E
- QPL-2939
- MIL-STD-167
- MIL-S-901
- CHILLED WATER OR REFRIGERANT

WHEN ORDERING SPECIFY

- Size (51-58)
- Class
- — Class 1 – Chilled water, DW duct mounted
- — Class 2 – Seawater (DWS), duct mounted
- Composition
- — M – Magnetic
- — N – Nonmagnetic
- Hand
- — Left or right hand (Left if not specified)
- Hull number for replacement applications

Customized Solutions Available for Unique Applications

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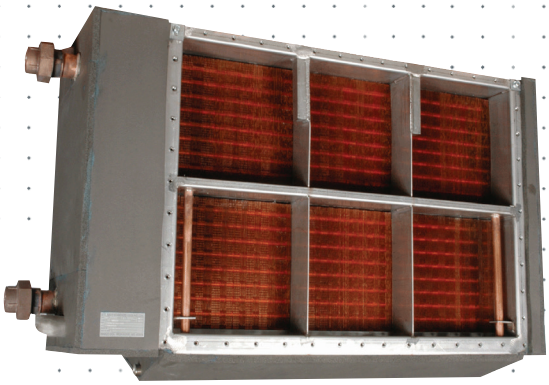
DW61-68 COOLING COILS (60 SERIES)



Navy Duct Water Coils (60 Series) use chilled water for the cooling and dehumidification of air. The cooling coils are built as a single unit consisting of supporting framework, cooling element and integral drain pan. Each cooling coil is built ready for installation and connection to the appropriate water supply, return lines and condensate drainage piping.

SPECIFICATIONS

- MIL-C-2939-F
- QPL-2939
- MIL-STD-167
- MIL-S-901
- CHILLED WATER

WHEN ORDERING SPECIFY

- Size (61-68)
- Class
  - Class 1: Chilled water, DW duct mounted
- Composition
  - M – Magnetic
  - N – Nonmagnetic
- Hull number for replacement applications

MECHANICAL CHARACTERISTICS

Model DW Series	Airflow		Capacity MBH ❶	Coil Face Size	
	CFM	Ft/Min		W" x H"	Ft2
61	280	491	9.0	11-3/4 x 7	0.57
62	450	500	16.5	14 x 9-1/4	0.90
63	670	496	27.3	21 x 9-1/4	1.35
64	975	488	40.0	25 x 11-1/2	2.0
65	1450	483	63.4	31-1/2 x 13-3/4	3.0
66	2500	500	112.2	39-1/2 x 18-1/4	5.0
67	3800	507	183.6	39-1/2 x 28-7/16	7.5
68	5000	500	240.7	39-1/2 x 37-7/16	10.0

❶ MBH rating based on the following conditions:
Entering air: 80°F DB, 67°F WB | Entering water: 45°F | Water flowrate: 3.6 GPM per Ton
Ask us about solutions for using 43°F water with our equipment.

APPROXIMATE DIMENSIONS (INCHES AND WEIGHTS)

Model DW Series	Weight (Lbs)		Coil Face Size	
	Dry	Wet	W" x H"	Ft2
61	106	111	11-3/4 x 7	0.57
62	125	132	14 x 9-1/4	0.90
63	157	163	21 x 9-1/4	1.35
64	203	218	25 x 11-1/2	2.0
65	278	302	31-1/2 x 13-3/4	3.0
66	416	454	39-1/2 x 18-1/4	5.0
67	688	752	39-1/2 x 28-7/16	7.5
68	838	923	39-1/2 x 37-7/16	10.0

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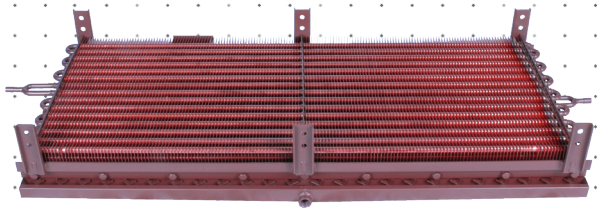
GRAVITY COOLING COILS (GW/GF 1, 3 & 5)



Navy Gravity Water / Refrigerant Coils (GW/GF Series) use chilled water or refrigerant for the cooling and dehumidification of air. The gravity coils shall be built as a single unit consisting of supporting framework, drain pans, and cooling element. Each gravity coil is ready for installation and connection to the appropriate water/ refrigerant supply and return lines and condensate drainage piping.

CHARACTERISTICS AND APPROXIMATE DIMENSIONS

Model Water / R-12	Weight (Lbs)		Capacity BTU ❶	Coil Face Size L" x W"	Frame Size L" x W" x D"
	Dry	Wet			
GW1 / GF1	42	96	1.1	22 x 11-5/8	26 x 14-5/8 x 10
GW3 / GF3	98	108	3.4	44 x 17-5/8	48 x 20-5/8 x 10
GW5 / GF5	146	162	5.5	54 x 23-5/8	58 x 26-5/8 x 10

❶ MBH rating based on the following conditions:
Entering air: 80°F DB, 67°F WB | Entering water: 45°F | Water flow rate: 3.6 GPM per Ton
Ask us about solutions for using 43°F water with our equipment.

SPECIFICATIONS

- MIL-C-2939
- QPL-2939
- MIL-STD-167
- MIL-S-901
- CHILLED WATER OR REFRIGERANT

WHEN ORDERING SPECIFY

- Size (1, 3 or 5)
- Class
  - GW: chilled water, gravity
  - GF: refrigerant, gravity
- Composition
  - Standard ASTM A569 steel construction
  - Copper fin, copper tube core available with either painted carbon steel frame or SST frame
  - ASTM A240 316 corrosion-resistant stainless steel

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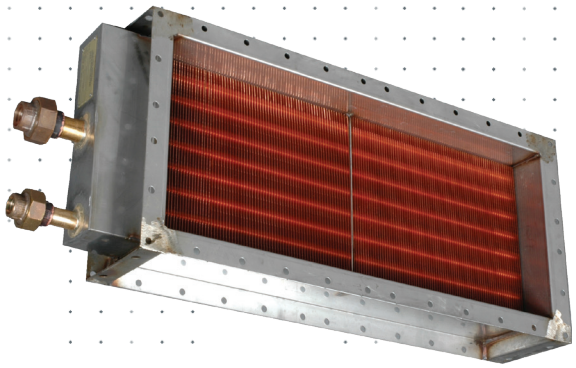
VENTILATION HEATERS
S21X-T38X



Navy Ventilation Heaters are duct type steam ventilation heaters for use in heating, ventilating and air conditioning systems aboard ship.

SPECIFICATIONS

- MIL-H-16235
- QPL-6235
- MIL-STD-167
- MIL-S-901
- STEAM OR HOT WATER

WHEN ORDERING SPECIFY

- Type I standard construction
- Type II 304 stainless steel non-magnetic construction
- Size (21-38)
- Fin spacing (L/M/H)
- Optional welded header box
- Hull number for replacement applications

CHARACTERISTICS AND APPROXIMATE DIMENSIONS

Model X = L, M or H	Weight (Lbs) L / M / H	CFM @ 600 FPM	Coil Face Size L" x W"	Frame Size L" x W" x D"
S21X (L / M / H)	9/10/10	81	6 x 3-3/4	9 x 6-1/4 x 5
S22X (L / M / H)	10/10/11	122	9 x 3-3/4	12 x 6-1/4 x 5
S23X (L / M / H)	12/12/13	190	14 x 3-3/4	17 x 6-1/4 x 5
S24X (L / M / H)	12/13/14	234	9 x 6-3/4	12 x 9-1/4 x 5
S25X (L / M / H)	18 / 19 / 21	364	14 x 6-3/4	17 x 9-1/4 x 5
T26X (L / M / H)	35 / 38 / 40	572	22 x 7	25 x 9-1/4 x 7
T27X (L / M / H)	42 / 45 / 48	848	22 x 10	25 x 12-1/4 x 7
T28X (L / M / H)	51 / 55 / 60	1,160	30 x 10	33 x 12-1/4 x 7
T29X (L / M / H)	59 / 65 / 76	1,534	30 x 13	33 x 15-1/4 x 7
T30X (L / M / H)	67 / 74 / 83	1,910	30 x 16	33 x 18-1/4 x 7
T31X (L / M / H)	72 / 79 / 88	2,140	42 x 13	45 x 15-1/4 x 7
T32X (L / M / H)	76 / 84 / 94	2,280	30 x 19	33 x 21-1/4 x 7
T33X (L / M / H)	90 / 101 / 114	2,940	42 x 17-1/2	45 x 19-3/4 x 7
T34X (L / M / H)	104 / 117 / 133	3,560	56 x 16	59 x 18-1/4 x 7
T35X (L / M / H)	116 / 132 / 153	4,240	42 x 25	45 x 27-1/4 x 7
T36X (L / M / H)	128 / 147 / 171	4,960	56 x 22	59 x 24-1/4 x 7
T37X (L / M / H)	153 / 178 / 208	6,350	42 x 37	45 x 39-1/4 x 7
T38X (L / M / H)	178 / 208 / 245	7,750	56 x 34	59 x 36-1/4 x 7

Customized Solutions Available for Unique Applications

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FAN COIL UNITS (FCU H/V)

HVAC Fan Coil Units (FCU) are used as an alternative to built-up air conditioning recirculation systems of a ship's heating, ventilating and air conditioning (HVAC) system. They provide heating, cooling, and air recirculation required to satisfy compartment environmental design conditions with a savings in space and weight over built-up systems.

The units consist of fans and two speed motors, air filters, operational controls, thermostat, cooling coil, thermal and acoustical insulation and optional electric heaters.

CHARACTERISTICS AND APPROXIMATE DIMENSIONS

Model H or V	Capacity BTU/ ❶	Heat Options kW Option1 /Option2 / Option3...	Cabinet Size L" x W" x D"	Air Flow CFM	Weight (Lbs)	
					Dry	Wet
FCU H1 / V1	5.85	0 / 1.2 / 2.2 / 3.3	50 x 25 x 10	145	261	264
FCU H2 / V2	9.69	0 / 1.2 / 2.2 / 3.3	50 x 25 x 10	240	268	271
FCU H3 / V3	15.28	0 / 1.75 / 3.5 / 5.25	52 x 27 x 14	350	343	348
FCU H4 / V4	22.89	0 / 2.0 / 4.0 / 6.0	52 x 36 x 14	530	393	401
FCU H5 / V5	30.50	0 / 2.0 / 4.0 / 6.0	52 x 44 x 14	690	478	488
FCU H6 / V6	39.91	0 / 3.0 / 6.0 / 9.0	52 x 39 x 17	950	513	524
FCU H7 / V7	45.56	0 / 3.0 / 6.0 / 9.0	52 x 52 x 17	1100	652	664
FCU H8 / V8	72.92	0 / 3.0 / 6.0 / 9.0	52 x 62 x 17	1650	774	793

❶ MBH rating based on the following conditions:
Entering air: 80°F DB, 67°F WB | Entering water: 45°F | Water flow rate: 3.6 GPM per Ton
Ask us about solutions for using 43°F water with our equipment.

SPECIFICATIONS

- MIL-A-24775
- MIL-STD-167
- MIL-S-901
- CHILLED WATER

WHEN ORDERING SPECIFY

- Size (1-8)
- Type
  - H: Horizontal, overhead mounting
  - V: Vertical, bulkhead mounting
- Grade
  - High impact shock
  - Type X: (Non-hi shock)
- Composition
  - M – Magnetic
  - N – Nonmagnetic
- Heater options
  - Heating in kilowatts (kW) as listed in table on the right
- Motor
  - Sealed
  - Non-SIS (Not sealed)
- Motor protection
  - LVP: low voltage protection
  - LVR: Low voltage release
- Chilled water (CHW) connection
  - Left or right hand (right if not specified)
- Hull number for replacement applications

Customized Solutions Available for Unique Applications

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EXPLOSION-PROOF FAN COIL UNIT (FCU)

SPECIFICATIONS

- NC-9601
- MIL-STD-167-1
- MIL-S-901
- CHILLED WATER

We offer the following Navy Standard Explosion Proof Fan Coil Units developed to replace the gravity cooling coils typically found in ships magazines and battery lockers.

- Maximum static pressure at fan coil discharge (external) is:
  - Size 1 and 2 0.00 inch w.g.
  - Size 3 thru 5 0.25 inch w.g.
- Supply and return water connections are bronze / silver brazed union 250# per MIL-F-1183.
- Drain connections to be straight nipple located both sides of unit. Unit drain pan supplied with FPT coupling.
- Coil size based on nominal 3.6 gpm per ton for BTUH rating plus fan heat.

WHEN ORDERING SPECIFY

- Size (1-5)
- Cooling Coil Connections
  - Cooling coil s field reversible to allow left or right hand connections. Right hand connection standard unless otherwise
- Mounting
  - Unit designed to be hard mounted to overhead or bulkhead and is field reversible. Overhead mounting is standard unless otherwise specified.

CHARACTERISTICS AND APPROXIMATE DIMENSIONS

Size	Air Volume (SCFM)	Cooling Capacity (MBH)	GPM	Fan Motor Power Max (HP)
1E	80	1.5	.51	1/20
2E	160	3.00	1.09	1/20
3E	200	5.00	1.70	1/20
3E	400	10.00	3.46	1/6
5E	800	20.00	6.66	1/3

Size	Water Conn. (IPS)	Drain Conn. (IPS)	Unit Wr. (Lbs)		DWG #
			Dry	Wet	
1E	1/2	1	159	160	1044-00-D
2E	1/2	1	168	170	1074-00-D
3E	1/2	1	173	175	1045-00-D
3E	1/2	1	246	250	1075-00-D
5E	1/2	1	267	272	1076-00-D

MBH Denotes gross BTUH less motor heat within ± 5%.
SCFM (Standard Cubic Feet Per Minute) at design operating conditions of 85°F DB 61°F WB return air.

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FAN COIL ASSEMBLIES (FCA)

HVAC Fan Coil Assemblies (FCAs) are designed for floor mounting, used in conjunction with a chilled water system, a drainage system, an air distribution system and a power source for air conditioning spaces on-board surface ships.

FEATURES

Type III FCAs should be specified when one or more duct sections are to be attached to the air inlet or to the air outlet of the FCA when it is placed in service.

SPECIFICATIONS

- MIL-A-23798
- MIL-STD-167
- MIL-S-901
- CHILLED WATER

CHARACTERISTICS AND APPROXIMATE DIMENSIONS

	Model	Capacity MBH ❶	Cabinet Size L" x W" x D"	Air Flow CFM	Weight (Lbs)	
					Dry	Wet
Type III	FCA 21	31.3	44 x 28 x 50	760	990	1003
	FCA 22	51.2	44 x 28 x 50	1260	1060	1089
	FCA 23	77.6	48 x 32 x 75	1880	1210	1253
	FCA 24	99.8	51 x 37 x 50	2550	1305	1349
	FCA 25	151.3	56 x 37 x 50	3800	1520	1586

❶ MBH rating based on the following conditions:
Entering air: 80°F DB, 67°F WB | Entering water: 45°F | Water flow rate: 3.6 GPM per Ton
Ask us about solutions for using 43°F water with our equipment.

WHEN ORDERING SPECIFY

- Size (21-25)
- Type
  - — Type III: Two section unit: cooling coil & fan-motor section
- Grade
  - — High impact shock
  - — Type X: (Non-hi shock)
- Composition
  - — M – Magnetic
  - — N – Nonmagnetic
- Hand
  - — Left or right hand (Right if not specified)
- Motor
  - — Sealed
  - — Non-SIS (Not sealed)
  - — 1EEE45 MARINE DUTY
- Grille requirements
  - — Inlet — Outlet
- Cover plate requirements
  - — Inlet — Outlet
- Hull number for replacement applications

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SELF-CONTAINED AIR CONDITIONER (SCAC) 3.0, 5.0 & 7.5 TON

SPECIFICATIONS

- MIL-A-19865C
- MIL-STD-167-1
- MIL-S-901
- CHILLED WATER

WHEN ORDERING SPECIFY

- Size (3, 5, 7.5)
- M-Magnetic or N-Semi-magnetic
- Note: 3, 5, & 7.5 operating on R-407a are under development

The Leonardo DRS Self-Contained Air Conditioner (SCAC) is in line with our strong tradition of supplying proven, fully-qualified, shock-hardened HVAC equipment to the U.S. Navy and is currently fielded on the LCS Independence and LHD platforms. The SCAC was re-designed to meet EPA regulations by utilizing refrigerant R-134a and /or R-407a, environmentally friendly, non-ozone depleting cooling mediums.

- Shell and tube sea water condenser
- High efficiency sealed insulation system motor
- Removable air discharge plenum
- Sea water strainer (over packed)
- Cleanable aluminum air filter
- Remote mount controller per MIL-C-2212 (over packed)
- Manual thermostat
- Manual fan switch with on, off and auto settings
- Hermetic type compressor
- Copper tube, aluminum plate fin evaporator coil
- Designed for refrigerant R-134a or R-407a

PRODUCT SPECIFICATIONS BY MODEL NUMBER ON NEXT PAGE.

Customized Solutions Available for Unique Applications

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MODEL NUMBERS

Description	SCAC 3.0T	SCAC 3.0T	SCAC 5.0T	SCAC 7.5T
Drawing	1620-0000	1619-0000	1621-0000	1622-0000
Refrigerant	R134a	R407A	R407A	R407A

PHYSICAL DATA

Height (inches)	With Plenum	75.0	75.0	75.0	75.0
	Without Plenum	65.0	65.0	65.0	65.0
Width (inches)		40.0	40.0	45.0	48.0
Depth (inches)		24.0	24.0	25.0	25.0
Weight with Controller (pounds)	Dry	803	803	970	1085
	Wet	813	813	985	1105

ELECTRICAL DATA

Power Supply		3 ph, 60 Hz 440 VAC	3 ph, 60 Hz 440 VAC	3 ph, 60 Hz 440 VAC	3 ph, 60 Hz 440 VAC
Current (amps)	Normal (1)	4.8	9.1	11.0	13.3
	Overload (2)	5.0	9.6	12.1	13.8
Power Input (watts)	Normal (1)	3300	4700	7055	8900
	Overload (2)	3440	5099	7877	9400
Minimum Airflow CFM		900	900	1500	2250
Capacity (BTU/Hr)	Normal (1)	36,500	43,000	61,000	90,000
	Overload (2)	48,200	49,000	76,000	103,000
Water Flow (gpm)	Normal (1)	14.3	14.3	22.0	27.9
	Overload (2)	19.6	19.6	22.6	35.0
Blower Speed (rpm)	With Plenum	1000	1000	900	900
	Without Plenum	1460	1460	1240	1130
Refrigerant Type		R134a	R407a	R407a	R407a
Refrigerant Charge (pounds)		10.4	11.0	12.0	20.0

(1) Based on 80 deg. F Dry Bulb / 67 deg F Wet Bulb Entering Air Temperature, 95 deg. F Entering Water Temperature and 35 psig entering Water pressure.

(2) Based on 100 deg. F Dry Bulb / 85 deg F Wet Bulb Entering Air Temperature, 100 deg. F Entering Water Temperature and 35 psig entering Water pressure.

MODULAR AIR COOLER (MAC V3)

With each ship alteration, heat loads on modern naval vessels are changing. Variable speed provides the flexibility to easily adjust the air conditioning system to match requirements.

The Variable Speed Modular Air Cooler (MAC) adds new capabilities to a proven design, advancing naval shipboard Heating Ventilating Air Condition (HVAC) equipment by pairing the Leonardo DRS Marlo Coil Modular Air Cooler currently fielded on CVN 78, LPD and LHA ships with a fully hardened Leonardo DRS Variable Speed Drive. The MAC was developed to replace large fan rooms with significantly more airflow and capability than older fan coil assemblies.

Additionally, the V3 model has been packaged to include the variable speed drive components within the modular air cooler's existing cabinet; eliminating the need for a separate remote mounted cabinet and is suitable for field retrofit on existing modular air coolers. The variable speed drive and the MAC have each been tested for vibration, shock and EMI.

SPECIFICATIONS

- MIL-STD-NNS-PS-2180
- MIL-STD-167-1 TYPE 11
- MIL-STD-901D
- CHILLED WATER
- MIL-STD-740-1
- MIL-STD-740-2
- MIL-STD-461E

WHEN ORDERING SPECIFY

- Model
  - — MAC: Modular Air Cooler with remote-mounted variable speed drive cabinet
  - — MAC V3: Modular Air Cooler with integrated variable speed drive

PHYSICAL & COOLING FEATURES

Height (inches)	75
Width (inches)	37
Depth (inches)	60
Weight with Controller (lbs)	Dry 2130
	Wet 2230
Full Load Amperage	14.5 amps @440 VAC
Operating Temp.	4 to 50° C
Max Airflow	5,416 SCFM

External Static Pressure	1.89 in H_20 (est.)
Max Cooling Capacity	228,000 btu/hr (est.)
Rated Water Inlet Temp.	45°F
Rated Water flow	3.6 gpm/ton
Coil Type	Fin & Tube
Coil Material	Cooper

Capacity rated at the 80/67 dry bulb/wet bulb conditions. Unit can be configured to automatically vary airflow based upon plenum pressure, unit airflow, unit capacity, or space temperature.

VARIABLE SPEED DRIVE FEATURES

Type	Variable speed; Mil-PRF-32168
Rated Power (hp)	10
Input Voltage	440 VAC +/-10%, 3 phase for navy applications; 460 V, 230V or 208V for commercial applications
Input Frequency	60 hz +/-3%

Overload	150% for 60 seconds
Output Voltage	200% for 5 seconds
Output Frequency (hz)	15-73
Communications	Profibus DP over copper or fiber (with converter)

Customized Solutions Available for Unique Applications

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MODULAR AIR COOLER (MAC 2)

The Modular Air Cooler (MAC) offers a proven solution to a growing problem with the U.S. Navy's Nimitz class aircraft carrier's HVAC system. Legacy ventilation Fan Coil Units (FCU) throughout these vessels are aging and in need of repair or replacement. With the limited availability of repair parts and unavailability of replacement units, an energy efficient, low cost application, which is also suitable for field retrofit, is needed.

Leonardo DRS has designed, qualified and fielded a family of MACs for the CVN 78 Ford class aircraft carriers. These units offer the range of performance previously delivered by legacy built-up FCUs at a fraction of the size, weight, airborne noise and energy demand. In addition, the units offer reduced maintenance and improved resistance to corrosion, a common problem found in today's FCUs, in a modular design that will fit through a standard watertight hatch measuring 26 in. x 66 in.

In most cases, the smaller in physical-size MAC unit can deliver increased performance to, not only accommodate ship alterations, but supply necessary cooling services to upgraded equipment which often times carries increased heat loads in machinery and electronics spaces throughout the ship.

Whether your particular need is a replacement for a failing Fan Coil Unit, increased cooling in a heat demanding machinery or electronics space or both, the Leonardo DRS family of Modular Air Coolers offers proven capability and design to support naval missions.

HIGHLIGHTS

- Increased energy efficiency
- Reduced footprint
- Weight savings
- Field retro-fit
- Low cost, low risk solution

SPECIFICATIONS

- MIL-STD-NNS-PS-2180
- MIL-STD-167-1 TYPE 11
- MIL-STD-901D
- CHILLED WATER
- MIL-STD-740-1
- MIL-STD-740-2
- MIL-STD-461E

WHEN ORDERING SPECIFY

- Model
  - MAC: Modular Air Cooler
- Size
  - 2, 3A, 3B or 3C
- Hand
  - LH or RH

Customized Solutions Available for Unique Applications

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Naval Power Systems
Marlo Coil
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MODULAR AIR COOLER (MAC)

GENERAL FEATURES

	MAC-2	MAC-3A	MAC-3B	MAC-3C
Units Dimensions (in.)	54.4 L x 37.0 W x 64.1 H	58.4 L x 37.0 W x 74.3 H	58.4 L x 37.0 W x 74.3 H	58.4 L x 37.0 W x 74.3 H
Unit Weight, Dry/Wet (lbs)	1450 / 1515	1820 / 1920	1880 / 1980	1925 / 2025
Motor HP	5	5	10	11
Full Load Amperage	7	7	14.2	15.1
Air Flow Range (cfm)	1020 / 3000	2500 / 3200	3000 / 4500	4100 / 5840
External Static Pressure at Air Flow (W.C.)	3.64 / 0.99	3.08 / 2.38	3.30 / 1.31	2.81 / 0.86
Rated Water Inlet Temperature (°F)	45	45	45	5
Entering Air Dry Bulb Temperature (°F)	80	80	80	80
Entering Air Wet Bulb Temperature (°F)	67	67	67	67
Rated Water Flow (gpm/mbh)	0.3	0.3	0.3	0.3
Capacity Range (mbh)	55.82 / 145.60	134.77 / 169.36	159.67 / 229.07	211.30 / 285.51
Coil Type	Fin and Tube	Fin and Tube	Fin and Tube	Fin and Tube
Coil Fins and Tubes	Cooper	Cooper	Cooper	Cooper
CHW Connection Type	Union	Union	Union	Union
CHW Connection Size (in.)	1 1/2	2	2	2
Condensate Drain Connection Type	Union	Union	Union	Union
Condensate Drain Connection Size (in.)	1	1	1	1
Condensate Drain Connection Quantity	1	1	1	1

Specifications subject to change without notice.

WEIGHT & DIMENSION COMPARISON

	CVN 68 Class Ventilation Fan Coil Unit						CVN 78 Class Modular Air Cooler				
Model#	Size	Assy #	Weight	Height	Width	Length	Size	Weight	Height	Width	Length
0553	1	99	1668	76	64	41.5	2	1450	65	56	37
0554	1	98	1715	76	64	41.5	2	1450	65	56	37
1053	1	97	1713	76	64	41.5	2	1450	65	56	37
1054	1	96	1760	76	64	41.5	2	1450	65	56	37
1054A	1	94	1795	76	64	41.5	2	1450	65	56	37
1554	1	95	1795	76	64	41.5	2	1450	65	55	37
1055	2	99	2351	76	72	56	2	1450	65	56	37
1555A	2	93	2386	76	72	56	2	1450	65	56	37
1555	2	98	2386	76	72	56	2	1450	65	56	37
1556	2	97	2618	76	72	56	2	1450	65	56	37
2055	2	96	2406	76	72	56	2	1450	65	56	37
2056B	2	96	2638	76	72	56	2	1450	65	56	37
2056A	2	94	2638	76	72	56	2	1450	65	56	37
2056	2	95	2638	76	72	56	2	1450	65	56	37

CONTINUED ON PAGE 18

WEIGHT & DIMENSION COMPARISON CONTINUED

	CVN 68 Class Ventilation Fan Coil Unit						CVN 78 Class Modular Air Cooler				
Model#	Size	Assy #	Weight	Height	Width	Length	Size	Weight	Height	Width	Length
2047	3	95	3414	77	88	60	3A	1920	75	60	37
3047A	3	94	3609	77	88	60	3A	1920	75	60	37
3047A	3	99	3609	77	88	60	3A	1920	75	60	37
3048	3	98	3937	77	88	60	3C	2025	75	60	37
5047	3	97	3684	77	88	60	3B	1980	75	60	37
5048	3	96	4012	77	88	60	3C	2025	75	60	37

PERFORMANCE COMPARISONS

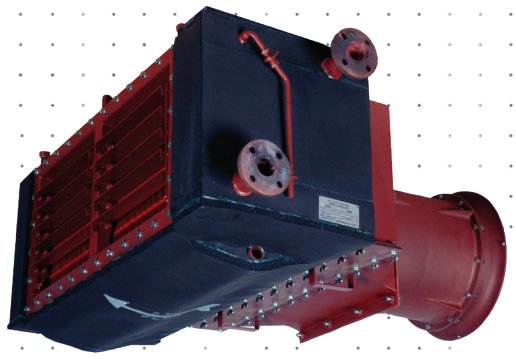
	CVN 68 Class Ventilation Fan Coil Unit						CVN 78 Class Modular Air Cooler						
	MINIMUM			MAXIMUM				MINIMUM			MAXIMUM		
Model#	CFM	ESP	MBH	CFM	ESP	MBH	SIZE	CFM	ESP	MBH	CFM	ESP	MBH
0553	550	2.49	22.89	810	1.06	31.80	2	1020	3.64	55.82	3000	0.99	145.61
0554	600	2.54	26.24	960	0.26	39.57	2	1020	3.64	55.82	3000	0.99	145.61
1053							2	1020	3.64	55.82	3000	0.99	145.61
1054	880	2.63	36.70	1200	1.49	47.77	2	1020	3.64	55.82	3000	0.99	145.61
1054A							2	1020	3.64	55.82	3000	0.99	145.61
1554							2	1020	3.64	55.82	3000	0.99	145.61
1055	900	2.79	44.49	1600	1.49	70.99	2	1020	3.64	55.82	3000	0.99	145.61
1555A	1290	2.91	59.80	1800	1.44	77.80	2	1020	3.64	55.82	3000	0.99	145.61
1555	1290	2.91	59.80	1800	1.44	77.80	2	1020	3.64	55.82	3000	0.99	145.61
1556	1500	2.92	77.63	2090	0.39	103.30	2	1020	3.64	55.82	3000	0.99	145.61
2055							2	1020	3.64	55.82	3000	0.99	145.61
2056B	1760	3.47	89.15	3000	0.52	139.30	2	1020	3.64	55.82	3000	0.99	145.61
2056A	1760	3.47	89.15	3000	0.52	139.30	2	1020	3.64	55.82	3000	0.99	145.61
2056	1760	3.47	89.15	3000	0.52	139.30	2	1020	3.64	55.82	3000	0.99	169.36
2047	2250	3.10	114.60	3155	0.39	151.90	3A	2500	3.08	134.77	3200	2.38	169.36
3047A	2800	3.60	137.40	4500	1.03	201.60	3A	2500	3.08	134.77	3200	2.38	169.36
3047A	2800	3.60	137.40	4500	1.03	201.60	3A	2500	3.08	134.77	3200	2.38	169.36
3048	3000	3.57	155.10	5015	0.21	240.60	3C	4100	2.81	211.30	5840	0.86	285.51
5047	3750	3.69	174.50	4500	2.95	201.60	3B	3000	3.30	159.67	4500	1.31	229.07
5048	3750	3.94	188.10	6000	1.50	278.30	3C	4100	2.81	211.30	5840	0.86	286.51

MODULAR AIR COOLER (MAC)

AIRBORNE NOISE LIMITS

MAC-2	Sound Power Level, dB re pW							
Octave Band Center Frequency	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
Casing Radiated	84	78	69	61	57	57	55	55
Ducted Discharge	90	89	79	75	80	78	71	65
Ducted Inlet	91	84	78	83	82	81	81	79
Free Inlet Casing Radiated	91	84	79	81	80	80	81	79
MAC-3A	Sound Power Level, dB re pW							
Octave Band Center Frequency	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
Casing Radiated	84	74	64	62	52	52	53	56
Ducted Discharge	84	78	77	76	72	71	69	64
Ducted Inlet	95	90	75	75	80	80	77	74
Free Inlet Casing Radiated	93	88	76	75	82	78	76	73
MAC-3B	Sound Power Level, dB re pW							
Octave Band Center Frequency	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
Casing Radiated	83	78	71	67	62	58	57	57
Ducted Discharge	89	94	87	83	80	76	71	66
Ducted Inlet	89	86	77	77	84	81	82	79
Free Inlet Casing Radiated	91	87	81	84	84	81	82	82
MAC-3C	Sound Power Level, dB re pW							
Octave Band Center Frequency	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
Casing Radiated	89	84	72	63	62	60	60	58
Ducted Discharge	89	86	86	84	82	82	72	68
Ducted Inlet	96	96	83	82	84	85	84	81
Free Inlet Casing Radiated	95	96	83	79	83	85	85	82

UW51-55 UNIT COOLERS



Leonardo DRS Navy heating, ventilating, air conditioning air handling units (AHU) are designed to comply with Navy specifications, are first article qualified and, in many cases, are qualified product listed. Navy AHUs are manufactured with proven performance and quality construction, and are fully supported with replacement parts and full integrated logistics support data.

Our short manufacturing lead times make our Navy AHUs readily available for new construction and overhaul & repair.

Unit Coolers consist of a vaneaxial fan and motor, a DW type duct cooling coil, with air filters and directional louvers built as a single unit for overhead mounting.

MECHANICAL CHARACTERISTICS

Model	Flow rate GPM	Capacity BTU/Hr	Air Flow CFM
UW51	4	13,500	215
UW52	7	22,200	340
UW53	10	33,500	510
UW54	15	49,300	750
UW55	19	62,400	1120

APPROXIMATE DIMENSIONS (INCHES AND WEIGHTS)

Model	Frame Size L" x W" x D"	Weight (Lbs)	
		Dry	Wet
UW51	23 x 12-1/8 x 38-7/8	202	207
UW52	25-1/4 x 14-3/8 x 38-5/8	236	239
UW53	32-1/4 x 14-3/8 x 40-3/8	315	326
UW54	374 x 16-5/8 x 40-7/8	411	427
UW55	43-1/2 x 18-7/8 x 43-7/8	510	534

SPECIFICATIONS

- MIL-C-2939-E
- QPL-2939
- MIL-STD-167
- MIL-S-901
- CHILLED WATER OR REFRIGERANT

WHEN ORDERING SPECIFY

- Size (51-55)
- Class
  - UW - Chilled water, gravity
  - UF - Refrigerant
- Composition
  - M – Magnetic
  - N – Nonmagnetic
- Hand
  - Left or right hand (Left if not specified)
- Hull number for replacement applications

Customized Solutions Available for Unique Applications

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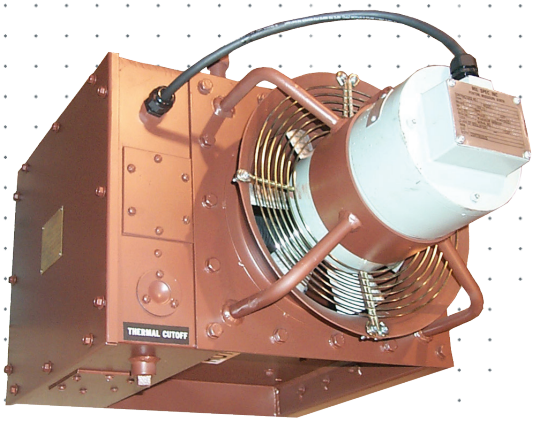
TYPE 11-16 ELECTRIC UNIT HEATERS



Unit Heaters are designed for overhead mounting. The units consist of a fan and motor, steam/hot water heating coil, fan guard and directional louvers built as a single unit. Electric heating elements are available in lieu of the standard steam/ hot water coil.

SPECIFICATIONS

- MIL-U-7293 MODIFIED
- MIL-STD-167
- MIL-S-901

MECHANICAL CHARACTERISTICS

	Size 11	Size 12	Size 13
Power (AC) Volts / Ph	440/3	440/3	440/3
Capacity (kW)	2.0 / 3.0	4.0 / 8.0	10.0 / 12/-
Cabinet Size (L" x W" x D")	23 x 15.5 x 29	25 x 18.5 x 29	28 x 21.5 x 29 30
Air Flow (CFM)	300	500	790
Weight (lbs.)	87	108	129

WHEN ORDERING SPECIFY

- Size (11-13)
- Hull number for replacement applications

Customized Solutions Available for Unique Applications

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FIRE FIGHTING

ICON DEFINITIONS


MIL-SPEC

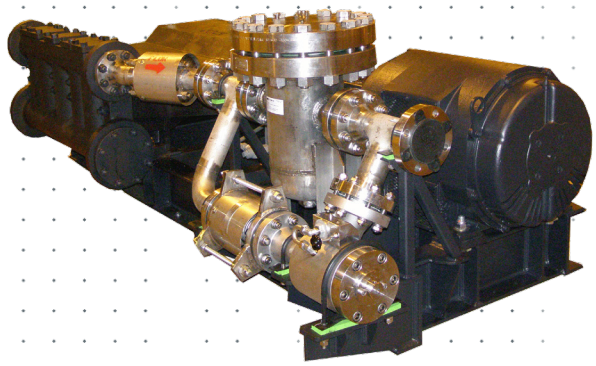

Vibration Qualification


Shock Qualification

The Water Mist Fire Fighting Pumps system features up to 1250 psi back pressure with a flow rate up to 400 gallons per minute.

There are six Water Mist Fire Fighting Pumps installed on U.S. Navy DDG 1000-class Destroyers and over 50 on U.S. Navy Amphibious Ships.

WATER MIST FIRE FIGHTING PUMP



SAFE AND ENVIRONMENTALLY FRIENDLY FIRE SUPPRESSION

The Water Mist Fire Fighting Pump (WMFFP) system is a high pressure on-board pumping system used in conjunction with specially designed spray nozzles to extinguish shipboard fires. The Water Mist system is the U.S. Navy's next generation fire fighting system. It is being used on the LPD 17 San Antonio Class Amphibious Transport Ships, The LHD 8 Makin Island Amphibious Assault Ship, the LHA 6 America Class Amphibious Assault ships and the DDG 1000 Zumwalt Class Multi-Mission Surface Combatants. It is also under contract for design and delivery for the DDG flight III program.

The nozzles create a back pressure of up to 1,250 psi at a flow rate up to 400 GPM. The system's design creates small droplets of water which are very effective at absorbing heat. The fire is extinguished mainly from cooling, and oxygen is displaced by the resulting water vapor rather than saturating the area. the system includes the Water Mist Fire Fighting Pump (WMFFP) nozzles, motor controllers and alarm system.

The Water Mist System is designed to replace dangerous and environmentally damaging Halon Fire Suppression Systems. On-board potable water is used to minimize damage to shipboard equipment overhead mounting.

HIGHLIGHTS

- Up to 1,250 psi back pressure
- Up to 400 gpm flow rate

The fine water mist from the nozzles.

SEE NEXT PAGE FOR SPECIFICS BY SHIP CLASS

SPECIFICATIONS

- PPD
- MIL-STD-167
- MIL-STD-901D

WHEN ORDERING SPECIFY

- Discharge pressure
- GPM
- With or without bypass

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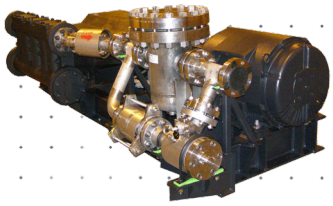
WATER MIST FIRE FIGHTING PUMP



SPECIFICATIONS BY SHIP CLASS

	LPD 17 Class	LHD 8 / LHA 6 Classes	DDG 1000 Class	DDG 51 Flight III
System Weight (lbs)	10,600	10,800	11,200	11,500
System Length (feet)	12	12	12	12
System Width (feet)	5	5	5	5
System Height (feet)	4	4	5	5
Performance	230 gpm @ 1250 psi	230 gpm @ 1250 psi	400 gpm @ 750 psi	230 gpm@ 1250
Shock Isolation	12 Wire Rope Isolator	12 Wire Rope Isolator	12 Wire Rope Isolator	22 Wire Rope Isolator
Electric Motor	200 hp 440v / 3 phase / 60 hz	200 hp 440v / 3 phase / 60 hz	200 hp 440v / 3 phase / 60 hz	200 hp 440v / 3 phase / 60 hz
Pump	Positive Displacement	Positive Displacement	Positive Displacement	Positive Displacement
Gearbox	4 to 1 Reduction	4 to 1 Reduction	5 to 1 Reduction	4 to 1 Reduction
Filter	100 Mesh Size	100 Mesh Size	100 Mesh Size	100 Mesh - Duplex
Pipe Size	3 Inches	3 Inches	4 Inches	3 inch
Drawing #	76000	76300	76600	1950-1000

REFRIGERATION

ICON DEFINITIONS


MIL-SPEC


Airborne Noise


Vibration Qualification

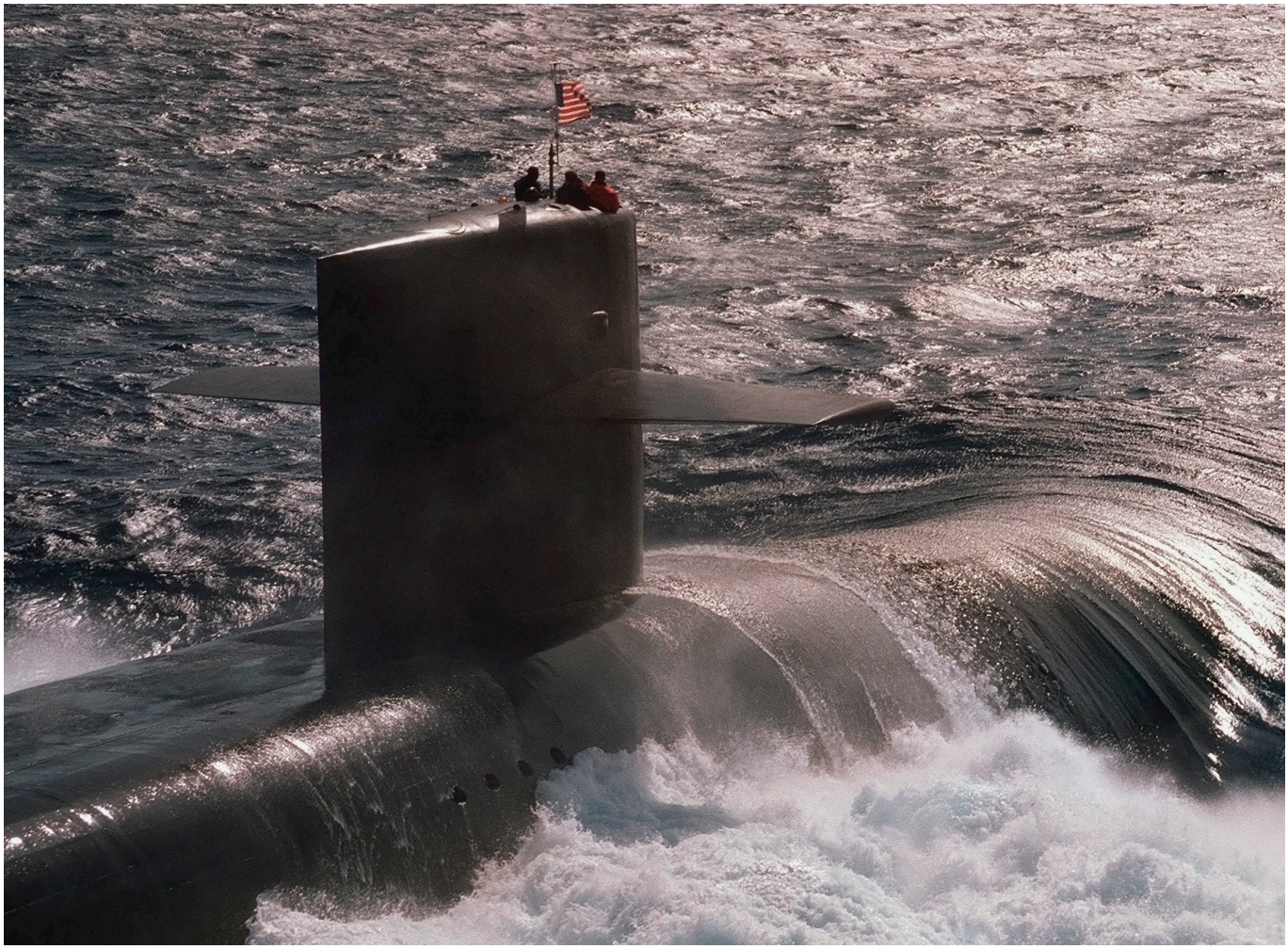

Structureborne Noise


Shock Qualification


EMI


Refrigerant

There is refrigeration equipment from Leonardo DRS on 20+ U.S. Navy submarines



MODULAR REFRIGERATION SYSTEM (MRS)

Developed for DDG 51 Flight IIA, the Leonardo DRS designed Modular Refrigeration System (MRS) is a high-efficiency system that incorporates self-contained diagnostic capabilities and a simple to use Human Machine Interface (HMI). The flip of an internally mounted switch is all that is required to convert the system from chill to freeze mode. Full system redundancy is assured with two or more units.

Incorporating the latest Navy concepts in ships stores refrigeration, the MRS consists of a Modular Refrigeration Unit (MRU), controller, remote mounted condenser and associated cables that make installation much simpler and more robust than past refrigeration systems. DRS has designed the MRS to have the condenser mounted outside of the freeze / chill space. This arrangement eliminates the possibility that the chilled water would freeze in the condenser, damaging it and shutting down the system.

The fully-qualified .75 Ton version of the MRS has 9,000 BTUH refrigeration at freeze conditions, and 12,000 BTUH (1.0 Ton) refrigeration at chill conditions. The 1.5 Ton (18,000 BTUH) unit is under development.

MECHANICAL CHARACTERISTICS

	.75T	1.5T
Dimensions (inches)	MRU 72L x 30W x 20H Controller 25W x 34Hx 12D	MRU 86L x 32W x 24H Controller 25W x 34Hx 12D
Weight (lbs)	MRU 675 Controller 83	MRU 880 Controller 83
Cooling Capacity at Freeze Condition	9,000 BTUH	18,000 BTUH
Cooling Capacity at Chill Condition	12,000 BTUH	21,000 BTUH
Operating Temperature	–3° to 41° F	–3° to 41° F
Max Air Flow	2000 cfm	4000 cfm
Rated Water Inlet Temperature	44° F	44° F
Rated Water Flow	3.0 GPM	4.5 GPM
Coil Type	Fin & Tube	Fin & Tube
Coil Material	Copper-tube / Aluminum-fin	Copper-tube / Aluminum-fin
Refrigerant	R-404A	R-407A

SPECIFICATIONS

- PPD
- MIL-STD-167
- MIL-STD-901D
- R-404A / R-407A
- MIL-STD-740-1
- MIL-STD-740-2
- MIL-STD-461E

WHEN ORDERING SPECIFY

- Size
  - .75T or 1.5T

Customized Solutions Available for Unique Applications

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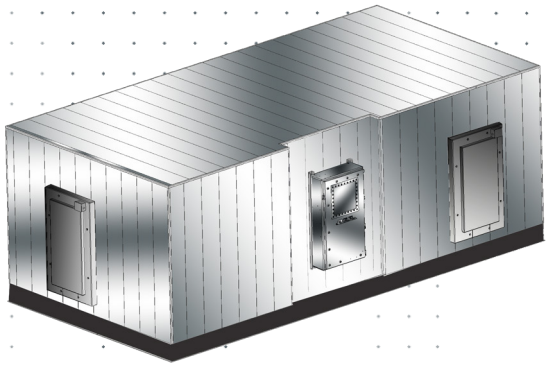
SELF CONTAINED SHIP STORES



SPECIFICATIONS

- PPD
- MIL-STD-167-1
- MIL-S-901
- MIL-STD-740
- MIL-STD-461

WHEN ORDERING SPECIFY

- Freeze box volume
- Chill box volume
- Limiting overall dimensions

Leonardo DRS Marlo Coil offers a purpose designed self-contained Ship Stores Refrigeration System for combatant ships and submarines. The system consists of separate freeze and chill storerooms that share a common refrigeration system. The chill storeroom is able to be converted to a freeze storeroom when necessary.

The single skid design allows a complete factory assembled and factory tested unit to be delivered to the shipbuilder ready for insertion into the ships structure. Interfaces to the ships chilled water, electric, control, and condensate drain systems can happen in days in lieu of months greatly reducing the impact to the ships typical freeze and chill storeroom erection schedule.

The construction consists of fully welded corrugated aluminum panels forming the interior and exterior of the cabinet with up to 4” of foam-in-place insulation separating the inner and outer cabinets. This virtually eliminates cold shorts between the refrigerated spaces and the ships interior spaces.

This concept is limited to being able to ship a single skid unit via flatbed truck from the manufacturing facility near St. Louis, MO USA to the shipbuilder via the highway system. Consequently it is most suitable to submarines and smaller surface vessels.

Please contact us for details on this novel approach to a ships stores refrigeration system.

Customized Solutions Available for Unique Applications

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ELECTRONICS COOLING

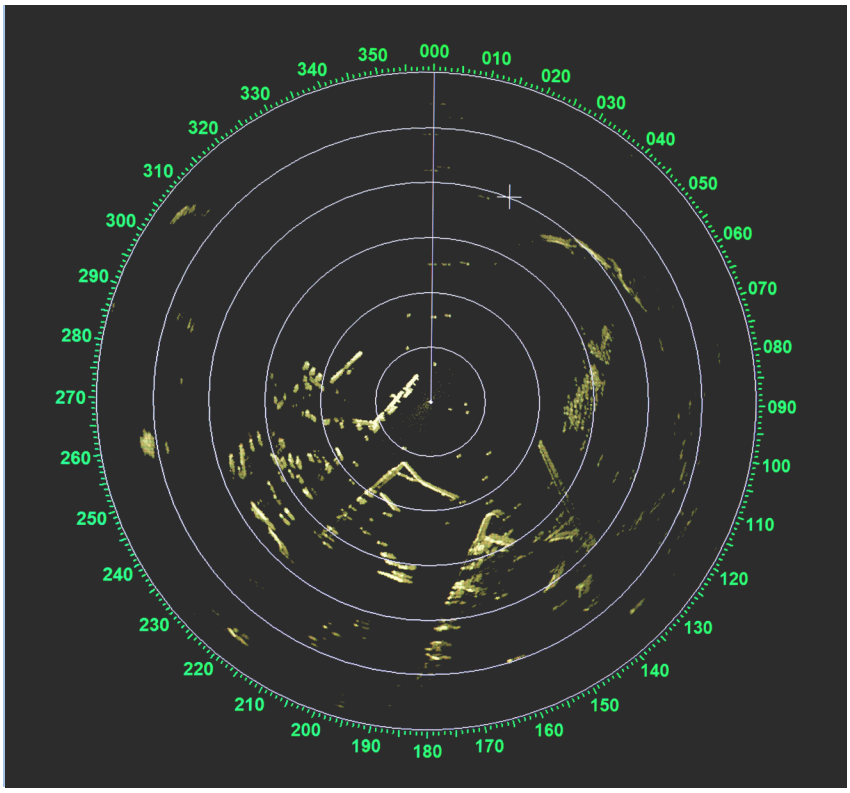
ICON DEFINITIONS


MIL-SPEC


Vibration Qualification


Shoçk Qualification

We have dedicated cooling systems that are designed specifically for weapons, combat systems and electronics packages.



DEDICATED SHIPBOARD COOLING SYSTEMS (3 & 6 TON)

As weapons, combat systems and electronics packages become more sophisticated, robust and power dense, the need for dedicated electronics cooling is quickly becoming a necessity. Leonardo DRS is at the fore front of this emerging market having developed, qualified and manufactured dedicated cooling systems for shipboard electronic modular enclosures and advanced weapons systems.

We can work to whatever your system or cooling requirements are, and is your low risk solutions provider for dedicated cooling for weapons, combat systems and electronics packages.

GENERAL FEATURES

	3 Ton Cpacity	6 Ton Capacity
Unit Size (inches)	45 W x 26 D x 45 H	45 W x 26 D x 45 H
Unit Weight (lbs)	Dry 818 | Wet 838	Dry 865 | Wet 887
Full Load Amperage	3	4.5
Operating temperature	50° C	50° C

COOLING FEATURES

Max Air Flow	1,125 CFM	2,250 CFM
Makeup Air	80 CFM	80 CFM
External Static Pressure	1.7 in H_2O	2.7 in H_2O
Cooling Capacity	39.600 BTU/hr	70,200 BTU/hr
Rated Water Inlet Temp	45° F	45° F
Rated Water Flow	10.7 gpm	21.6 gpm
Coil type	Fin & tube	Fin & tube
Coil Material	Copper	Copper

Capacity rated at the 91 DB / 75.7 WB conditions

CONTROLS

Communications	Profibus
Overload	Electronic
Temperature Control	Adjustable: 32° F to 45° F
Water Control Valve	Included
Additional Inputs	RTD Temperature Sensor in Air Return

DRIVE FEATURES

Input Voltage	440V
Input Frequency	60 Hz

SPECIFICATIONS

- PPD
- MIL-STD-167-1
- MIL-S-901

WHEN ORDERING SPECIFY

- 3 or 6 Ton capacity

Customized Solutions Available for Unique Applications

Leonardo DRS
Naval Power Systems
Marlo Coil
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About Leonardo DRS

Leonardo DRS is a prime contractor, leading technology innovator and supplier of integrated products, services and support to military forces, intelligence agencies and defense contractors worldwide. Its Naval Electronics business unit provides leading naval computing infrastructure, network and data distribution and middleware enterprise services, as well as world-class manufacturing and support capabilities. Headquartered in Arlington, Virginia, Leonardo DRS is a wholly owned subsidiary of Leonardo S.p.A. See the full range of capabilities at www.LeonardoDRS.com and on Twitter @LeonardoDRSnews.

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