Contents:

With more than five decades of experience in heat exchanger design and manufacture, Lytron's expertise is second-to-none. Our heat exchangers are used in many industries including military and aerospace, medical and industrial lasers, medical imaging, analytical instrumentation, power electronics, semiconductor equipment, machine tools, and telecommunications.

Any of our heat exchanger technologies can be customized to your exact requirements. We also supply heat exchanger subassemblies, adding fittings, hoses, fans, sensors, and other instrumentation to your specification. And our 15 standard product lines ensure that when you need an off-the-shelf part we are likely to have something that meets your requirements.

Custom Heat Exchangers for High Performance Applications

Lytron supplies custom heat exchangers for applications that require high performance and reliability. We design and build lightweight plate-fin, flat-tube, and tube-fin heat exchangers for the aerospace, military, medical, laser, traction, and power generation markets as well as others.

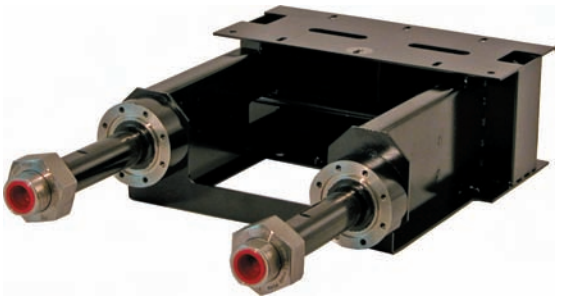
Lytron's engineering team provides expert design, analysis, and verification for custom solutions. Our engineers perform advanced thermal analysis using cutting-edge, proprietary simulation software based on more than 50 years of empirical data. This results in the most accurate thermal performance predictions available today. We can also validate and verify your heat exchanger's design using Lytron's extensive in-house engineering laboratory. Our testing capabilities include thermal testing, maturity testing, flight certification testing, and verification testing.

Throughout the prototype process, Lytron's production engineers work closely with design engineers to ensure that your heat exchanger is Designed-for-Manufacturability (DFM). Since Lytron's engineers and manufacturing are located in the same facility, products transition smoothly from design, through prototyping, to production. We also carry out all performance-critical manufacturing processes in-house, from fin stamping and tube bending to vacuum brazing and heat treating. This gives us control over the finished product, as well as increased flexibility and shorter lead times.

In addition to providing best-in-industry design and manufacturing, Lytron also offers more heat exchanger technologies than any other thermal solutions company. Lytron has the technology you need and the experience to customize it for your application.

A vacuum-brazed, air-cooled condenser for aircraft features two continuous, serpentine, flat tube extrusions welded together, an integrated hail guard, a cast inlet plenum duct, and a manifolded inlet and outlet

Hydraulic oil cooler designed for a helicopter application has a custom manifold with bypass valves, an air duct, and mounting brackets

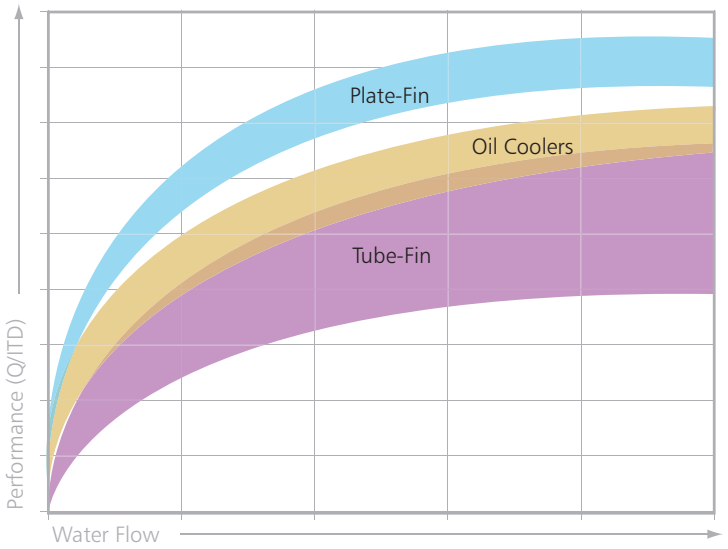


Water-to-air tube-fin heat exchanger coated for corrosion resistance designed and manufactured to meet military specifications and AWS standards for naval applications

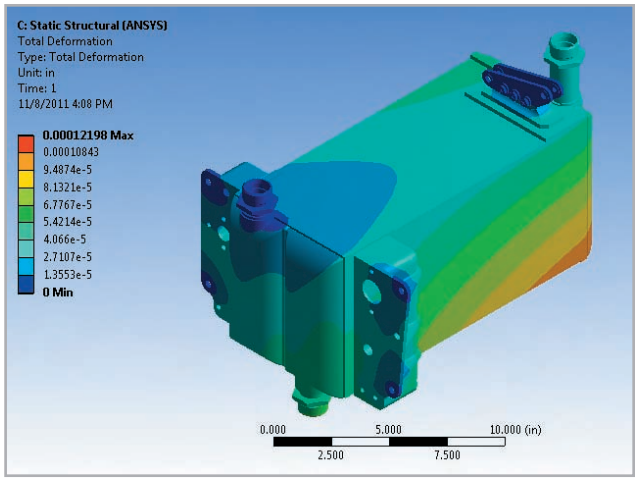
Liquid-to-liquid oil cooler for commercial aircraft designed to withstand 400,000 pressure cycles from 0 to 600 psi and a burst of pressure of over 1,600 psi

Heat Exchanger Technologies Performance Comparison Chart

This chart compares the performance of different heat exchanger technologies, including plate-fin heat exchangers, flat tube oil coolers, and tube-fin heat exchangers. Performance is shown as Q/ITD, the heat load divided by the difference in incoming temperature of the liquid and air. Units are not shown so that heat exchanger technologies can be compared regardless of size. Please visit www.Lytron.com to see additional custom heat exchangers.



Our experienced engineering team has the knowledge and tools necessary to provide you with a custom thermal solution that meets all of your requirements.



Our engineers perform structural analysis as needed to ensure your heat exchangers will meet your demanding specifications.

Vacuum-Brazed Heat Exchangers

Lytron's aluminum heat exchangers offer superior heat transfer. They are vacuum-brazed in an environmentally controlled room for maximum cleanliness, quality, and reliability. With our numerically controlled vacuum brazing process and robust fixture designs, we can ensure complete metallurgical bonding between the fins and the separator plates or flat tubes. This guarantees ruggedness and leak-free operation. Lytron operates several vacuum brazing ovens, including one that can braze parts up to 10 feet (3.05 m) long and 3 feet 2 inches (0.97 m) wide.

Plate-fin heat exchanger with manifold, mounting brackets, fan plate, and corrosion protection coating for use in a military ground vehicle

Plate-Fin Heat Exchangers

All our aluminum, vacuum-brazed, plate-fin heat exchangers are custom-designed, as every requirement is unique. Plate-fin heat exchangers are widely used in aerospace, military, and other high performance applications because they offer excellent thermal transfer capacity combined with small size and weight. Plate-fin heat exchangers can be designed for use with any combination of gas, liquid, and two-phase fluids.

Custom plate-fin heat exchanger with manifold and chemical conversion coating

We carefully select the number of plate and fin layers, the size of the plates and fin, and the type of fin for optimum performance. Manifold ducting and mounting brackets are welded in place as specified, and any required paint or coating (including MilSpec) can be added.

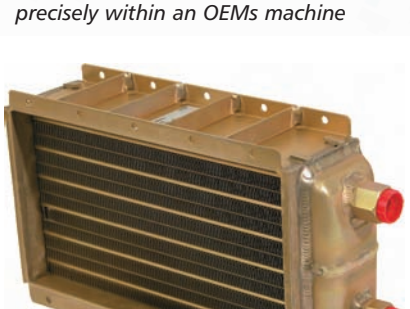
Titanium plate-fin heat exchangers

Plate-fin evaporator with dual core designed and manufactured for use in a military ground vehicle

Flat Tube Heat Exchangers

Lytron's vacuum-brazed, extruded flat tube technology is used in oil coolers, condensers, and more. Flat tube technology allows for many customization possibilities. Four different flat tube widths are available, and the length and the number of tubes can be varied. The flat tube can also be bent into a 1/4″ (6.35 mm) inside radius without buckling, so heat exchangers can be manufactured in a curved shape if needed. Custom fittings and manifolds can be added, and flat tube heat exchangers can be painted or anodized for extra protection.

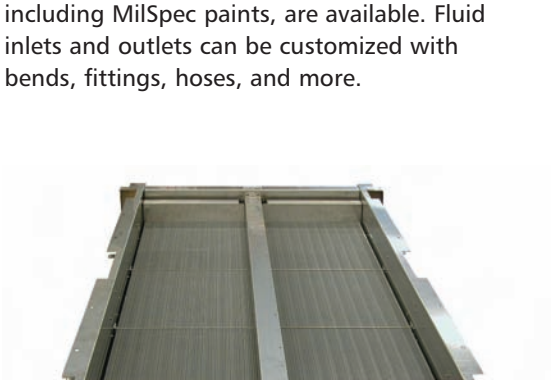
Flat tube oil cooler with curved tubes designed to fit precisely within an OEMs machine



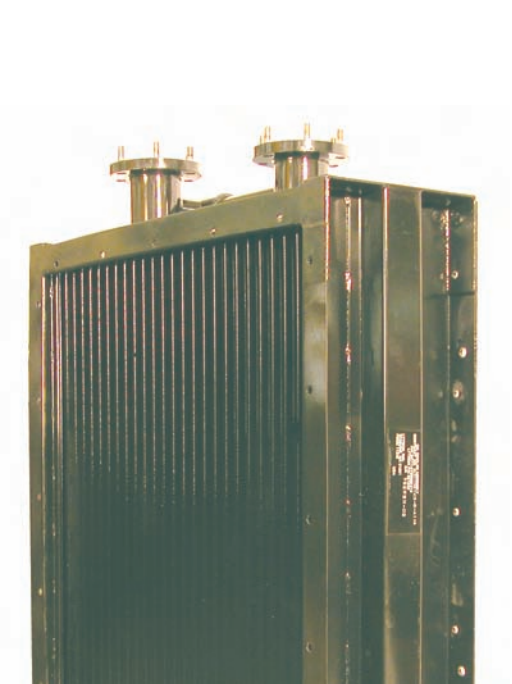
Hydraulic oil cooler for business jet with custom "picture frame" mounting brackets

Tube-Fin Heat Exchangers

The building blocks of a tube-fin heat exchanger are tubes, fin, and frame. We have a variety of fin patterns to choose from, and can customize the tube configuration and frame. Lytron also works with specialty metals, such as nickel and cupronickel. To meet the stringent shock and vibration requirements of some applications, we can also provide ruggedized frames and fluid connections and insert additional tube sheets as supporting elements within the core. Paints and coatings, including MilSpec paints, are available. Fluid inlets and outlets can be customized with bends, fittings, hoses, and more.



Large tube-fin heat exchanger for server cooling is 6' (1.8 m) long and 3' (0.9 m) wide



Large 4´(1.2 m) heat exchanger with nickel tubes and copper fin

Value-Added Assemblies

Lytron also designs and manufactures custom heat exchanger assemblies, providing Original Equipment Manufacturers (OEMs) with an innovative design that meets system interface challenges. Heat exchanger assemblies include plate-fin heat exchangers, flat tube heat exchangers, evaporators, condensers, oil coolers, or tube-fin heat exchangers, as well as any number of other components that make integration of your heat exchanger faster and easier. The simplest heat exchanger assemblies are heat exchangers with fans, while the most complicated are major sub-assemblies or entire cooling systems ready to drop into your system or equipment. Value-added components include, but are not limited to:

- Fans and finger guards
- Controls, including fan speed controls
- Pumps and pump systems
- Fittings/connectors and hoses/tubing
- Shrouds and ducting
- Mounting brackets
- Reservoirs
- Electrically actuated thermal control valves
- Pressure bypass and solenoid valves
- Check valves
- Thermostats for temperature control
- Temperature/pressure sensors
- Relays for on/off functions
- Air heaters
- Bladders/pressure compensators
- Cold plates
- Wiring harnesses
- Drain ports
- Shock isolators
- Hail/FOD guards

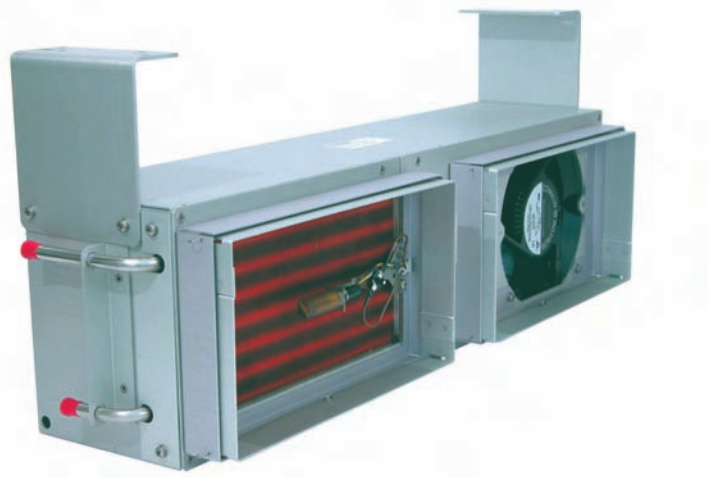
There are many benefits to working with Lytron for the design and build of your heat exchanger assembly or sub-assembly:

- Innovative designs and the highest quality products
- Fewer suppliers
- Fewer part numbers
- Lower total cost of assembly due to Lytron's supply chain management program and efficient manufacturing processes
- Faster time to market
- More time for you to focus on your final product.

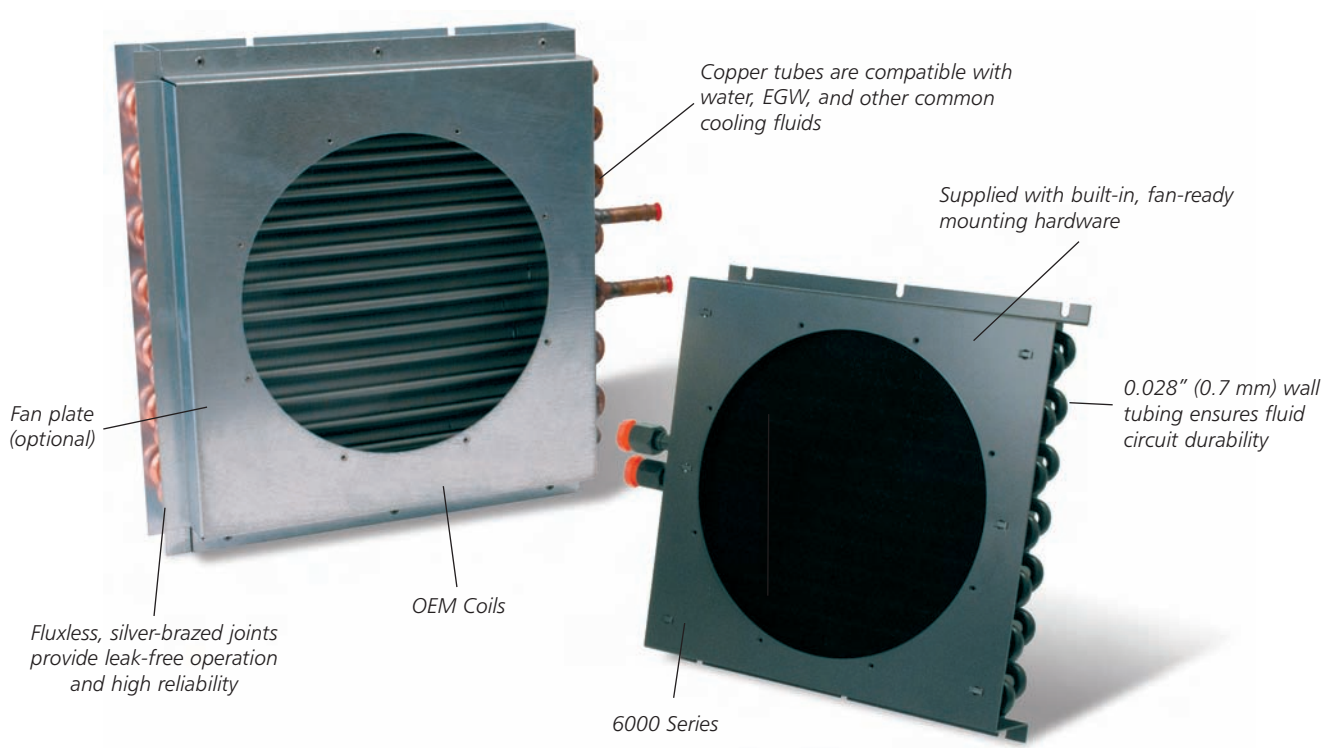
Please contact Lytron today to discuss your requirements.

Liquid-to-liquid plate-fin heat exchanger, designed for oil cooling in a military ground vehicle, has a custom manifold, mounting brackets, and corrosion protection coating

Tube-fin heat exchanger assembly with integrated fans and tubes



Clear anodized heat exchanger subassembly including fan and temperature sensor



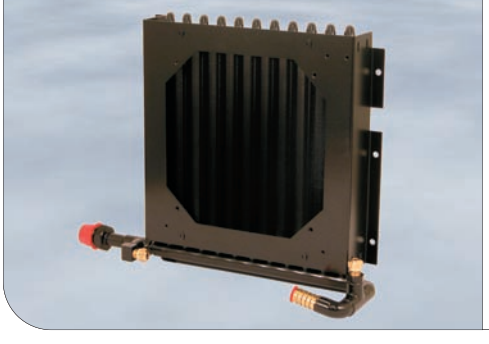
DWG 51
GRAPHS 56
SPECS 59
SELECT 60

Both the OEM Coils and 6000 Series copper tube-fin heat exchangers offer high performance and reliability. The OEM Coils heat exchanger has aluminum fins and is unpainted with galvanized steel side plates. The 6000 Series heat exchanger has a different tube configuration, uses copper fins, is painted black for corrosion resistance, and includes a fan plate. OEM Coils are best suited for the price-sensitive customer in applications where the appearance of the heat exchanger is not critical, such as when the heat exchanger is hidden inside of the equipment. The 6000 Series is an attractive, high performance heat exchanger that delivers efficient heat transfer and maximum reliability in a compact package.

- **Engineered for performance:** The OEM Coils and 6000 Series are both engineered for performance. The seamless copper tubes are expanded into the fin with an extruded full collar that ensures excellent metal-to-metal contact to optimize thermal performance. However, with the 6000 Series, the higher tube density results in maximum heat transfer.
- **Reliable, leak-free, and robust:** Our thick-walled (0.028″/0.7 mm) seamless copper tubing and fluxless silver-brazed joints ensure the integrity of the fluid path. All OEM Coils and 6000 Series heat exchangers are also pressure tested to 150 psi (10.3 bar) to guarantee reliability. The 6000 Series units are electro-static dip painted for long life even in corrosive or harsh environments.
- **Compatible with a range of coolants:** The OEM Coils and 6000 Series are compatible with water, Ethylene Glycol/Water (EGW) solutions, and other common coolants.

Please see our specifications table on page 59 to review the heat exchanger options, including sizes, configurations, fittings, fans, and more.

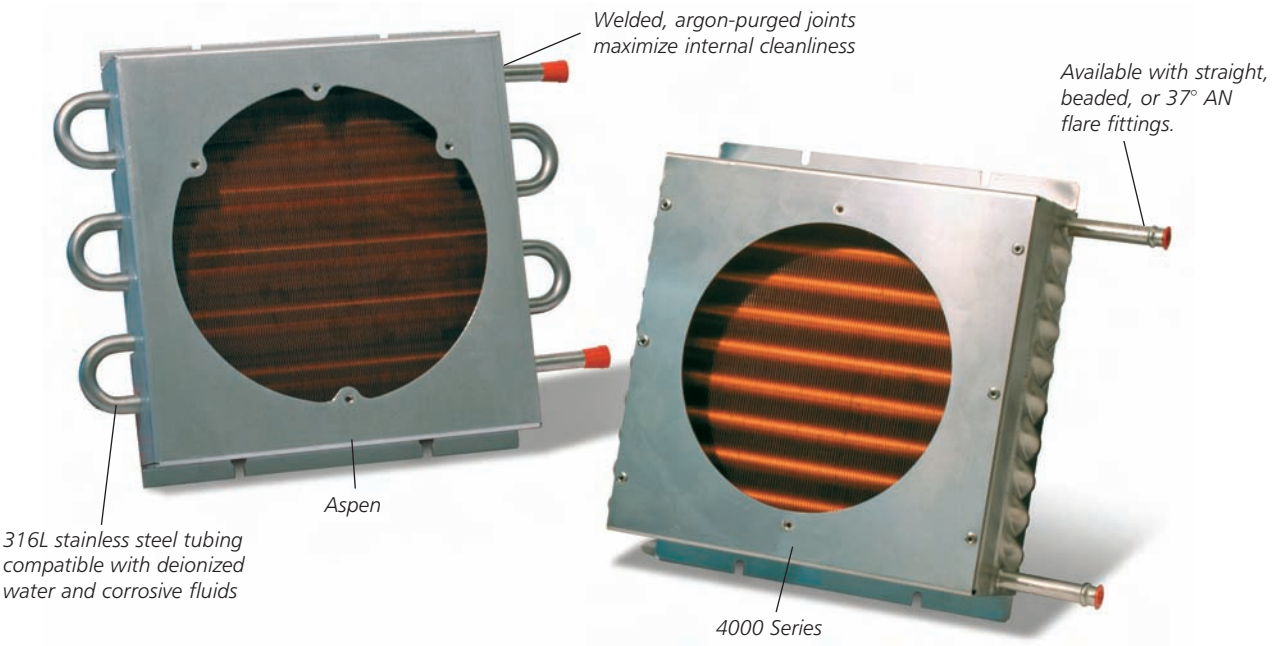
6000 Series heat exchanger with custom circuitry, sensor ports, and inlet/outlet fittings



Customization Options

For high volumes of the OEM Coils or 6000 Series, we can customize dimensions, tube configurations, inlet/outlet positions, fittings, or paints/coatings to meet your requirements. Assemblies including fans and other components can also be supplied.

See page 42 for more custom heat exchangers.



DWG 51
GRAPHS 56
SPECS 59
SELECT 60

The Aspen and 4000 Series tube-fin heat exchangers are ideal for applications where deionized water or corrosive fluids are used and a high performing heat exchanger is required. When a slightly lower performance/size ratio is acceptable, the Aspen offers better value - 80% of the performance of the 4000 Series at approximately 50% of the cost. The Aspen also has lower air and liquid side pressure drops than the 4000 Series. However, when high performance in a small envelope is required, the 4000 Series is the best option.

- **Engineered for performance:** The Aspen and 4000 Series are both engineered for performance. Heavy-walled, seamless stainless steel tubes are expanded into copper fin with an extruded full collar. The copper fin and the excellent metal-to-metal contact between the tube and the fin collar ensure optimum thermal performance.
- **Compatible with deionized water and corrosive liquids:** All the wetted surfaces in the Aspen and 4000 Series are 316L stainless steel, so they are ideal for use with high purity and/or corrosive coolants such as deionized water.
- **Rugged and reliable:** The welded stainless steel frame and fan plate offer durability and strength. The Aspen and 4000 Series heat exchangers are 100% leak tested to 150 psi (10.3 bar). The Aspen has 0.020" (0.5 mm) wall tubing and the 4000 Series has 0.028" (0.7 mm) wall tubing.
- **Integrated fan plate for improved performance and convenience:** The integrated fan plate acts as a plenum to ensure uniform air-flow distribution through the core, thus maximizing performance. It also enables easy fan installation.
- **Extremely clean (Aspen):** With our Aspen Series, our proprietary manufacturing process expands the tubes into the copper fin without the use of oils and our liquid return design eliminates potential particle trapping sites, which can contaminate cooling fluid. Argon-purged welded joints further ensure cleanliness.

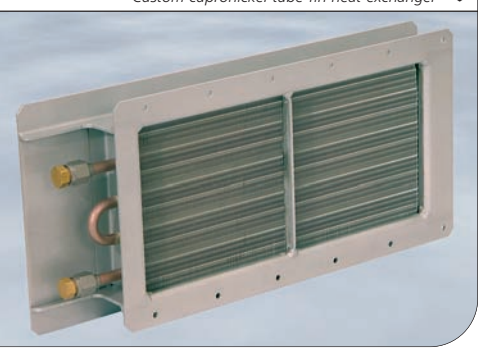
Please see our specifications table on page 59 to review the heat exchanger options, including sizes, configurations, fittings, fans, and more.

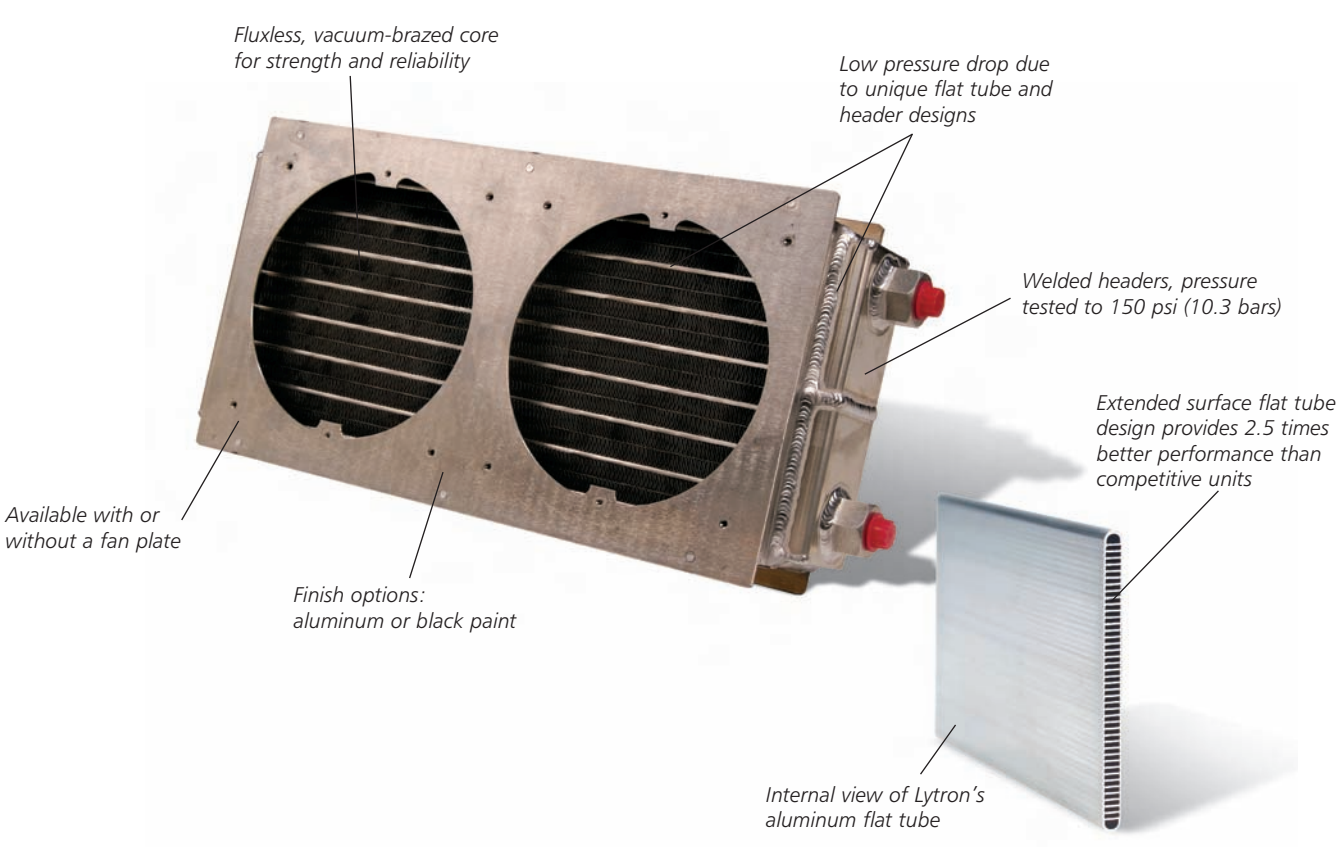
Custom cupronickel tube-fin heat exchanger ⌄⌄

Customization Options

Aspen and 4000 Series style heat exchangers can be manufactured in custom sizes and tube configurations to meet your thermal and mechanical specifications. Inlet/outlet positions, fittings, paints, and other coatings are available. Assemblies including fans and other components can also be supplied.

See page 42 for more custom heat exchangers.





DWG 51
GRAPHS 56
SPECS 59
SELECT 60

ES Series oil coolers are engineered for high performance with poor heat transfer fluids such as oils and EGW. They provide up to 2.5 times greater thermal performance per unit volume than competitive models.

- **High performance:** The ES Series uses Lytron's unique aluminum flat tube technology, which has multiple extended surface channels in each tube. These tubes provide maximum cooling by having a large surface area in contact with the fluid (approximately 12 in^2 (77 cm^2)/linear inch of tube). Lytron's air-side fin geometry efficiently channels air across the fin surface to further boost heat transfer capability.
- **Clean and reliable:** The fluxless vacuum-brazed construction results in a clean, rugged, and highly reliable part with excellent thermal contact and mechanical strength.
- **Low pressure drop:** Our flat tube fluid channels and efficient header manifold result in a very low pressure drop so smaller, less expensive pumps can be used.
- **Lightweight:** The all-aluminum, vacuum-brazed construction is lightweight.

Please see our specifications table on page 59 to review the heat exchanger options, including sizes, configurations, fittings, fans, and more.

Commercial condenser with single-piece aluminum flat tube

Customization Options

Oil coolers can be manufactured in different sizes and tube widths, and with custom inlet/outlet configurations. Curved heat exchangers can be manufactured as the flat tube can be bent without buckling or damaging the internal channels. Assemblies including fans and other components can also be supplied.

See page 42 for more custom heat exchangers.

Internal view of liquid-to-liquid brazed plate heat exchanger

DWG 51
GRAPHS 56
SPECS 59
SELECT 60

Lytron's brazed-plate heat exchangers are unsurpassed for liquid-to-liquid heat transfer. Their innovative design packs maximum performance into a compact and reliable package.

- **High performance in a small package:** Lytron's liquid-to-liquid heat exchangers are up to 80-90% smaller in volume and weight than conventional shell-and-tube designs. The counterflow design utilizes stainless steel sheets stamped with a herringbone pattern of grooves, stacked in alternating directions to form separate flow channels for the two liquid streams. This allows 90% of the material to be used for heat transfer, making it extremely efficient.
- **High reliability:** The plates are brazed together at the edges and at a matrix of contact points between sheets, ensuring that the heat exchangers are highly reliable and rugged.
- **Copper- and nickel-brazed versions for compatibility with a wide range of fluids:** We offer copper-brazed units for use with water, EGW, and other common coolants. Our nickel-brazed units are appropriate for use with deionized water, high purity, and corrosive fluids.
- **High operating temperatures and pressures:** Copper-brazed units can be operated at temperatures of up to 383°F (195°C) and pressures up to 450 psig (31 bar). Nickel-brazed units can be operated at temperatures of up to 662°F (350°C) and pressures up to 232 psig (16 bar).

Liquid-to-liquid heat exchanger subassembly with custom hoses and fittings »

Customization Options

Liquid-to-liquid heat exchangers can be supplied as subassemblies with fittings, hoses, and other accessories.

See page 42 for more custom heat exchangers.

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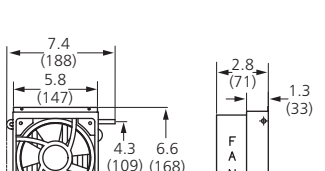

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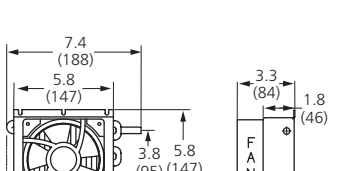

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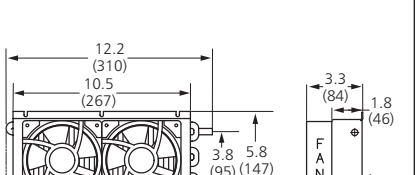

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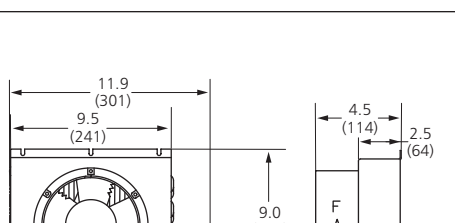

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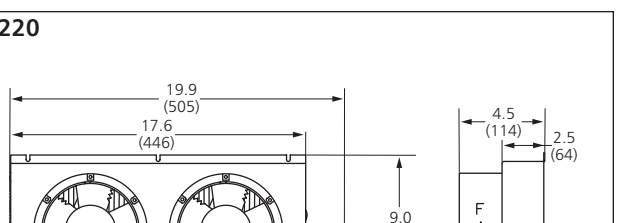

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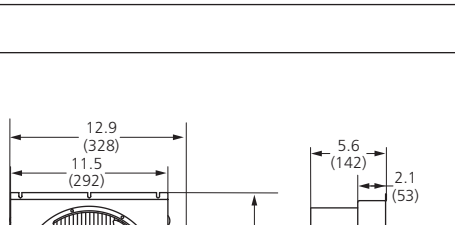

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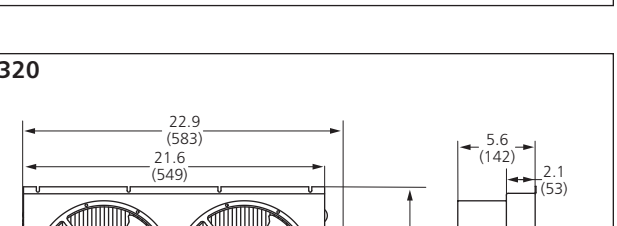

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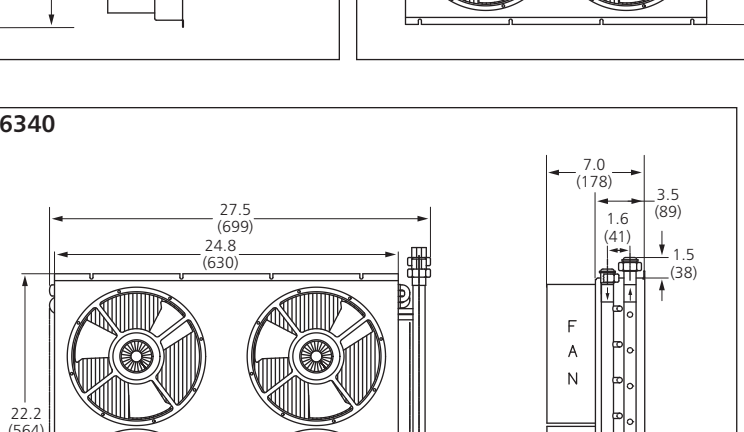
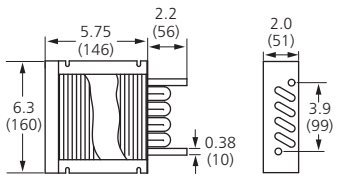


PDFs, IGS files, and eDrawings of standard heat exchangers are available at www.Lytron.com.
Main dimensional label is inches. Dimension in parentheses is mm.

M05-050



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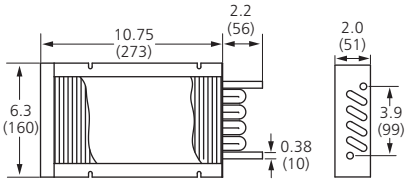

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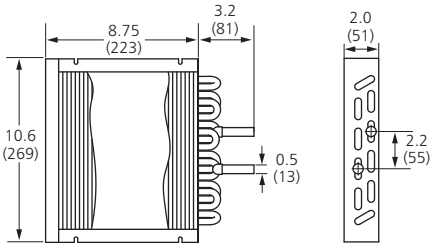

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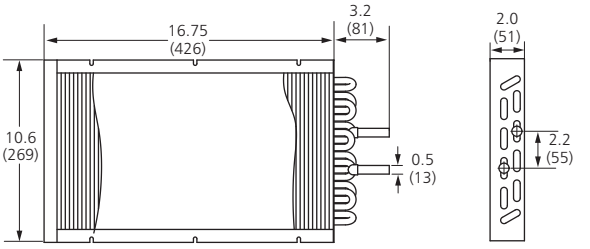

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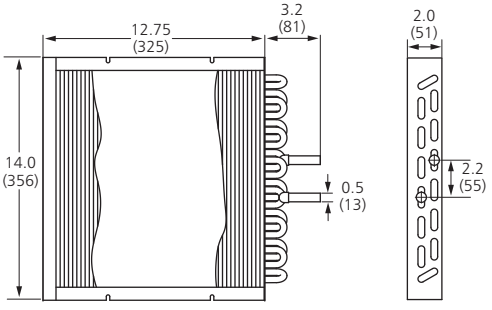

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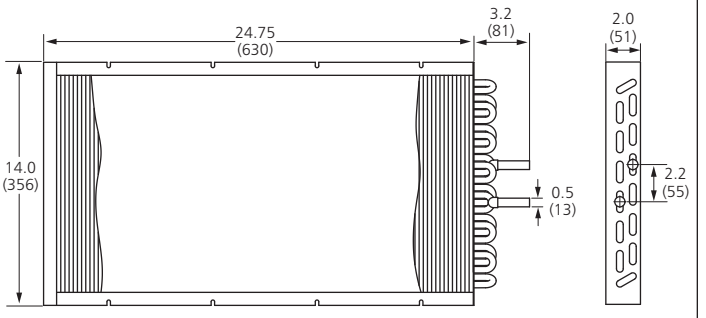

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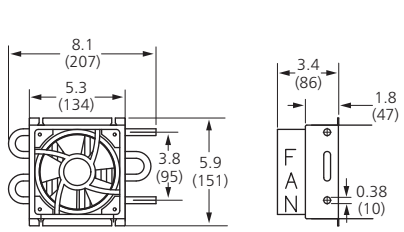
AS04-05



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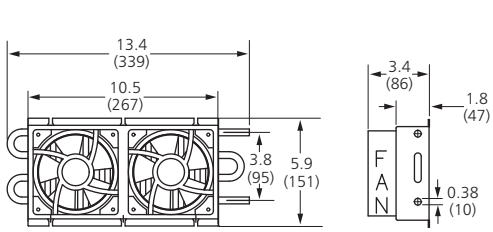

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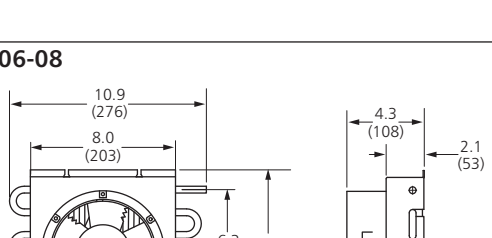

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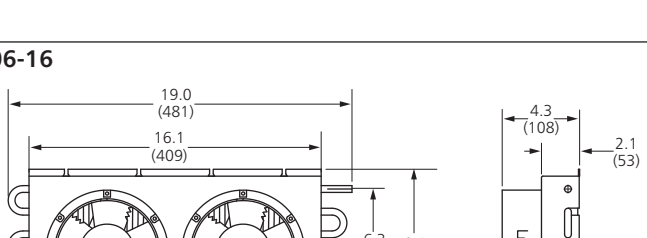

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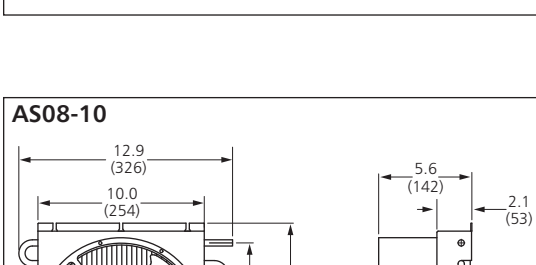

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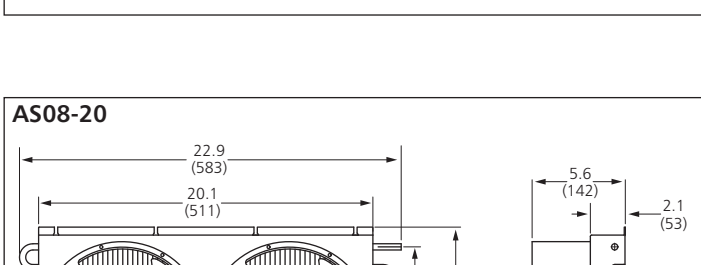
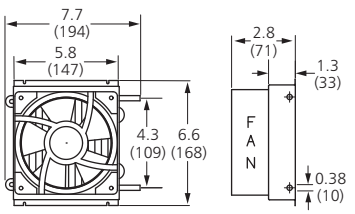


PDFs, IGS files, and eDrawings of standard heat exchangers are available at www.Lytron.com.
Main dimensional label is inches. Dimension in parentheses is mm.

4105



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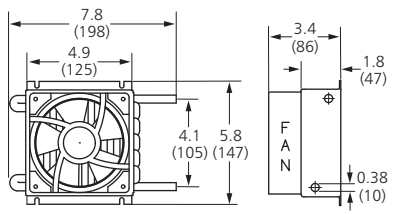

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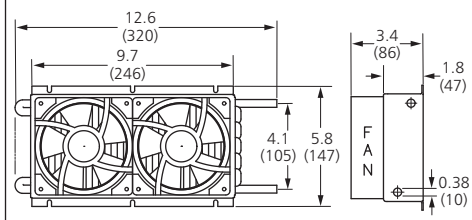

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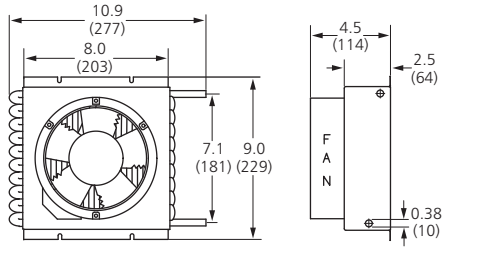

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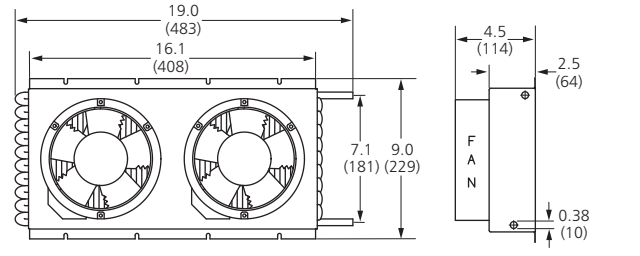

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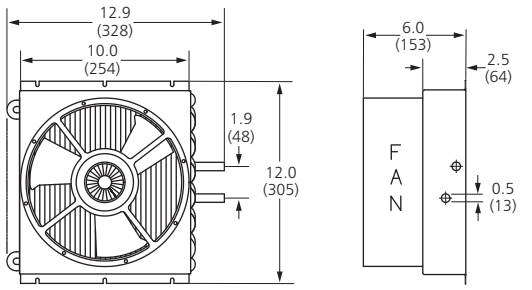

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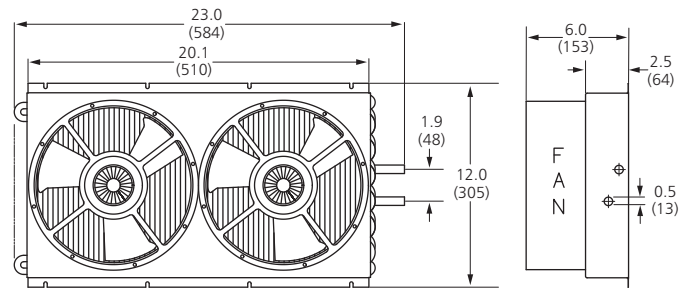
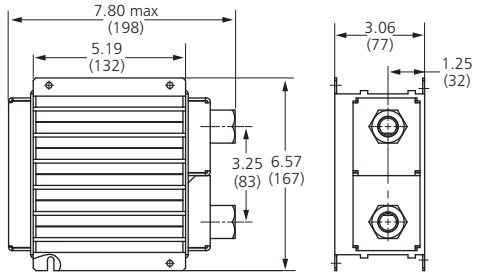
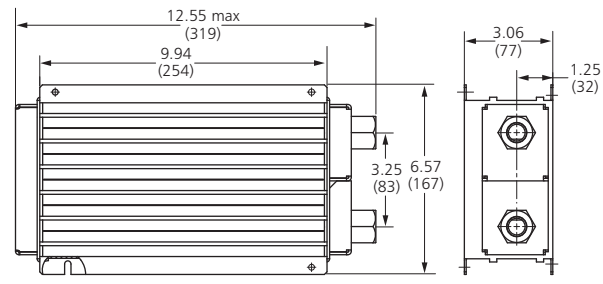


ES0505

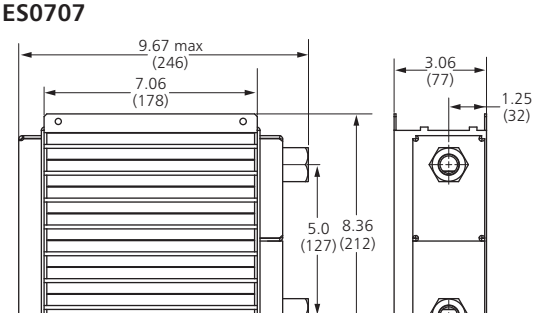


ES0510

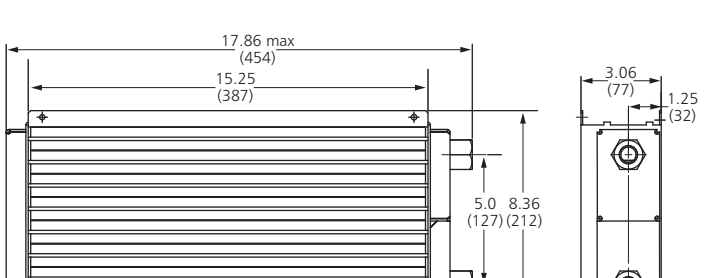


PDFs, IGS files, and eDrawings of standard heat exchangers are available at www.Lytron.com.
Main dimensional label is inches. Dimension in parentheses is mm.

ES0707



ES0714



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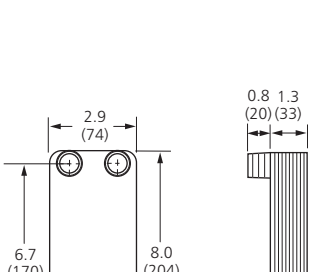

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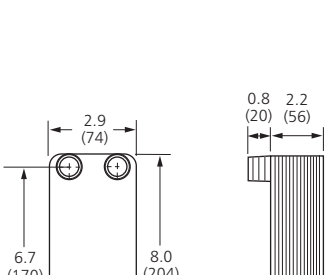

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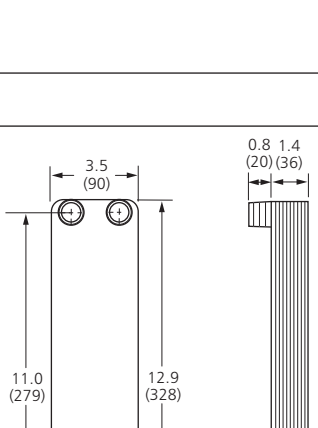

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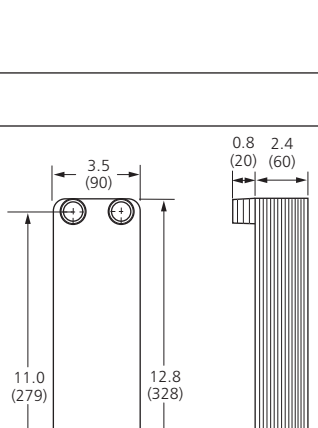
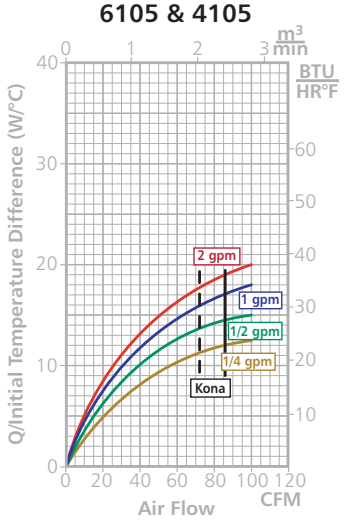
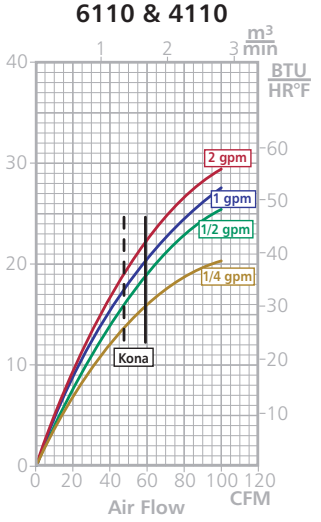


PDFs, IGS files, and eDrawings of standard heat exchangers are available at www.Lytron.com.
Main dimensional label is inches. Dimension in parentheses is mm.

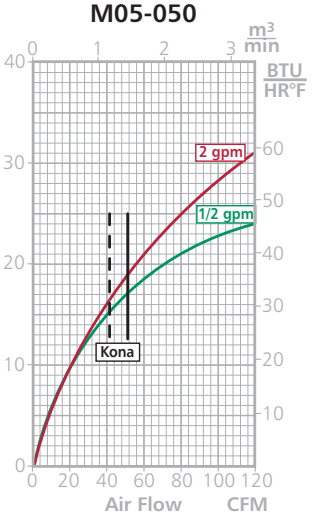
6105 & 4105



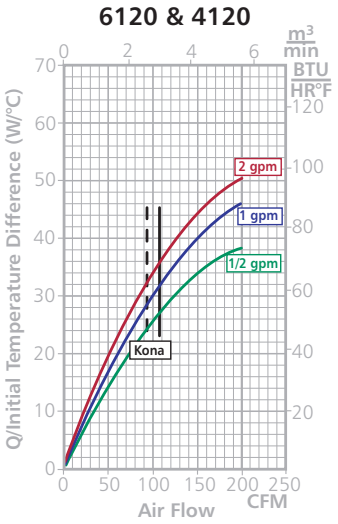
6110 & 4110



M05-050



6120 & 4120



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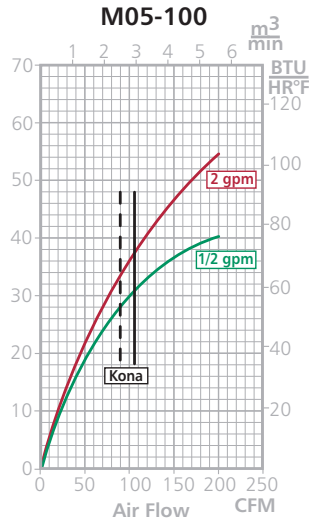

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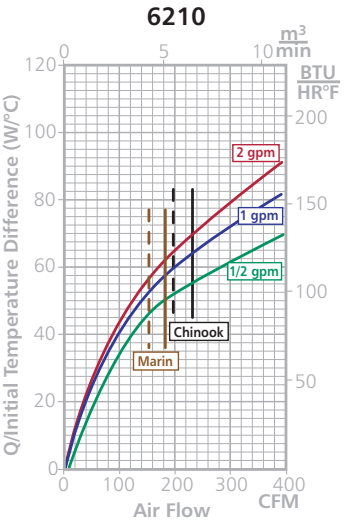

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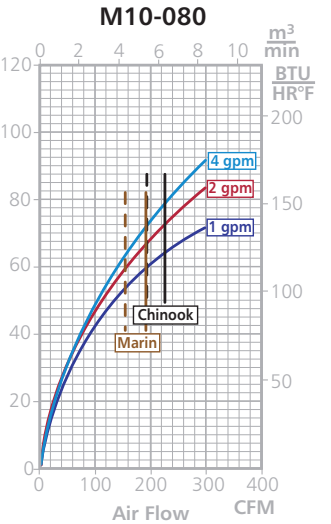
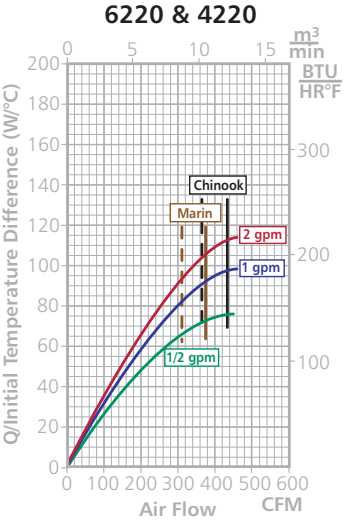
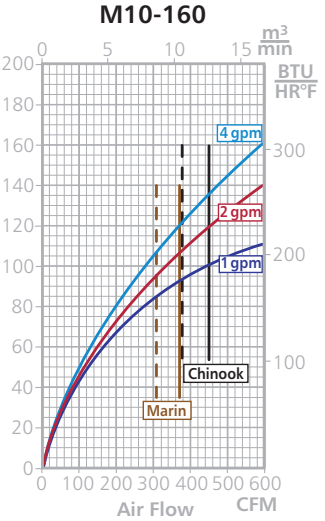


6220 & 4220



M10-160



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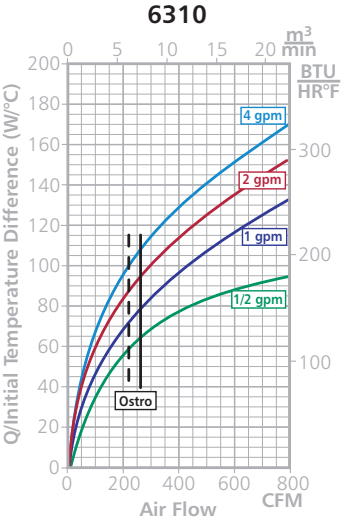
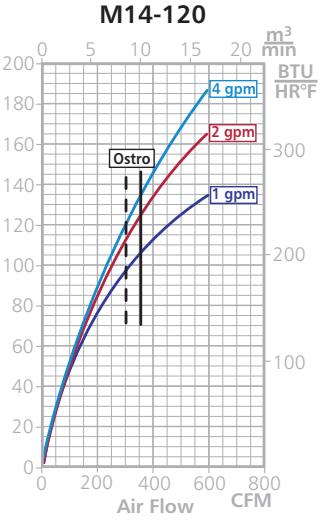


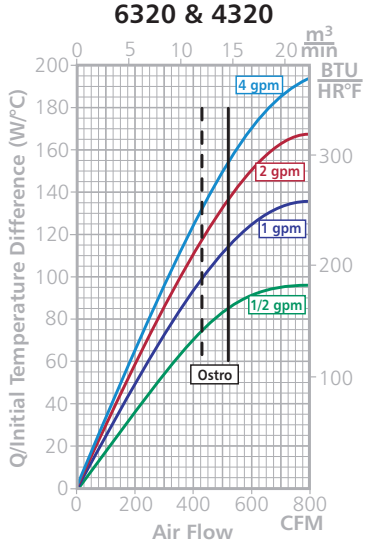
M14-120



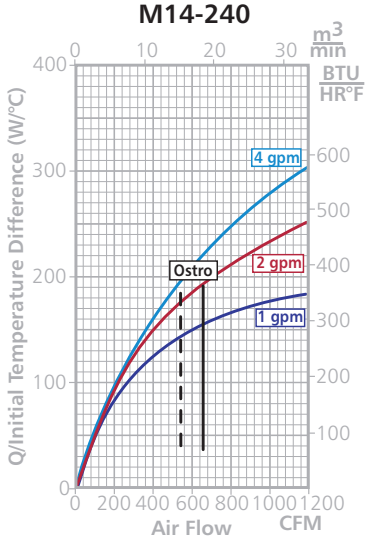
[1] *The solid vertical lines indicate the performance provided by our standard fans at 60 Hz and 20°C. Dashed fan lines represent fan performance at 50 Hz and 20°C.*

For pressure drop curves, please visit www.Lytron.com.

6320 & 4320



M14-240



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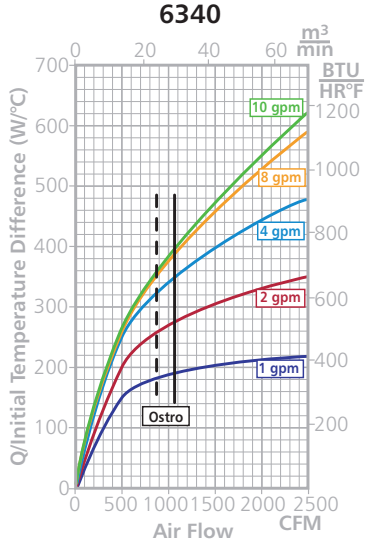
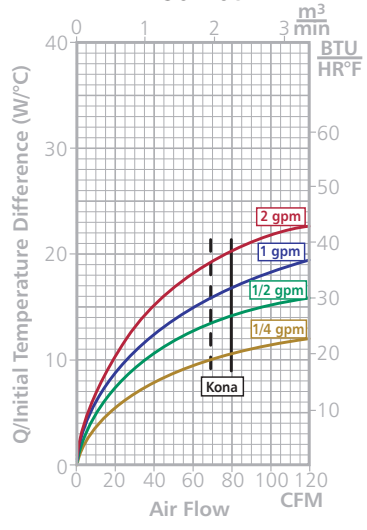
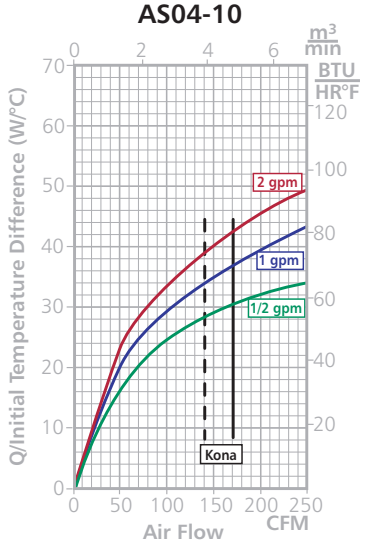


AS04-05



AS04-10



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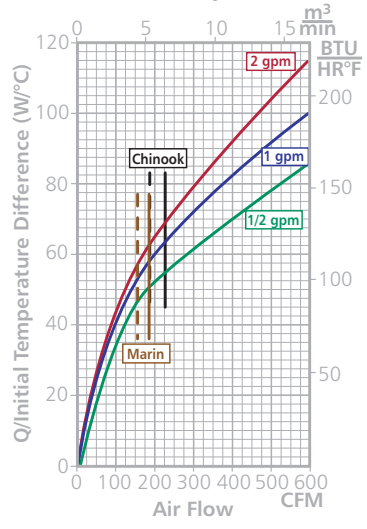
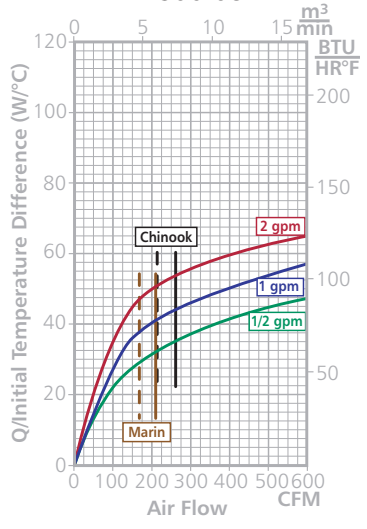
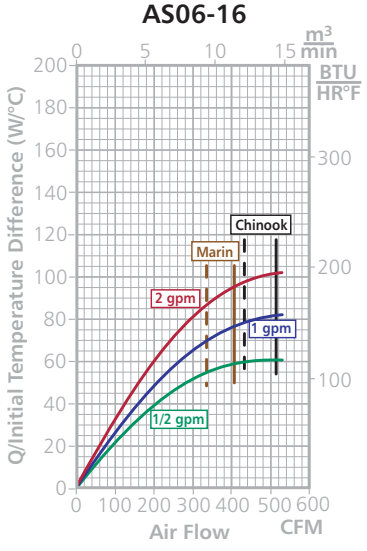


AS06-08



AS06-16



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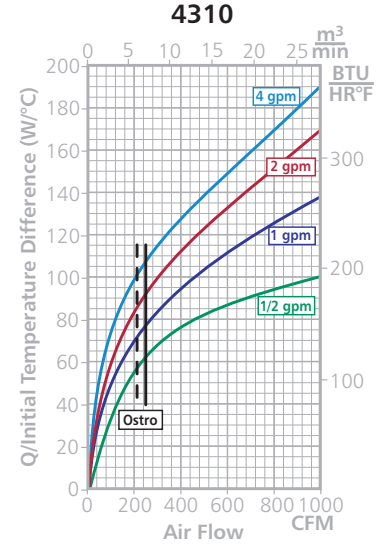
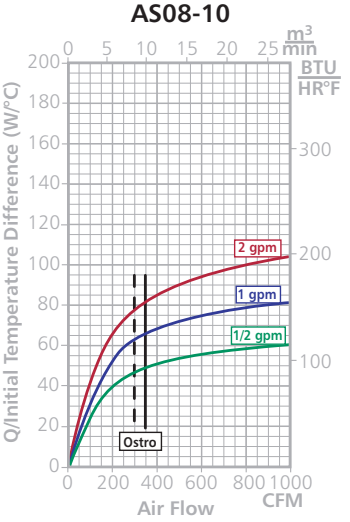


[1] *The solid vertical lines indicate the performance provided by our standard fans at 60 Hz and 20°C. Dashed fan lines represent fan performance at 50 Hz and 20°C.*

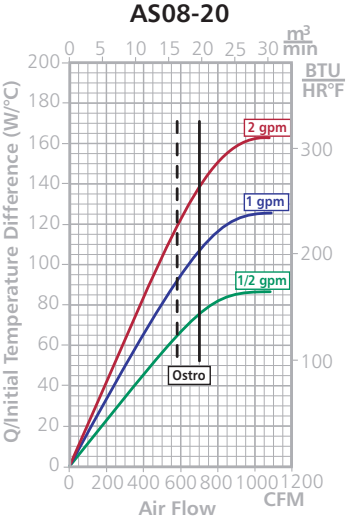
For pressure drop curves, please visit www.Lytron.com.

DWG 51
GRAPHS 56
SPECS 59
SELECT 60
Standard Heat Exchangers

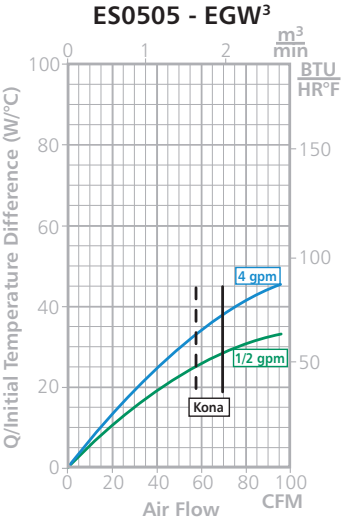
AS08-10



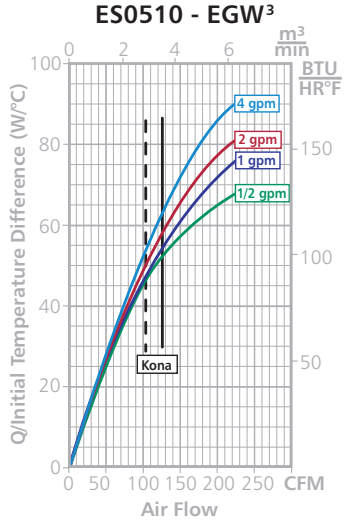
AS08-20



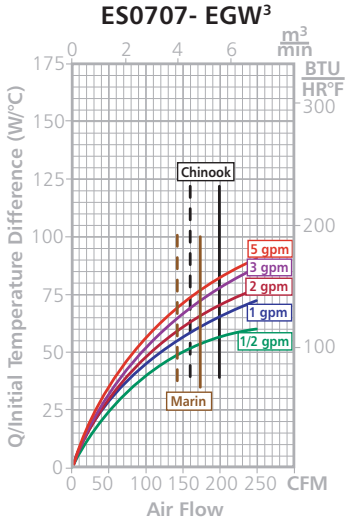
ES0505 - EGW[3]



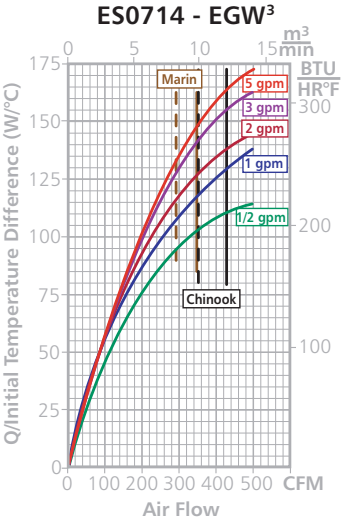
ES0510 - EGW[3]



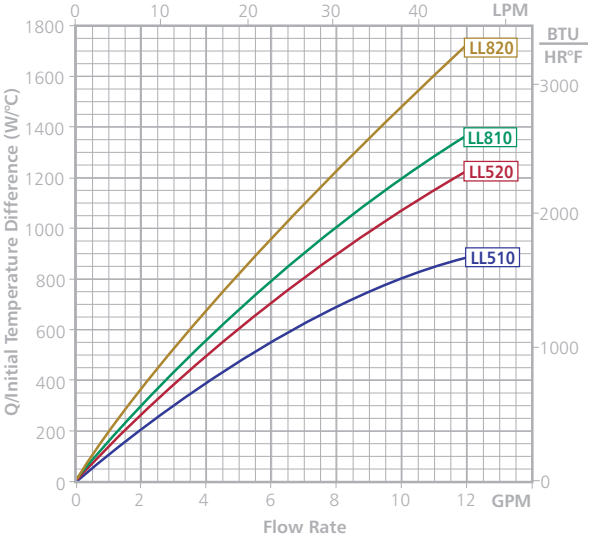
ES0707- EGW[3]



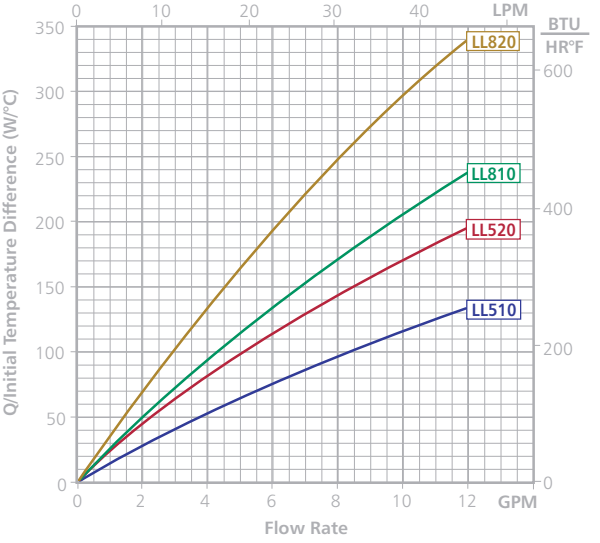
ES0714 - EGW[3]



Liquid-to-Liquid Thermal Performance Using Water and Water



Liquid-to-Liquid Thermal Performance Using Water and Oil



[1] The solid vertical lines indicate the performance provided by our standard fans at 60 Hz and 20°C. Dashed fan lines represent fan performance at 50 Hz and 20°C.
[2] See www.Lytron.com for ES Series performance graphs for oil. [3] 50/50 EGW at 160°F (71°F).

For pressure drop curves, please visit www.Lytron.com.

First select a core number → **Next, select a fitting option** → **Add a fan plate if desired** → **Arrive at a base part number** *e.g. 6120G1 BD* → **Add any additional options**

CORE NUMBER	FITTINGS [1]			FAN PLATE	FANS [2]				
	SB	BD	AN	Fan Plate	Kona	Marin	Chinook	Ostro	# of fans
6105G1	•	•	•	included	•				1
6110G1	•	•	•	included	•				1
6120G1	•	•	•	included	•				2
6210G1	•	•	•	included		•	•		1
6220G1	•	•	•	included		•	•		2
6310G3	•	•	•	included				•	1
6320G3	•	•	•	included				•	2
6340G1[1]				no fan plate					
6340G2[1]				included				•	4
M05-050	•	•	•	0=no fan plate; 1=fan plate	•				1
M05-100	•	•	•		•				2
M10-080	•	•	•			•	•		1
M10-160	•	•	•			•	•		2
M14-120	•	•	•					•	1
M14-240	•	•	•					•	2
AS04-05G01	•	•		included	•				1
AS04-10G01	•	•		included	•				2
AS06-08G01	•	•		included		•	•		1
AS06-16G01	•	•		included		•	•		2
AS08-10G01	•	•		included				•	1
AS08-20G01	•	•		included				•	2
4105G1	•	•	•	included	•				1
4110G10	•	•	•	included	•				1
4120G10	•	•	•	included	•				2
4210G10	•	•	•	included		•	•		1
4220G10	•	•	•	included		•	•		2
4310G10	•	•	•	included				•	1
4320G10	•	•	•	included				•	2
ES0505G[1]				21=no paint, no fan plate; 22=black paint, no fan plate; 23=no paint, fan plate attached; 24=black paint, fan plate attached	•				1
ES0510G[1]					•				2
ES0707G[1]						•	•		1
ES0714G[1]						•	•		2

Liquid-to-Liquid Part Numbers

Core Number		LL510G12	LL520G12	LL810G12	LL820G12	LL510G14	LL520G14	LL810G14	LL820G14
Plate material		AISI 316L stainless steel							
Braze material		copper 99.9%				nickel 99.7%			
Number of plates		10	20	10	20	10	20	10	20
Dry Weight	lbs	2.6	3.7	4.9	6.7	2.6	3.7	4.9	6.7
	kg	1.2	1.7	2.1	2.9	1.2	1.7	2.1	2.9
Fittings		¾″ MNPT							

[1] SB=Stub End; BD=Beaded Fitting; AN=37° AN Flare; 6340G1 AND 6340G2 - Leave blank: 0.875″ O.D. union fitting; ES Series–leave blank: ⅜–18 NPT fitting (e.g. – ES0707G24 has an NPT fitting, black paint, and fan plate)

[2] Fans, fan plugs, and fingerguards must be ordered separately. Assembly available on orders of 10+ pieces—ask for details.

Please visit www.Lytron.com for heat exchanger dry weight and fluid volume, fan, fan plugs, and fingerguard specifications and complete part numbers, ordering information, and distributors.

DWG 51 GRAPHS 56 SPECS 59 SELECT 60

1. Cooling Liquid

In order to select the correct Lytron heat exchanger or oil cooler, you must first determine the required thermal performance for your application. Use the example shown below:

Step 1: Application Data

Liquid type:	Water
Required heat load (Q):	3,300 W (11,263 BTU/Hr)
Temp. of incoming liquid ($T_{liquid\ in}$):	80°C (176°F)
Temp. of incoming air ($T_{air\ in}$):	21°C (70°F)
Rate of liquid flow:	2 gpm (7.6 lpm)

Step 2: Select the heat exchanger product series

Choose an aluminum, copper, or stainless steel heat exchanger based on the fluid compatibility. Aluminum tubing is usually used with light oils, or Ethylene Glycol and Water (EGW) solutions, copper is normally used with water, stainless steel is used with deionized water or corrosive fluids.

Step 3: Calculate the Initial Temperature Difference (ITD)

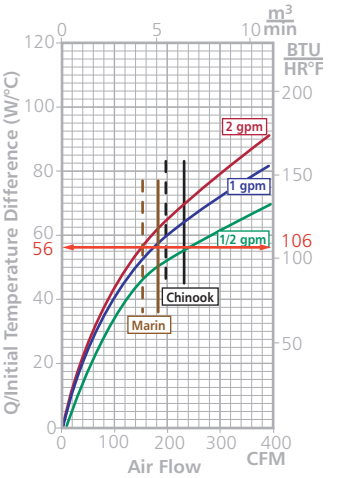
Subtract the temperature of the incoming air from the temperature of the incoming liquid as it enters the heat exchanger.

$$ITD = T_{liquid\ in} - T_{air\ in}$$
$$= 80°C - 21°C = 59°C \text{ (or } 176°F - 70°F = 106°F)$$

Step 4: Calculate the required performance capability (Q/ITD)

Divide the required heat load (Q) by the ITD found above in step 3.

$$\text{Performance capability} = \frac{Q}{ITD} = \frac{3{,}300\ W}{59°C} = 56\ W/°C \text{ or } \frac{11{,}263\ BTU/HR}{106°F} = 106\ BTU/Hr°F$$



Step 5: Select the appropriate heat exchanger model

Refer to the thermal performance graphs for the heat exchangers selected. (Performance graphs for copper heat exchangers, stainless steel heat exchangers, and oil coolers can be found on pages 56, 57, and 58 respectively.) Any heat exchanger that exceeds 56 W/°C at 2 gpm (using a standard fan) would be acceptable. As shown in the following graph, Lytron's 6210 exceeds the required performance.

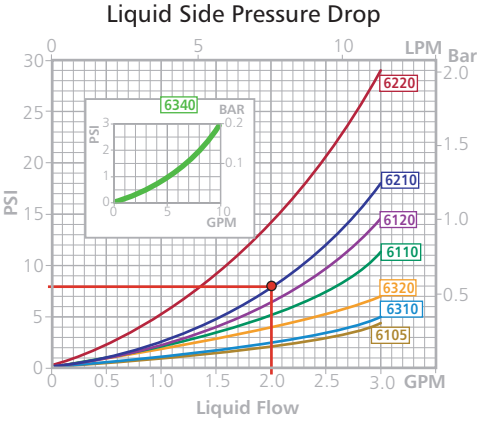
Step 6: Determine the liquid pressure drop

From the data given, we know our pump needs to supply water at 2 gpm. Using the liquid side pressure drop chart for the 6210 curve on www.Lytron.com, the point where a vertical line at the 2 gpm point on the x-axis intersects with the 6210 curve reveals that the liquid pressure drop through the 6210 is 8 psi (0.55 bars). The pump selected must overcome this pressure drop to ensure a 2 gpm flow.

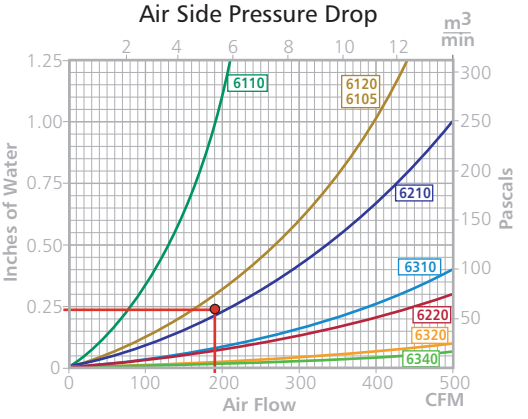
Step 7: Determine the air pressure drop

The vertical line on the thermal performance chart indicates the air flow rate (180 CFM for the Marin fan) as provided by our standard fans at 60 Hz. The intersection point of this air flow rate and the 6210 graph on the air side pressure drop reveals that the air side pressure drop through the 6210 is 0.24 inches of water (55 pascals).

Liquid Side Pressure Drop



Air Side Pressure Drop



2. Cooling Air

In cabinet cooling applications, the air is hotter than the liquid. In this case, the ITD is the difference between the hot air entering the heat exchanger and the cold liquid entering the heat exchanger. You may need to calculate the temperature rise using the heat load and the temperature of the cool air entering the cabinet.

Example: Cabinet Cooling application

You are cooling a cabinet containing electronic components that generate 2400 W of heat. The air in the cabinet must not exceed 55°C. What heat exchanger should be selected, and what is the temperature of the cool air entering the electronics cabinet?

Step 1: Application Data

Liquid type:	Water
Required heat load (Q):	2,400 W (8,189 BTU/Hr)
Temp. of incoming liquid ($T_{liquid\ in}$):	20°C
Max. temp of air in cabinet ($T_{air\ in}$):	55°C (131°F) —— *This is the temperature of the hot air entering the heat exchanger*
Rate of liquid flow:	2 gpm (7.6 lpm)

Step 2: Calculate the ITD

Subtract the temperature of the incoming liquid from the temperature of the incoming air as it enters the heat exchanger.

$ITD = T_{air\ in} - T_{liquid\ in} = 55°C - 20°C = 35°C$ (or 131°F – 68°F = 63°F)

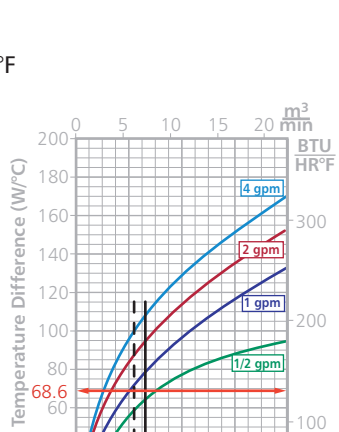
Step 3: Calculate the required performance capability (Q/ITD)

Divide the required heat load (Q) by the ITD found above in step 2.

$$\text{Performance capability} = \frac{Q}{ITD} = \frac{2{,}400\ W}{35°C} = 68.6\ W/°C \text{ or } \frac{8{,}189\ BTU/HR}{63°F} = 130\ BTU/HR°F$$

Step 4: Select the appropriate heat exchanger model

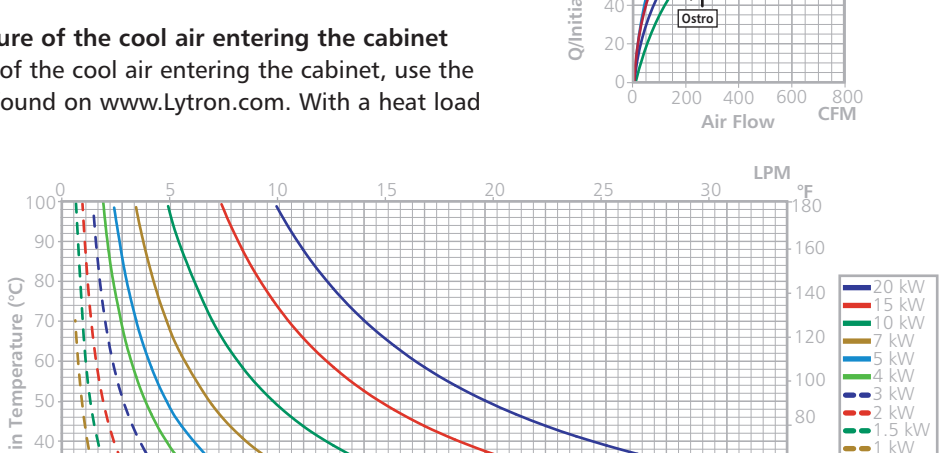
Refer to the thermal performance graphs for the heat exchangers selected. (Performance graphs for copper heat exchangers, stainless steel heat exchangers and oil coolers can be found on pages 56, 57, and 58 respectively.) Any heat exchanger that exceeds 68.6 W/°C at 2 gpm (using a standard fan) would be acceptable. Using water as the coolant, a copper heat exchanger is recommended. As shown in the following graph, Lytron's 6310 exceeds the required performance, offering a Q/ITD of approximately 96 W/°C using our Ostro fan.



Liquid and air pressure drop can be determined the same way as in the previous example.

Step 5: Calculating the temperature of the cool air entering the cabinet

Now, to calculate the temperature of the cool air entering the cabinet, use the temperature change graph for air found on www.Lytron.com. With a heat load of 2,400 W, and a flow rate of 250 CFM (the flow rate of the standard Ostro fan recommended for use with the 6310) we can see that the temperature change is 17°C. This means that the cool air entering the cabinet will be: 55°C – 17°C = 38°C



[1] These graphs offer a simple graphical way of estimating fluid temperature change if you know your heat load and flow, without having to do calculations. The graphs for water, air, 50/50 Ethylene Glycol/Water (EGW) and oil allow you to calculate temperature changes for air and liquid for all types of heat exchangers.