Evaporator & Heat Pump Coils

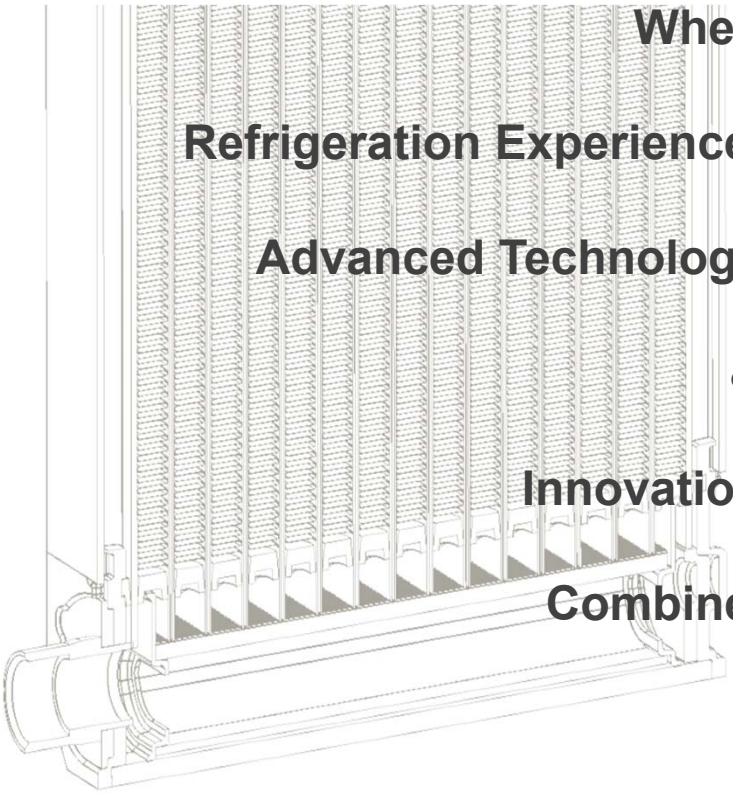
1 to 30 Tons

Alcoil

www.Alcoil.net

MicroChannel Evaporators
&
Heat Pump Coils

Product Guide



When

Refrigeration Experience,

Advanced Technology

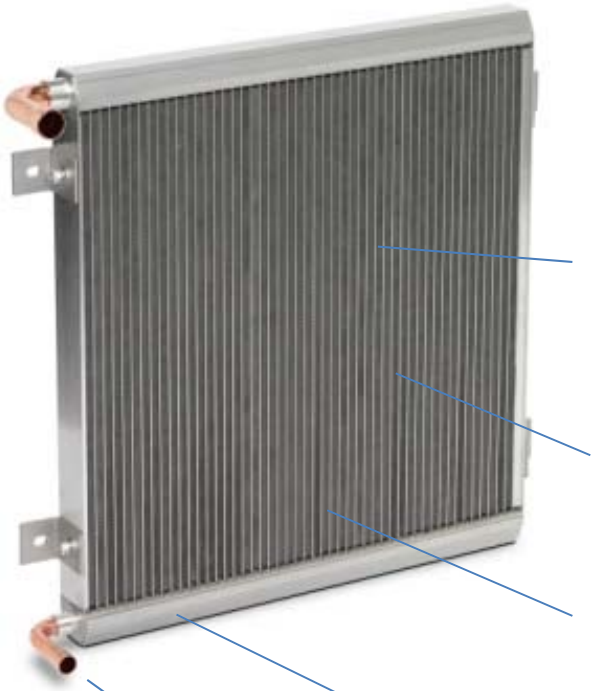
&

Innovation

Combine.

Contents

Alcoil Microchannel Evaporator



Custom & Standard Sizes
Flexibility and variable dimensions are tailored to our OEM customer needs using AlcoiSELECT Software. Custom and QuickShip sizes are available from as small as 4”x4” to over 80”x95””. Capacities range from ¼ tons to over 30 tons.

Easy OEM Mounting
The coil itself is a robust frame that provides air tight flush mounting, thereby eliminating unnecessary components and air bypass. Optional “L” brackets, ¼”-20 studs or ¼”-20 flush nuts are available for easy mounting.

High Water Shedding & High Performance Fins
A state of the art louvered fin design provides low airside pressure drop and high water condensate shedding. This is due to using capillary forces and gravity to pull condensate off the coil.

Vertical MicroChannel Tubes
Alcoil’s patented innovation incorporates vertical tubes that draw the refrigerant upward, through thin Microchannel tubes. Each tube has over 30 micro-ports that induce high heat transfer and exceptional evaporative performance.

Built-in DX Distributor
A unique Built-in DX Distributor is designed to evenly spread the entering refrigerant across the width of the coil. This provides assured coil performance and part load operation. Unlike any HVAC/R coil, the lower coil header eliminates the need for an external distributor and complex piping.

Connections and More
Alcoil condensers are available with copper sweat connections and custom orientations.

Alcoil’s MicroChannel Evaporators are based on an innovation in refrigerant flow distribution, combined with a water-shedding coil design. Put simply. It works. Read on.

Wide Range of Applications

As a Direct Expansion (DX) Cooling Coil, Heat Pump or Reverse operation Heating/Cooling Coil, Alcoil has several small, medium and large models designed to be a workhorse in HVAC/R applications. The MicroChannel coil has been designed as a high performance Evaporator to tackle sensible and latent (dehumidifying) heat transfer, plus have the versatility for operate in reverse as a condenser.

This application strength makes the E & HP Series ideal for:

- **Cooling Coils**
- **Make Up Air**
- **Heat Pump (indoor coils)**
- **Heat Pump (outdoor coils)**
- **Dehumidfier Coils**

In all the above applications, whether comfort control or process, Alcoil E & HP Series Coils deliver……..

Performance & Efficiency
Compared to old style fin/tube designs, Advanced Micro-Channel technology, combines integrally brazed airside fins, perfected DX Refrigerant Distribution, and condensate water-shedding to achieve high efficiencies and better coil performance.

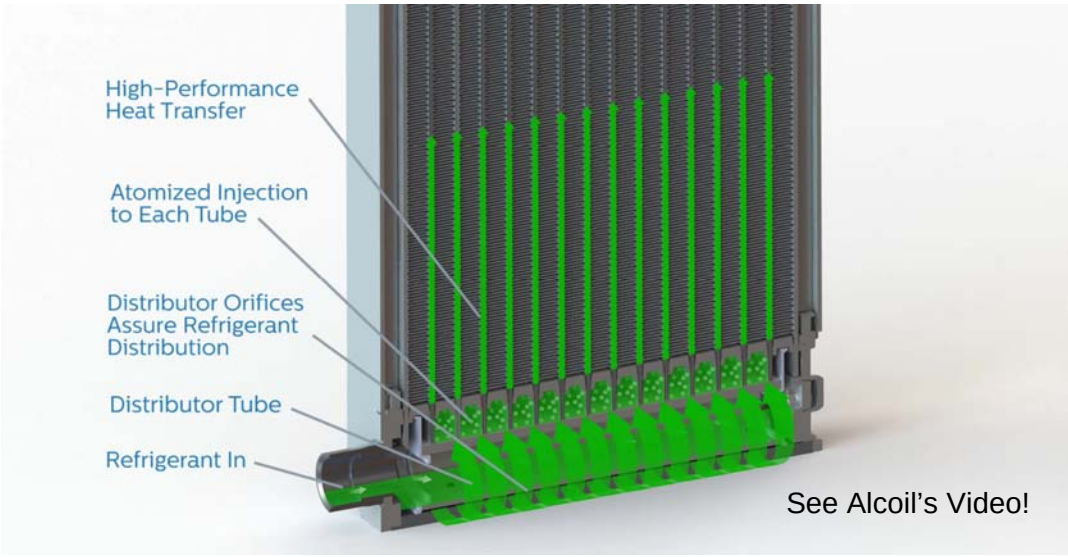
Smaller Size
Up to 20% smaller coil face depending upon the design conditions. And almost always, Alcoil heat exchangers are thinner and take up less space.

Less Weight
Up to 50% less weight. This reduces shipping costs, minimizes equipment structural support, reduces labor to install, and shipping costs.

Less Refrigerant Charge
Typically 30% to 50% less refrigerant charge required as an evaporator or heat pump coil.

Lower Cost
No more copper spaghetti and related problems. All aluminum, built-in DX Distributor and less weight translates to 5% to 20% lower cost, depending upon design conditions.

How Does it Work?



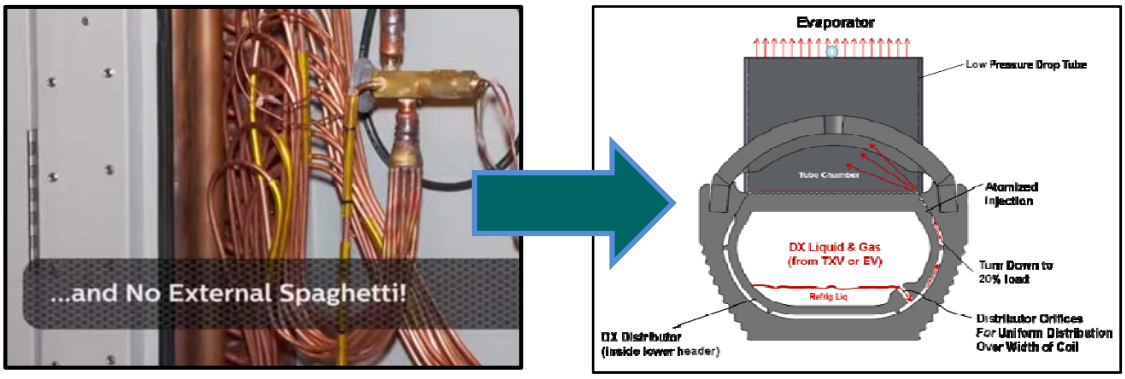
Evaporator performance is dependent upon 3 things:

1) Uniform Refrigerant Distribution feed to all the coil tubes
2) High performance Tubes and Fins
3) Condensate Water-shedding from the coil

The foundation of Alcoil's evaporator innovation is a Built-in Direct Expansion (DX) Distributor. Based on years of proven results, Alcoil takes the technology to a new level.

Liquid/Gas refrigerant from the TXV (or EV) enters the lower header connection and into an internally snug "DX Distributor Tube". The Liquid/Gas refrigerant mixture then enters "Distributor Orifices" in the "DX Distributor tube" to spread out the refrigerant over the width of the coils. The Distributor Orifices feed a narrow gap that directs the refrigerant to a final stage of "Atomization Injection", where it is injected in close proximity to the coil tubes. This sheer thin wall of refrigerant allows each tube to be equally fed for evaporation and heat transfer in the MicroChannel tube. Good velocity in the tubes and distributor dynamics assures no oil trapping, good performance and turn-down to 20% load, if needed.

The Alcoil DX Distributor also works in reverse, allowing condensed liquid refrigerant to pass as a condenser for reverse cycle Heat Pumps.



3 Configurations

E & HP Models Evaporator & Heat Pump

Typical E & HP Series Single “Module” models are typical for ½ ton to 20 ton capacity coils, depending on actual design conditions, air flow rate and target performance.

E and HP Models
w/ Elbow Connections at 3 o‘clock
w/ LBrackets

w/ Straight Connections
w/ LBrackets

w/ Face Connections
w/ ¼-20 Threaded Flush Nut Inserts

2E & 2HP Models Evaporator & Heat Pump

“Multi-Module” versions are designated as 2E and 2HP, up to 92” wide face. These models are typical for 15 ton to 40 ton capacity coils, up to 95” wide and 77” tall, depending on actual design conditions, type refrigerant, air flow rate and target performance.

2E & 2HP Models
w/ Center Elbow Connections
w/ LBrackets

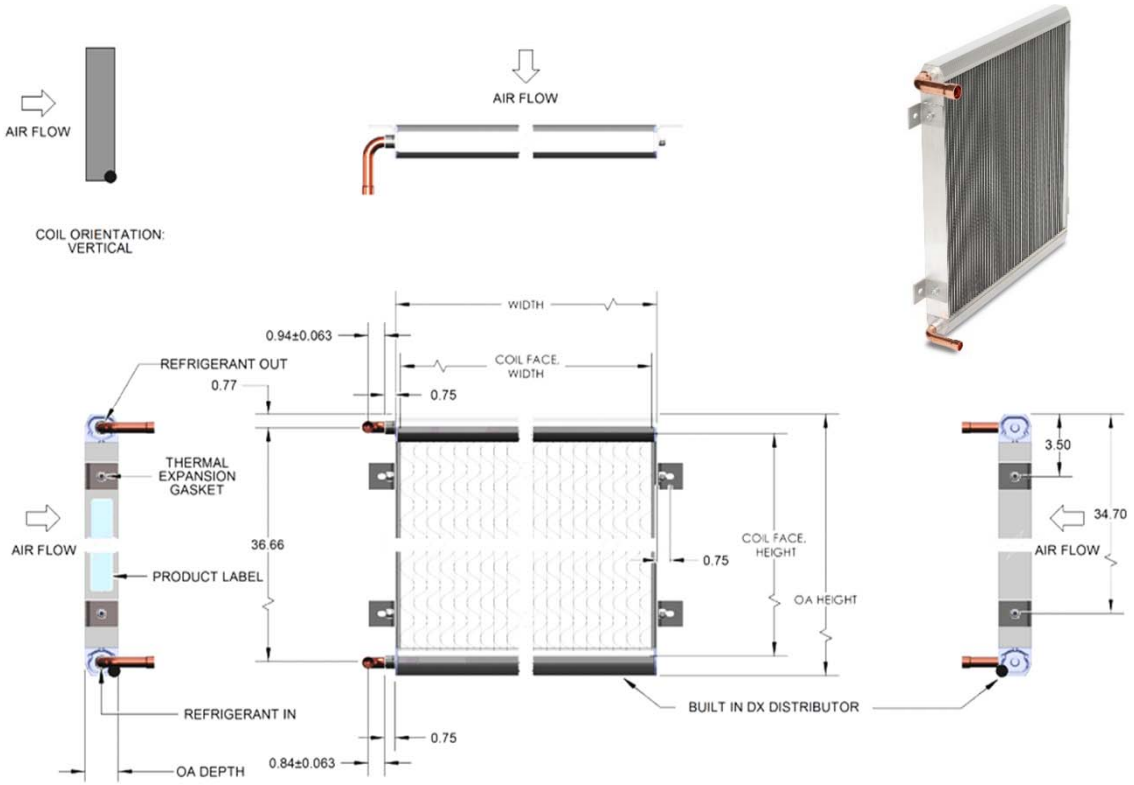
2RE Model Evaporator only

2RE Model (Two Row)
w/ Elbow Connections
w/ LBrackets

Alcoil

E & HP Series – Evaporator & Heat Pump

½ to 20 tons



Capacity Range:	½ to 20 tons
Refrigerants	R410a, R407C, R134a, R404a, R508B, R290, & others
Design Working Pressure	650psig, 450psig & 300psig models
Design Working Temperature	250F
Maximum Face Width (E & HP model)	46.4”W
Maximum Face Height	77”W (up to 96”W upon request)
Tube Sizes	1.25” (High Performance) 1.9” O.A. Coil Depth
Fins	24 fpi, high performance, louvered
Connection Sizes	3/8”, 1/2”, 5/8”, 7/8”, 1-1/8”
Connection Locations	EndCap (shown) & Header Face (optional)
Built-in DX Distributor	Evaporators: 5 to 30psi pressure drop Heat Pump (Evap/Condenser): 5 to 20 psi pressure drop
Mounting Options	LBrackets, ¼”-20 Threaded, Flush Nut Inserts ¼”-20 x ½” Studs, or
Testing	Per UL 207 at full pressure, Helium Leak tested
Code Approval	Underwriters Laboratories (U.L. Listed)

Model Nomenclature: **E32x48x1.25V-15H06-D1440C-01**

- E-Evaporator,HP-Heat Pump
- Face Width
- Face Height
- Tube Size
- Tube Orientation
- Item# / Drawing#
- Revision Level
- Blank – No Coating
- C – Coating

c UL us LISTED

Alcoil

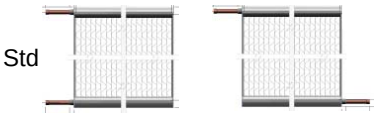
Connection Options (E & HP)

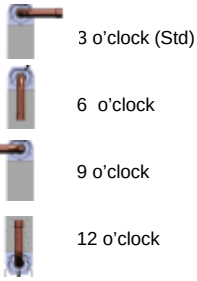
All Evaporators and Heat Pump versions for OEMs have options for EndCap or Face Connections for easy packaging, piping and fit-up. A full range of copper connection sizes and connection locations are shown below. All connections options are available using AlcoilSELECT™ software, except for Specials and c

► EndCap Connections

1.25V Models (only)	3/8”, 1/2”, 5/8”, 7/8”, & 1-1/8” ID Solder

Location	Same Side Connections (std) Opposite Side Connections
Straight (Std #1)	Same Side Connections (std)
Elbow (Std #2)	Same Side Connections (std) 3 o’clock, 6 o’clock, 9 o’clock, 12 o’clock Opposite Side Connections Custom angles (w/ volume production)
Specials	Stainless Steel Pipe, Butt Weld (3/8” to 1”) Carbon Steel Pipe, Butt Weld (3/8” to 1”) SS & Carbon Steel Pipe, Butt Weld (LV model only, 450psig) Copper 1-5/8” OD (LV model only, 450psig)



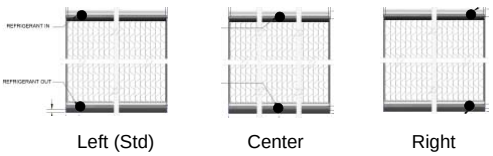


► Face Connections

Face Connections are ideal for compact packaging where dimensions and space are critical. Standard location is Left side on the headers. Optional locations are header center or right side of headers. Straight and elbow connections, up to 7/8” IDS are available.

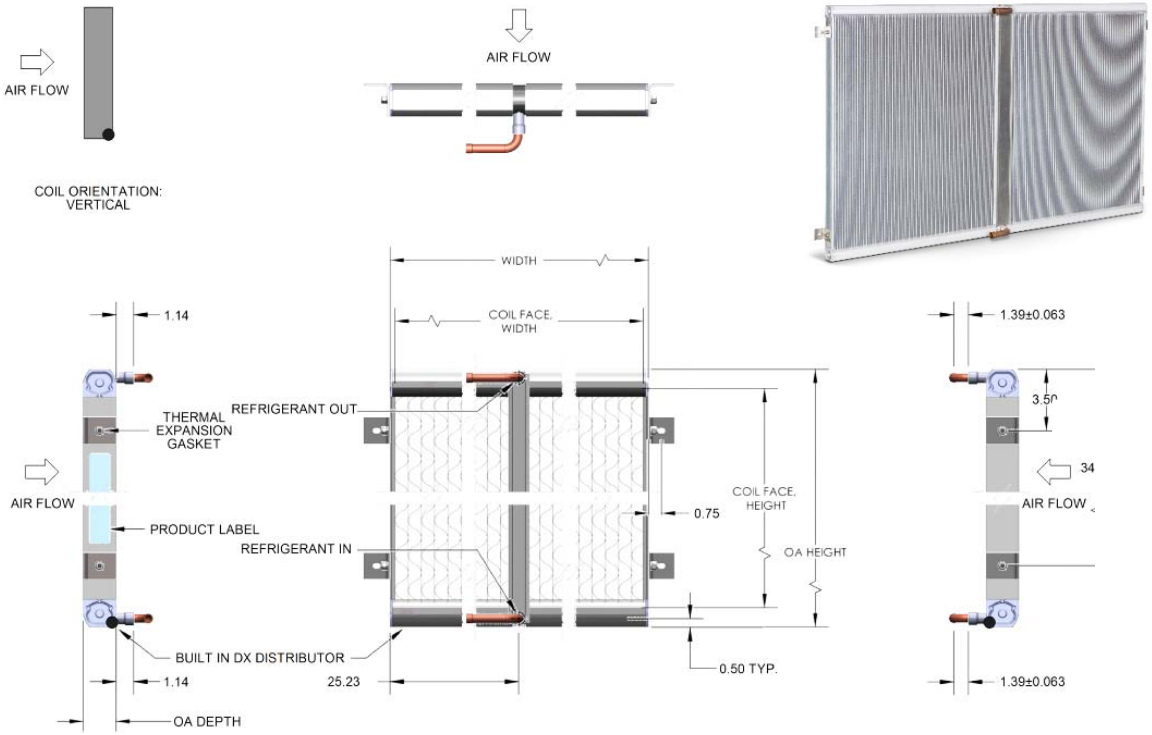
1.25V Models (only)	3/8”,1/2”, 5/8”, 7/8” ID Solder

Location	Left, Same Side (std), Center Right Opposite Sides, Left/Right, Right/Left
Straight (Std)	Same side (Std)
Elbow	3 o’clock, 6 o’clock, 9 o’clock, 12 o’clock Opposite Side Connections Custom angles (w/ volume production)
Specials	None.



2E & 2HP Series

10 to 40 tons



Capacity Range:	10 to 40 tons
Refrigerants	R410a, R407C, R134a, R404a, R508B, R290, & others
Design Working Pressure	650psig, 450psig and 300psig models
Design Working Temperature	250F
Maximum Face Width (E & HP model)	92”W
Maximum Face Height	77”H (up to 96”H upon request)
Tube Sizes	1.25” (High Performance) 1.9” O.A. Coil Depth
Fins	24 fpi, high performance, louvered
Connection Sizes	OUTLET (top): 7/8”, 1-1/8”, 1-3/8” & 1-5/8” INLET (bottom) 7/8”, 1-1/8”
Connection Locations	Center only
Built-in DX Distributor	Evaporators: 5 to 30psi pressure drop Heat Pump (Evap/Condenser): 5 to 20 psi pressure drop
Mounting Options	LBrackets, ¼”-20 Threaded, Flush Nut Inserts ¼”-20 x ½” Studs, or
Testing	Per UL 207 at full pressure, Helium Leak tested

Model Nomenclature: **2E32x48x1.25V-15F03-S1452C-01**

- 2E-Evaporator,2HP-Heat Pump
- Face Width
- Face Height
- Tube Size
- Tube Orientation
- Item# / Drawing#
- Revision Level
- Blank – No Coating
- C – Coating

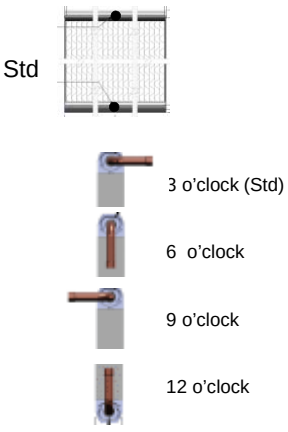
Connection Options (2E & 2HP)

All 2E & 2HP models is the workhorse of large face Evaporators and Heat Pump coils. The design has CENTER connections for standard packaging, piping and fit-up. A full range of copper connection sizes and connection locations are shown below. All connections options are available using AlcoilSELECT™ software, except for Specials and non-standard angles..

► CENTER Connections

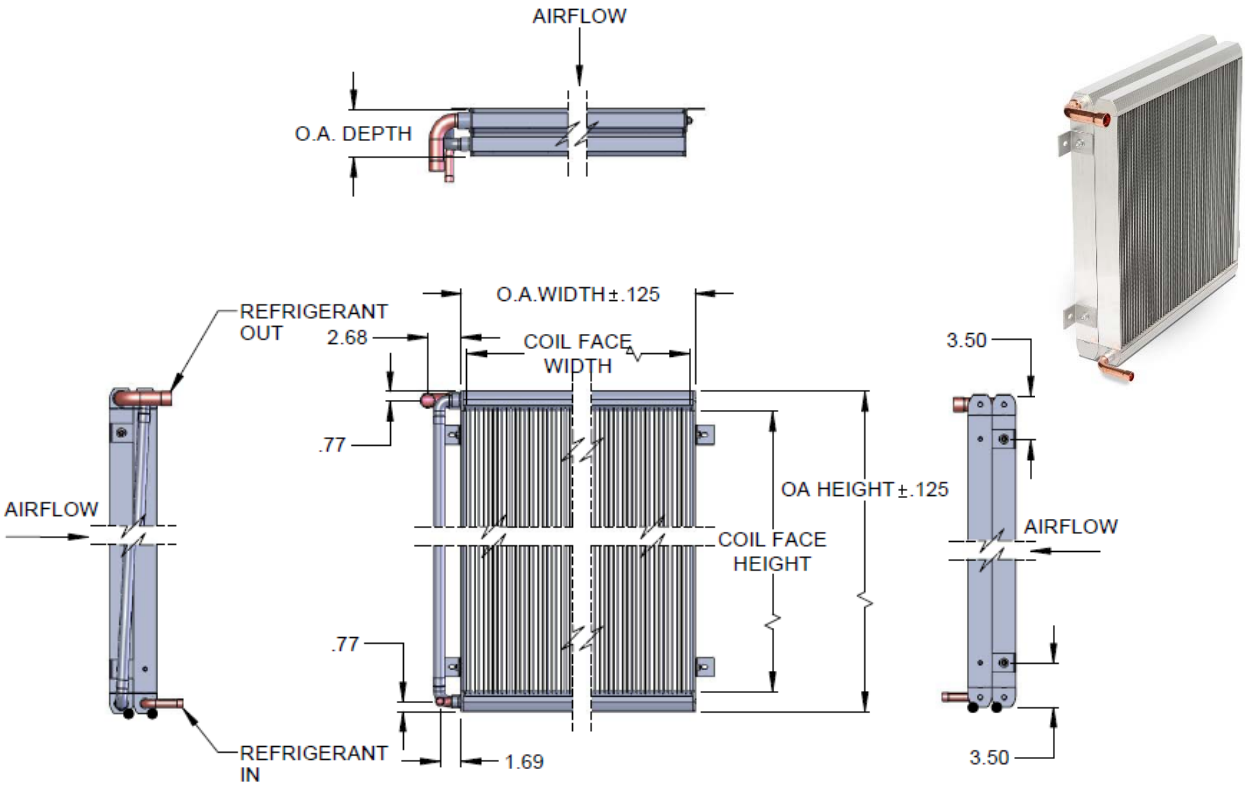
1.25V Models only .	Outlet (top) 7/8”, 1-1/8”, 1-3/8”, 1-5/8” ID Solder Inlet (bottom): 7/8” & 1-1/8” ID Solder

Location	Same Side Connections (std) Opposite Side Connections
Straight (Std #1)	Same Side Connections (std)
Elbow (Std #2)	Same Side Connections (std) 3 o’clock, 6 o’clock, 9 o’clock, 12 o’clock Opposite Side Connections Custom angles (w/ volume production)
Specials	Consult the factory.



2RE Evaporator (2 Row)

2 to 30 tons



Capacity Range:	1 to 30 tons
Refrigerants	R410a, R407C, R134a, R404a, R508B, R290, & others
Design Working Pressure	650psig, 450psig & 300psig models
Design Working Temperature	250F
Maximum Face Width (E & HP model)	46.4”W
Maximum Face Height	77”W (up to 96”W upon request)
Tube Sizes	1.25” (High Performance) 3.8” O.A. Depth
Fins	24 fpi, high performance, louvered
Connection Sizes	3/8”, 1/2”, 5/8”, 7/8”, 1-1/8”
Connection Locations	EndCap (shown) Header Face – Not Available
Built-in DX Distributor	Evaporators: 5 to 30psi pressure drop Heat Pump (Evap/Condenser): 5 to 20 psi pressure drop
Mounting Options	LBrackets, ¼”-20 Threaded, Flush Nut Inserts ¼”-20 x ½” Studs
Testing	Per UL 207 at full rated pressure, Helium Leak tested

Model Nomenclature: **2RE32x48x1.25V-15J21-K2266C-01**

- 2RE (2 Row)
- Face Width
- Face Height
- Tube Size
- Tube Orientation
- Item# / Drawing#
- Revision Level
- Blank – No Coating
- C – Coating

Connection Options (2RE)

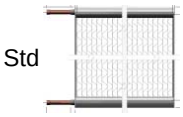
The 2RE Evaporator is a high performance coil intended to equal or exceed a traditional 6 row fin/tube performance. As a high performance evaporator, the 2RE is a TWO ROW evaporator with ONE single refrigerant circuit. The 2RE has the refrigerant side configured “in series”, entering the first coil, and then the second coil. Air flow is typically counterflow, providing exceptional performance.

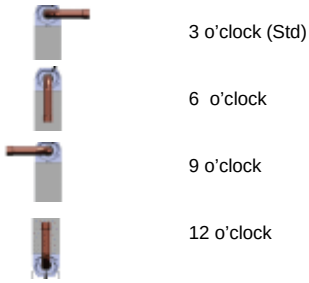
A full range of copper connection sizes and connection locations are shown below. All connections options are available using AlcoilSELECT™ software, except for Specials and custom angles..

► EndCap Connections

1.25V Models (only)	3/8”, 1/2”, 5/8”, 7/8”, & 1-1/8” ID Solder

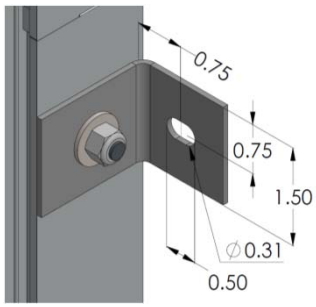
Location	Same Side Connections (std) Opposite Side Connections
Straight (Std #1)	Same Side Connections (std)
Elbow (Std #2)	Same Side Connections (std) 3 o’clock, 6 o’clock, 9 o’clock, 12 o’clock Opposite Side Connections Custom angles (w/ volume production)
Specials	Consult the factory





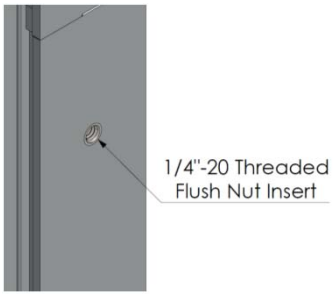
Mounting Options (ALL MODELS)

Alcoil models have four practical options for easy mounting and fit into OEM systems.



Mounting Bracket

1-1/2x1-1/2” with ¾” L stud & Nut
2 Brackets, each side up to 53” models
3 Brackets, each side & center for 54” and taller models
Thermal expansion gaskets included, under bracket



1/4-20 Threaded Flush Nut Insert

Located 3.5” from either end.For compact mounting from side wall or strut, or use with customer supplied Bracket.
2 inserts, each side up to 53” models
3 inserts, each side & center for 54” and taller models
5/16” maximum thread depth

¼”-20 Studs

Located 3/4”L, 3.5” from either end. For use with customer supplied Brackets or through the wall mounting.
2 Studs, each side up to 53” models
3 Studs, each side & center for 54” and taller models

None

Application Tips

Evaporator vs Heat Pump (Condenser) Models
The E, 2E, and 2RE models are DX Evaporators designed as strictly cooling coils. Total thermal heat transfer is a combination of "sensible heat load" and "latent heat load" from dehumidification. Evaporator models have an optimally designed DX Distributor for proper operation and part load performance.

The HP and 2HP models are also DX Evaporators, however, the DX Distributor is selected with a lower refrigerant pressure drop, such that the coil will also work as a Condenser in reverse mode.

Thus in this Application Section, all coils are assumed to be Evaporators. Special requirements or considerations for reverse cycle Heat Pump operation will be noted.

Coil Orientation
Coil orientation plays a role in overall coil performance. Vertical coil orientation is typical with good performance. Highest optimum efficiency is typically at 55 to 70 degrees (from horizontal), leaning with the direction of air flow. Coil performance depends upon airside face velocity, moisture loading and tilt angle.

Tilting the coil orientation toward the air flow reduces coil capacity. Thus, Air Flow direction and Tilt angle influence water condensate shedding rate, and thus coil capacity.

Air Flow Direction & Distribution
For vertical coils, air flow direction should follow the drawing convention. For slanted coils, air flow direction MUST follow the drawing convention and distributor orientation, otherwise a loss of capacity could occur.

Relative even air flow distribution across the face of any evaporator coil influences overall coil performance. Placement of fans, obstructions, and flow path turns influences overall air flow distribution and affects coil performance.

Air Velocities
Maximum recommend air flow velocity for Evaporators and in-duct Heat Pumps is 500 fpm (feet per minute) to assure no water particle entrainment in the air stream. Higher air flow velocities may be used if moisture carry-over is not important, or another means is used to capture it.

Maximum recommended air flow velocity for Heat Pump use in outdoor evaporator mode may exceed 500fpm and beyond 1000fpm to for excellent performance.

Heating mode in indoor applications may also use variable speed fans, exceeding 500fpm in heating mode.

Water (Condensate) Shedding
In Evaporator operation, Water Condensate accumulates on the coil fins. As the moisture droplets grow and become in contact with each other between the fins where gravity and capillary forces pull the water down through the fin louvers, between the tubes. This downward water flow starts a cascade of condensate to the bottom of the coil. The higher the latent moisture load, the higher the coil performance. Generally speaking, the Alcoil MicroChannel coil will typically have higher dehumidification, latent heat removal than traditional coils.

15

Application Tips

Non-Dehumidifying Environments
In computer applications, data centers and applications with minimal dehumidification, the Alcoil Microchannel is designed to have high performance sensible load capacity. A customer supplied drain pan is recommended, if humid operation ere to occur, such as cabinet doors open during operation.

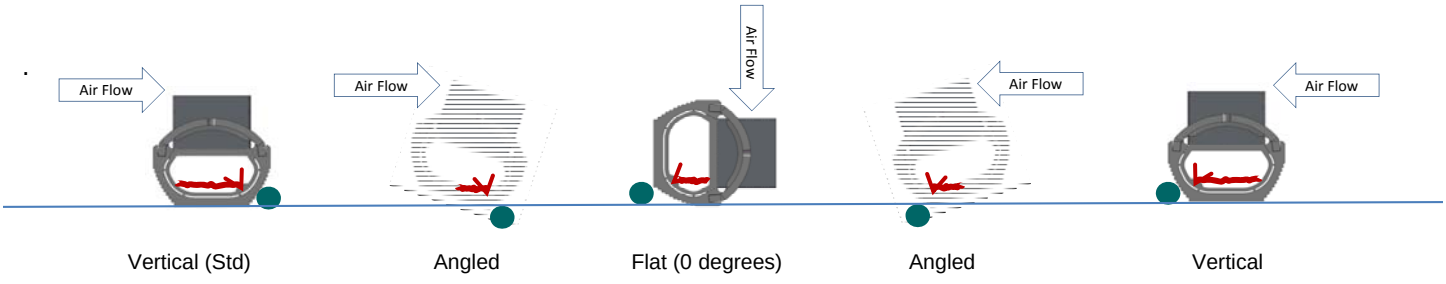
Condensate Drain Pan
The coil shoud be mounted above a condensate drain pan and should not sit in the drain pan with condensate. This assures longer coil life and avoids potential corrosion, bacteria, and other issues. The coil can rest on a ledge or protrusion of the drain pan, with suitable material compatibility. Acceptable materials include PVC & other plastics, aluminum, stainless steel and epoxy coated metals.

Refrigerant Side
Alcoil's Microchannel Evaporators are manufactured as 650psig, 450psig and 300psig versions that can be used with R410a (650psig model), R407C, R134a, R404A, R508B, and number of other refrigerants. For other refrigerants such as Ammonia and Propane, please contact the factory for custom models.

Heat Pump models are manufactured only as 650psig and 450psig versions, depending upon the refrigerant.

Because all Alcoil Evaporators use vertical micro-tubes, upward evaporative flow pushes refrigerant gas, liquid and entrained compressor through the coil. MicroChannel tube dynamics, combined with the DX Distributor system, ensure no oil entrapment at full load and part load.

DX Distributor Orientation
Alcoil's built-in DX Distributor is designed for Vertical coil operation, Angled coil operation and Flat, horizontal operation. This is possible due to the DX Distributor refrigerant orifices being located in the lower right side (when oriented vertically). This allows the coil to operate from 90 Degrees Vertical to 0 degrees flat. The "Distributor Dot" on the illustration below and all Alcoil Evaporator/Heat Pump drawings always show the "Distributor Dot" at the lowest point on the Lower header. Actual production units have a ★ on the right side Lower Header.



DX Distributor Pressure Drop
AlcoilSELECT software automatically selects the optimum distributor for the maximum design cooling load, and whether the coil operation is Evaporator Only or reversable Heat Pump (Evaporator/Condenser) operation. Adequate refrigerant pressure drop is essential to proper DX Distributor operation. Depending upon refrigerant type, DX Distributor pressure drops are typically configured for Evaporators from 10psi PD to 35psi PD. Heat Pump models are typically configured for 5psi PD to 25psid. This entrance pressure drop has no affect on overall coil evaporator operating pressure and evaporator temperature, since it is prior to the coil heat transfer surface.

To prevent oversizing or possible control instability, TXV or EV selection should NOT include the DX Distributor pressure drop in the selection criteria.

Application Tips

Refrigerant Charge
When using an Alcoil microchannel Evaporator or Heat Pump coil, the refrigerant system charge will typically use 30% to 60% less refrigerant than a traditional fin/tube coil (excluding a receiver, if used). Overcharging might system will result in higher head pressure and loss of system capacity.

The following procedure is recommended: 1) At full load or near full load operating conditions and by weight of refrigerant, put approximately 1/3rd the calculated charge in the refrigeration system. Let the system stabilize and check for gas bubbles in the liquid line sight glass. 2) Incrementally, add small amounts (.1oz) of refrigerant and wait for the system to stabilize. 3) When there are few or no gas bubbles entering the expansion valve, then the charge is most likely correct. 4) If the system is operating with higher head pressure than design, extract refrigerant charge from the system. As a second method, typical condenser refrigerant subcooling is 5F to 7F. Above 10F subcooling typically indicates an over-charged system.

System Operation & Control
Recommended Evaporator Superheat is 6F. Because the coil has micro-port tubes refrigerant liquid will not pass out the heat exchanger at low superheat temperatures. Thus, for optimum efficiency, a lower Superheat <10F operation is recommended. Higher superheat operation will lower coil capacity.

TXV, EV, & Hot Gas operation – In special systems, an over-reacting TXV or EV, or oversized TXV can cause system oscillation or high head and low suction pressure. Slower response EV control will typically remedy this situation. Where hot gas bypass is used on with the evaporator, a slow response modulating valve is recommended to prevent high pressure cutout due to rapid refrigerant transfer to the condenser and to prevent thermal shock and premature failure of the coil.

a) Low Evaporator Suction Operation – Recommended minimum evaporator suction temperature is 26F +/- 2F, depending upon the airside flow rate and other operating conditions. Frost build up may occur in this temperature range. Freezing or full freezing of the coil may cause coil failure.

b) Defrost Cycle (Heat Pump models) – Like all heat pump coils, outdoor operation must include a defrost cycle. Defrost time and frequency is dependent upon operating conditions, temperatures and air flow rates. The equipment OEM is responsible for developing the defrost cycle for the system.

c) High Ambient or High Head Operation is possible with Alcoil's 1.25 model, using proper head pressure control, fan speed control and equipment controls to take advantage of the MicroChannel's higher heat of rejection capabilities. For Heat Pumps, this

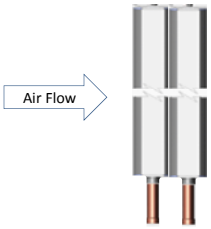
d) Fan Control – Recommended fan control is single speed, two speed or variable speed.

e) Air Flow Distribution can effect coil overall performance. Fan placement, obstructions, change of air flow, and other factors can effect overall coil performance. On new or complex designs, air annometer checks are recommended on new equipment designs.

Application Tips

Two Refrigerant Circuit Systems

High performance two refrigerant circuit (two compressors) systems are possible with the E, 2E and 3E models. Using a controllable EV refrigerant electronic valve on each Evaporator, two coils can be installed with the air flow as shown, ducted in series. With proper controls programming, the EV can control the load(s) and load allocation to each coil.



Connections

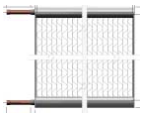
Proper coil orientation and piping of Refrigerant INLET and OUTLET Connections is required based on EVAP MODE and/or Condenser MODE operation. Orienting the coil upside down will result in significant loss of thermal capacity and a non-functioning coil.

Evaporator Mode	**Condenser Mode**
OUTLET at TOP	INLET at TOP
INLET on Bottom	OUTLET on Bottom

All models have copper IDS solder connections, optional elbow or straight connections for refrigerant piping. All connections also have a Viton protective sleeve for long-term corrosion protection.

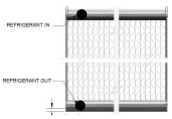
When soldering or brazing to Alcoil copper connections, a wet rag should be used at the base of the copper connection (at the black protective sleeve) to minimize heat at the copper to aluminum transition joint.

For models ordered with Aluminum solder connections, copper piping can be easily soldered into the aluminum connections using the appropriate Zn/Al brazing rods and flux. Contact Alcoil for information on soldering Al to Cu joints.


E, HP & 2RE


E, HP & 2RE


E, HP & 2RE


E & HP only

"Typical" piping configurations of E, HP and 2RE models are shown above.

Application Tips

Thermal Expansion
Alcoil models ordered with Brackets have expansion gaskets included under the bracket.

For models using Threaded, Insert Flush Nuts, Stud Bolts or other mounting methods, equipment design consideration must be made for thermal expansion. Because aluminum has a high coefficient of thermal expansion, the equipment frame and mounting method of the coil MUST accommodate thermal expansion(cooling & heating) of the coil in both Height and Width Dimensions.

The table herein shows the Minimum Recommended Allowance for Thermal Expansion for Heat Pump Condensers based on the Coil Height and Width assuming a 150F (83C) temperature differential. If high ambient or low ambient operation is expected, thermal expansion allowance should be increased based on the Refrigeration system Maximum Condensing Discharge (Superheat) Temperature at the High Pressure safety cutout, minus the lowest expected ambient operating temperature.

Reference: Thermal Expansion based on 150F (83C) rise or differential of coil inlet header temp vs steel frame.
Coil Width: Maximum Refrig Discharge Temp minus Lowest Ambient Operating Temperature (150F typical difference)
Coil Height: Maximum Condensing Temp (Ct at HP cutout) minus Lowest Ambient Operating Temperature (70-100F typical difference)

Coil Dimensions (Width & Height)

		Minimum Allowance for Thermal Expansion	
inches	mm	inches	mm
10	250	0.011	0.27
15	375	0.016	0.40
20	500	0.021	0.53
25	625	0.026	0.67
30	750	0.032	0.80
40	1000	0.042	1.07
50	1250	0.053	1.33
60	1500	0.063	1.60
70	1750	0.074	1.87
80	2000	0.084	2.13
90	2250	0.095	2.40
100	2500	0.105	2.67
110	2750	0.116	2.93
120	3000	0.126	3.20

Galvanic/Electrical
For most equipment applications, galvanic or stray current considerations are not necessary. Painted sheet metal parts, plastic parts and stainless steel interfaces with the aluminum coil(s) are normally accepted practice. With galvanize sheet metal, rubber can be used to prevent localized loss of galvanized zinc or interaction with the coil. For mobile, shipboard, or applications where equipment grounding may be an issue, coil electrical isolation from the equipment frame may be necessary, except for refrigerant connections.

Corrosion
Due to the all aluminum construction, brazed aluminum heat exchangers are subject to significantly less galvanic corrosion than traditional fin/tube coils, in that there are no dissimilar metals. Normal installations should not require coatings, except in environments corrosive to aluminum.

Sea coast and marine use is acceptable. Epoxy or Thermoguard Coating(s) is optional.

For applications with pollution, chemical emissions, exposure to moist air, or corrosive environments, coil coatings must be used. See Coatings Option Section.

Coil Cleaning
Routine cleaning of particulates from the coil can be performed with high pressure air. Routine cleaning of dirt and grime may be performed with high pressure water, including general detergents. Avoid chemical cleaning. In any cases, water pressure must be controlled to prevent damage to the fins. A coil filter or protective mesh cloth can also be used in the equipment design, if particulates are an issue.

Coating Options

Alcoil offers two coating options:

1) Epoxy Electrocoat
2) Thermoguard Polyurethane

Epoxy Electrocoat

While all-aluminum Microchannel coils are not subject to the same galvanic corrosion issues as traditional copper/aluminum coils, there are situations or installations that may require the highest level of protection with Epoxy Electrocoat.

Recommended use of Epoxy Electrocoat
- Industrial Pollution & Sulfurs
- Petrochemical Installation
- Adiabatic assisted Systems
- Sea Shore Installations (optional)

Specifications:

Material:	Epoxy Electrocoat, PPG Powercron series
Thickness:	0.001-inch, nominal
Appearance:	Black, semi-gloss
Process:	Dip bath with Electrodes, Oven Cured, UV top coating

Chemical Resistance Guide:
Epoxy Electrocoat is resistant to the following at 70°F:

Acetates (ALL)	Diethanolamine	Lactose	Propyl Alcohol
Acetic Acid	Distilled Water	Lauryl Acid	Propylene Glycol
Alcohols	Esters	Magnesium	Salicylic Acid
Amines (ALL)	Ethyl Acetate	Maleic Acid	Salt Water
Ammonia	Ethyl Alcohol	Menthol	Sodium Bisulfite
Ammonium Hydroxide	Ethyl Ether	Methanol	Sodium Chloride
Amino Acids	Fatty Acid	Methyl Ethyl Ketone	Sodium Hypochlorite 5%
Benzene	Fluorine Gas	Methyl Isobutyl Ketone	Sodium Hydroxide<10%
Borax	Formaldehyde 27%	Mineral Oil	Sodium Sulfate
Boric Acid	Fructose	Motor Oil	Stearic Acid
Butyl Alcohol	Gasoline	Mustard Gas	Sucrose
Butyl Cellosolve	Glucose	Naphthol	Sulfuric Acid 25-28%
Butyric Acid	Glycol	Nitrates	Sulfates (ALL)
Calcium Chloride	Glycol Ether	Nitrides	Sulfides (ALL)
Calcium Hypochlorite	Hydraulic / Brake Fluid	Oleic Acid	Sulfites (ALL)
Carbolic Acid	Hydrazine	Oxalic Acid	Starch
Carbonates	Hydrochloric Acid<10%	Oxygen	Tannic Acids
Carbon Dioxide	Hydrogen Peroxide 5%	Ozone	Toluene
Carbon Monoxide	Hydrogen Sulfide	Perchloric Acid	Transmission Fluid
Cetyl Alcohol	Hydroxylamine	Phenol 85%	Triethanolamine
Chlorides (ALL)	Iodine	Phosgene	Urea
Chlorine Gas	Isobutyl Alcohol	Phenolphthalein	Vinegar
Citric Acid	Isopropyl Alcohol	Phosphoric Acid	Water
Creosol	Kerosene	Potassium Chloride	Windshield Solvent
Diesel Fuel	Lactic Acid	Potassium Hydroxide	Xylene

The following substances are **not recommended** for use with Epoxy Electrocoat:

Chromic Acid	Hydrofluoric Acid	Nitric Acid	Sodium Hydroxide>10%

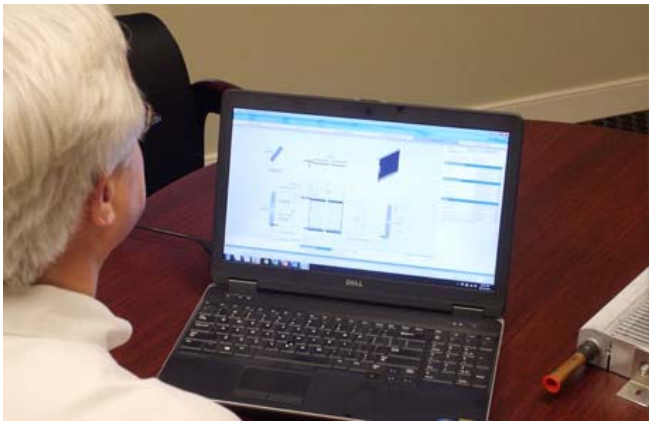
NOTES:
1) Epoxy Electrocoat is not intended for liquid immersion applications.
2) Elevated temperatures can have an adverse effect on the coating.
3) This guide is provided for **GENERAL REFERENCE ONLY** and is not a guarantee of performance in a specific situation.
4) Effect on heat transfer rate is typically 1% to 2% and up to 10% on airside PD.

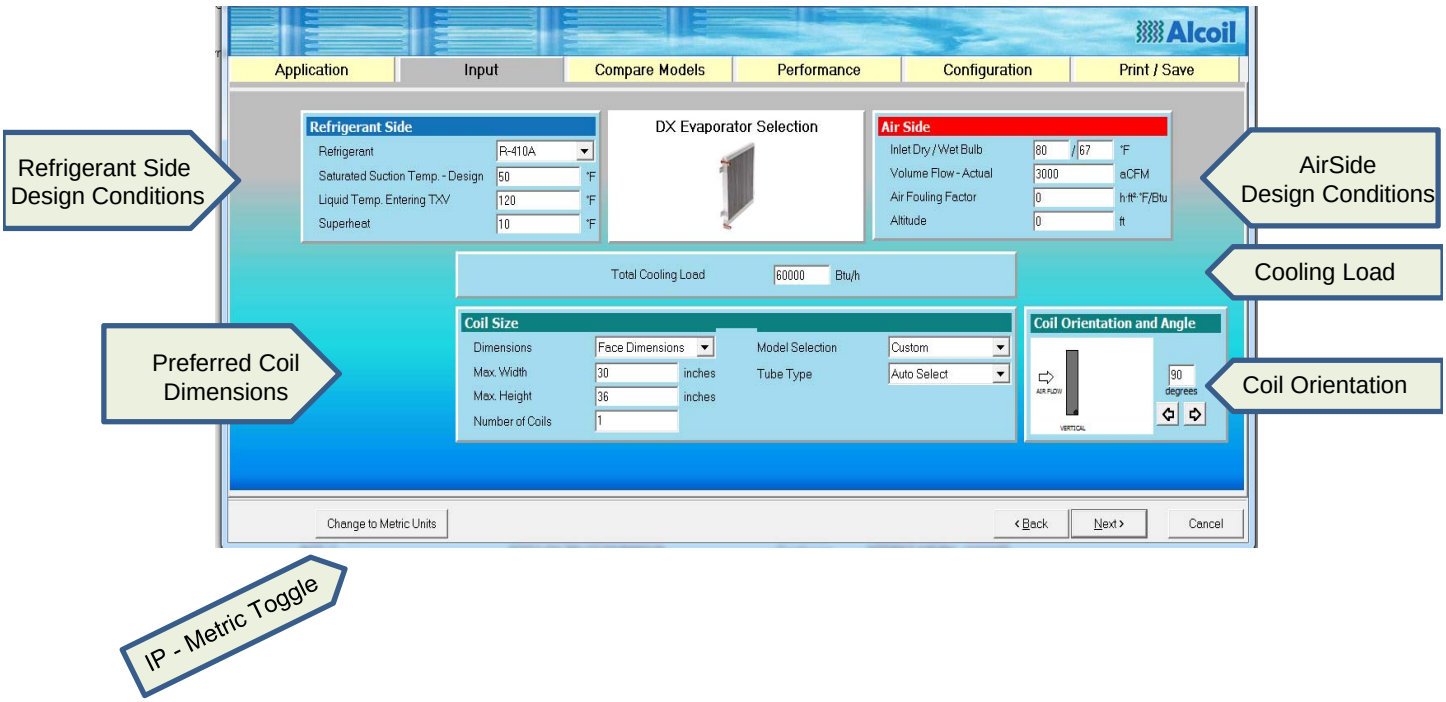
AlcoilSELECT™ Software

AlcoilSELECT is the most advanced and easiest to use Coil Selection and Design Program in the HVAC/R industry. As a downloadable software program for PC's, it is an essential tool to SELECT and CONFIGURE Airside Coil applications for Alcoil Microchannels.

It allows the user to provide INPUT for design conditions, COMPARE MODELS, review PERFORMANCE, and CONFIGURE the coil's connection, mounting, and other options.

AlcoilSELECT can save and print COIL PERFORMANCE and DRAWINGS, plus share the PROJECT file with Alcoil Sales Support for Quotes and Product Orders.

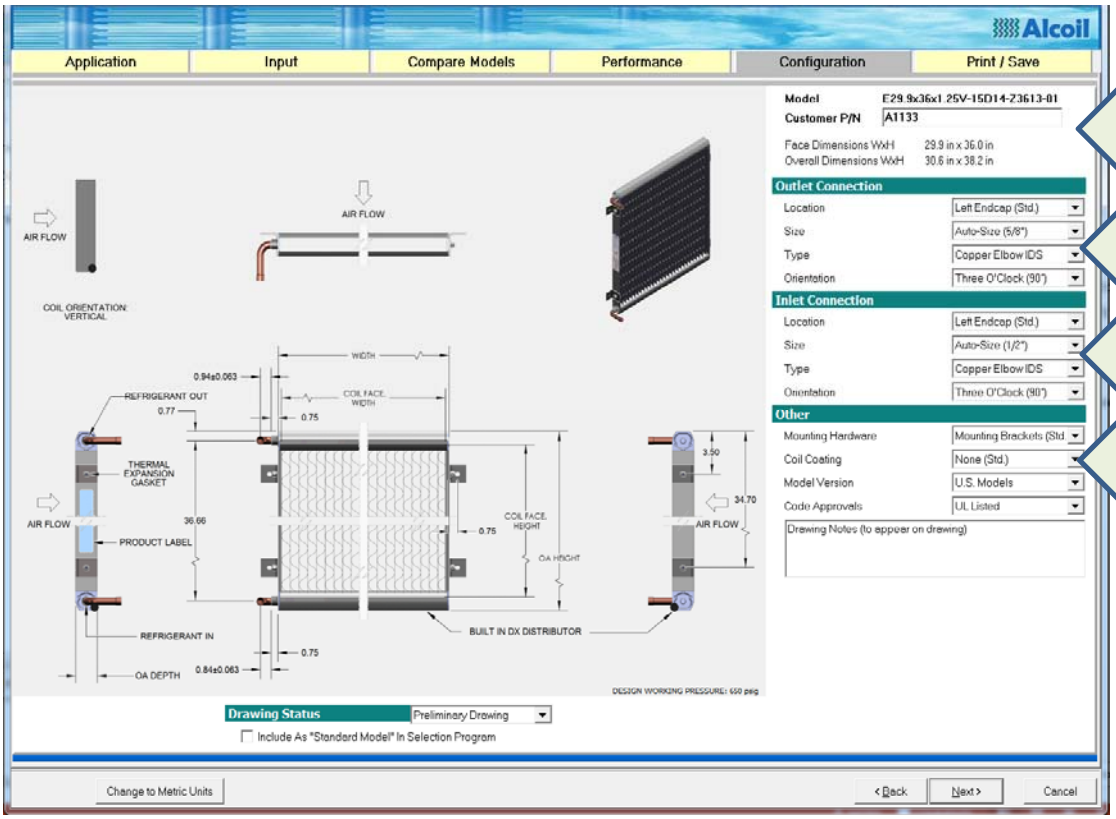




AlcoilSELECT™ Software

After an Alcoil model is selected, the CONFIGURATION screen is used to instantly view and change connection locations, connection size and orientation, select Mounting Options, select Coating options and more.

What you see, is what Alcoil will build, based all dimensions, features and options on the Product Drawing.



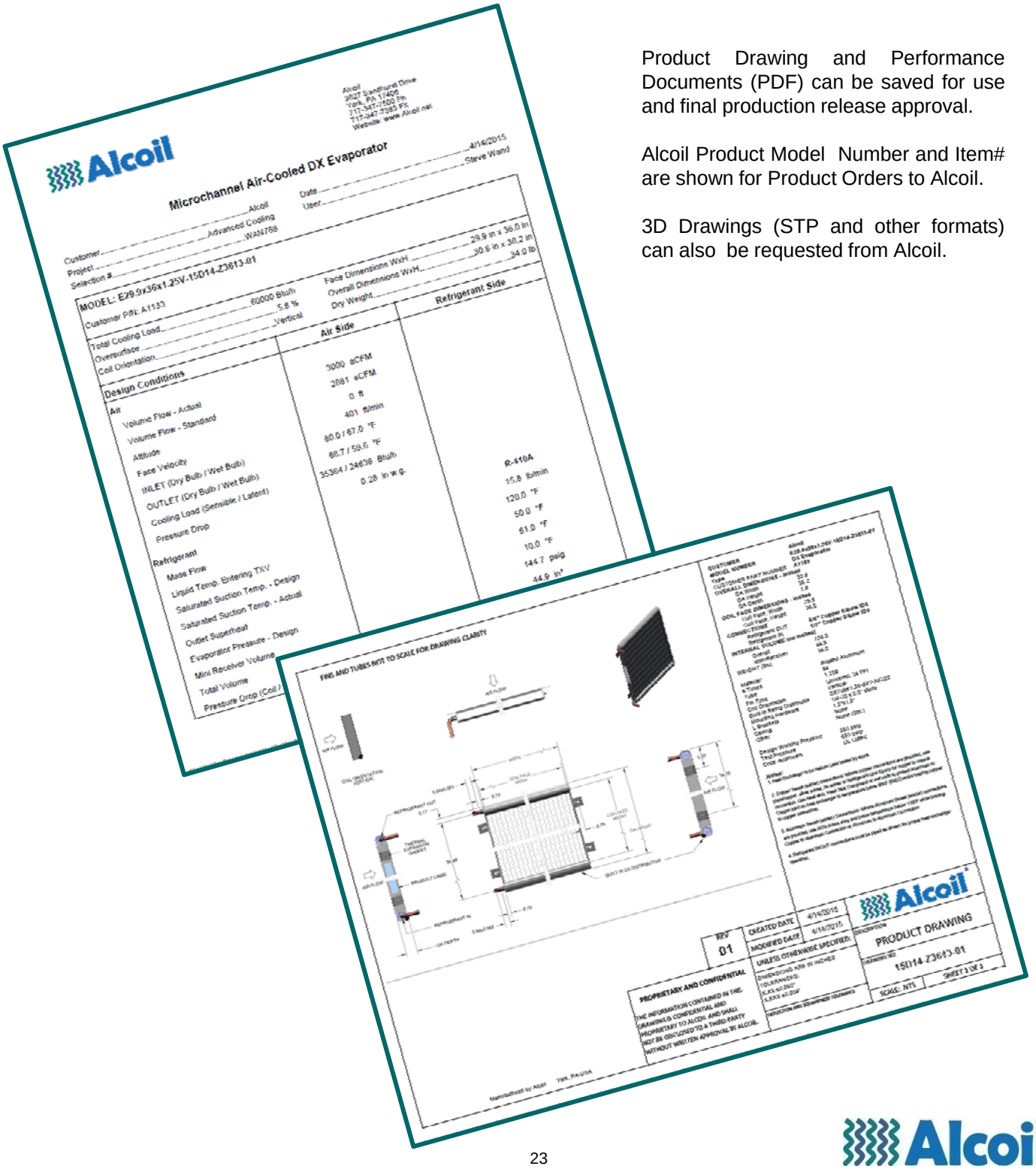
Alcoil Model & Item#
Your Part Number Here

Outlet Connection Options

Inlet Connection Options

Mounting Options
Coating Options
UL Listed Option

AlcoilSELECT™ Software

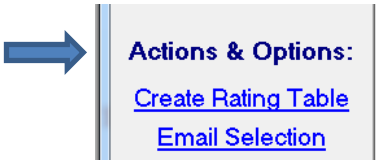


Product Drawing and Performance Documents (PDF) can be saved for use and final production release approval.

Alcoil Product Model Number and Item# are shown for Product Orders to Alcoil.

3D Drawings (STP and other formats) can also be requested from Alcoil.

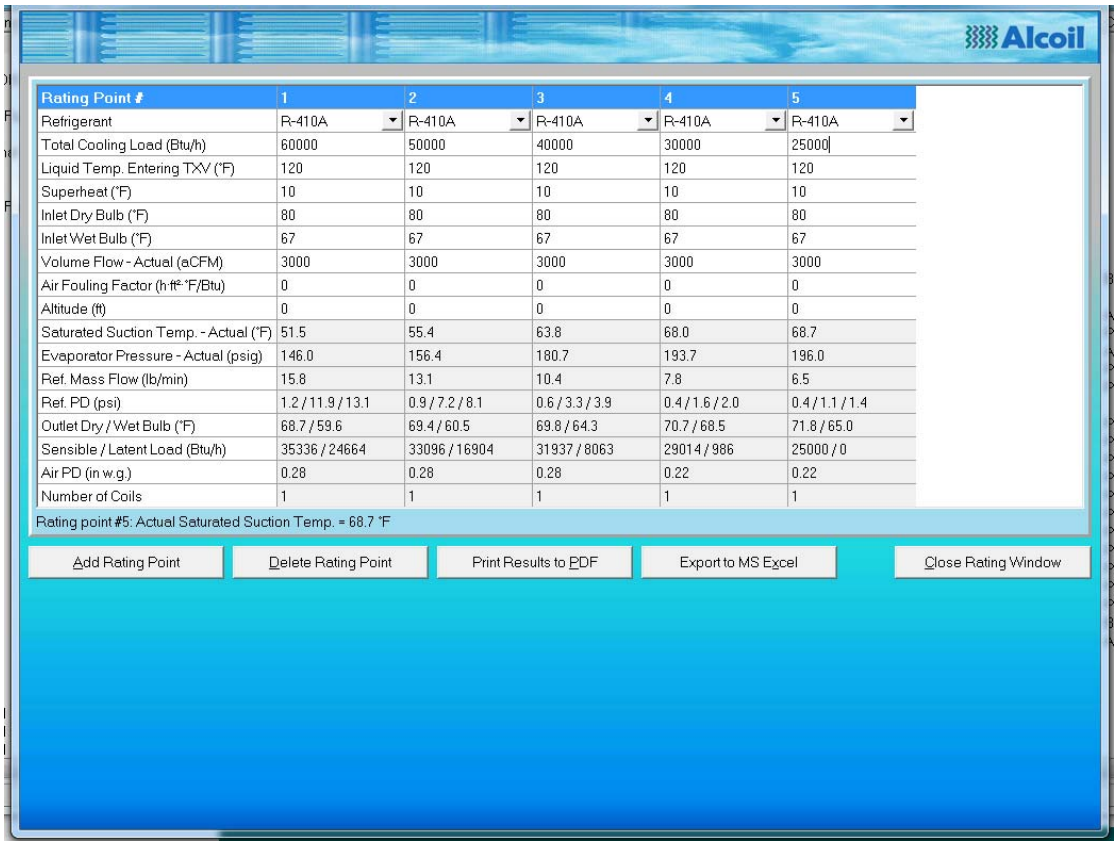
AlcoilSELECT also has two additional unique features



Coil Rating

"Create Rating Table" allows the user to take a specific coil selection, then create up to 99 rating points. Input variables such as Refrigerant type, Total Cooling Load, Air Temperature, Air Flow Rate and others can be changed to create additional rating points.

The Rating table can then be exported to an Microsoft Excel Spread Sheet for other uses or printed as a PDF.



Rating Point #	1	2	3	4	5
Refrigerant	R-410A	R-410A	R-410A	R-410A	R-410A
Total Cooling Load (Btu/h)	60000	50000	40000	30000	25000
Liquid Temp. Entering TXV (°F)	120	120	120	120	120
Superheat (°F)	10	10	10	10	10
Inlet Dry Bulb (°F)	80	80	80	80	80
Inlet Wet Bulb (°F)	67	67	67	67	67
Volume Flow - Actual (aCFM)	3000	3000	3000	3000	3000
Air Fouling Factor (h·ft²·°F/Btu)	0	0	0	0	0
Altitude (ft)	0	0	0	0	0
Saturated Suction Temp. - Actual (°F)	51.5	55.4	63.8	68.0	68.7
Evaporator Pressure - Actual (psig)	146.0	156.4	180.7	193.7	196.0
Ref. Mass Flow (lb/min)	15.8	13.1	10.4	7.8	6.5
Ref. PD (psi)	1.2 / 11.9 / 13.1	0.9 / 7.2 / 8.1	0.6 / 3.3 / 3.9	0.4 / 1.6 / 2.0	0.4 / 1.1 / 1.4
Outlet Dry / Wet Bulb (°F)	68.7 / 59.6	69.4 / 60.5	69.8 / 64.3	70.7 / 68.5	71.8 / 65.0
Sensible / Latent Load (Btu/h)	35336 / 24664	33096 / 16904	31937 / 8063	29014 / 986	25000 / 0
Air PD (in w.g.)	0.28	0.28	0.28	0.22	0.22
Number of Coils	1	1	1	1	1

Email Selection

Coil selections can be E-mailed to other users of AlcoilSELECT or Alcoil Support for assistance and review.

The following terms and conditions apply to all purchase orders, contracts or shipments between Alcoil ("Alcoil") and any customer ("Customer") for which Alcoil provides equipment, products, or services:

OFFER AND ACCEPTANCE. The products and services described are offered for sale by Alcoil subject to all of the terms and conditions stated herein. This writing constitutes an offer of sale, which is expressly limited to the products, services, terms, and conditions stated herein. By submitting a purchase order or other written response to this offer of sale, or by accepting delivery of the products and services offered herein, Customer accepts all of the terms and conditions contained herein. No additional, changed, or conflicting terms and conditions appearing in Customer's purchase order or other written response to this offer shall be binding upon Alcoil unless expressly agreed to in writing by Alcoil.

PAYMENT TERMS. Payment terms are NET 30 Days from Date of Invoice, Subject to credit approval by Alcoil's Credit Dept. Shipments, deliveries, and performance of work by Alcoil shall be subject to the continuing approval of Alcoil's Credit Dept., which may require full or partial payment in advance if the financial condition of Customer (in the sole opinion of Alcoil's Credit Dept.) does not justify continuance of work by Alcoil on the terms of payment agreed upon.

PRICES. All Prices are F.O.B, York, Pennsylvania, USA. All transportation expenses shall be paid by Customer, either Freight Collect, or Pre-paid/Add to Invoice. Alcoil reserves the right to adjust prices (surcharge or credit) at time of order entry due to material cost fluctuations.

TITLE AND RISK OF LOSS. Title to any products shipped by Alcoil shall pass to Customer upon delivery by Alcoil to the carrier. Risk of loss or damage to products in transit is assumed by Customer, and Customer shall bear responsibility for filing and pursuing any claims for loss or damage with the carrier.

DELIVERY. Shipping dates are approximate only based upon prompt receipt from Customer of all information required by Alcoil to meet Customer expectations. Alcoil shall not be liable for delays in delivery or failure to perform hereunder where such delay or failure results from: (i) causes beyond the reasonable control of Alcoil, (ii) acts of God, acts of Customer, or acts of civil or military authorities, (iii) inability of Alcoil to obtain necessary labor, materials, components, or facilities, or (iv) any other commercial impracticability. In the event of any such delay, the date of delivery shall be deferred for a period of time equal to the time lost by reason of the delay.

LIMITED WARRANTY OF PRODUCTS AND SERVICES

Limited Warranty. Alcoil warrants its products to be free from defects in materials and workmanship under normal use and operation for a period of one (1) year from the date of product installation and no more than one (1) year and six (6) months from date of product delivery, as evidenced by Alcoil shipping records (the "Warranty Period"). For any materials or workmanship determined by Alcoil to be defective within the Warranty Period, Alcoil shall, at its option, either: (i) repair any such defective material, component part, or service, or (ii) make available to Customer, FOB York, Pennsylvania, any repaired or replacement parts or materials to replace such defective material, component part, or service, or (iii) refund to Customer the amount paid by Customer for the defective product or service provided by Alcoil hereunder.

Exclusions. The above warranty shall not apply to any product that has been: (i) subjected to misuse, negligence or accident; (ii) misapplied by Customer or others for an improper use; (iii) installed in an improper manner; (iv) modified or repaired contrary to Alcoil recommendations or generally accepted practices or procedures in the industry, or (v) operated under conditions which may cause product failure. Alcoil shall not be responsible for any costs associated with the product damage, loss or replacement due to freeze-up, improper water treatment, improper cleaning, fluid chemistry exceeding Alcoil's recommendations, clogging and debris, fouling, corrosion, galvanic induced corrosion, vibration, thermal cycling, hydraulic shock, over-pressurization, compressor failure, system contamination, loss of protective coating (where applied) and any other operating or system condition which may cause product failure.

Warranty Procedures. If any Alcoil product is believed to be defective, written notice of such warranty claim must be made and an RMA# (Return Authorization) must be issued by Alcoil, 3627 Sandhurst Dr, York, PA 17406. Ph: 717-347-7500 Alcoil, at its option, may require return of any product believed to be defective for purposes of testing, inspection and verification, as a requirement for potential warranty coverage.

Disclaimer of Further Warranties. THE LIMITED WARRANTY SET FORTH ABOVE IS THE EXCLUSIVE WARRANTY APPLICABLE TO THIS CONTRACT, AND ALCOIL EXPRESSLY DISCLAIMS ALL OTHER WARRANTIES OR REMEDIES, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WHETHER THE SAME ARE WRITTEN, VERBAL, IMPLIED, OR STATUTORY.

Limitation of Liability. Under no circumstances shall Alcoil be liable for any incidental, consequential, or special damages, losses, or expenses incurred by Customer or any third party arising from this offer of sale or the performance of Alcoil hereunder. Under no circumstances shall the amount of any claim for damages or liability exceed the amount paid by Customer for products and services provided by Alcoil hereunder.

Time Limitation on Warranty Claims. No legal action or claim, whether based in tort, contract, strict liability, breach of warranty or otherwise, arising out of this offer of sale or the performance by Alcoil hereunder may be commenced more than one (1) year following expiration of the Warranty Period. Customer hereby waives any such claim or cause of action commenced after the Warranty Period.

TAXES AND DUTIES. Customer shall be responsible for collection or payment of any federal, state, provincial or local taxes or duties. Any taxes which Alcoil may be required to pay or collect, under any existing or future law, with respect to the sale, purchase, delivery, storage, or use of any product or services covered hereunder shall be the responsibility of Customer.

PROPRIETARY RIGHTS

Alcoil retains the exclusive right to all trade names, service marks, trademarks and patents for which Alcoil is the lawful owner or Licensee, and Customer acknowledges that Customer acquires no right, title or interest in or to any such trade names, service marks, trademarks or patents for any reason.

JURISDICTION AND VENUE. As to litigation arising from any disputes, claims or controversy, both Customer and Alcoil: (i) submit to the exclusive general jurisdiction of the state courts of York County, Pennsylvania, the federal courts of the United States of America for the Middle District of Pennsylvania, and any appellate courts from any decision thereof; (ii) consent that any such action or proceeding may be brought in such courts; and (iii) waive any objection that either may have to the venue of any such action or proceeding in any such court or that such action or proceeding was brought in an inconvenient forum and each party agrees not to plead or claim the same.

ENTIRE AGREEMENT. These terms constitute the entire agreement between the parties and all prior negotiations and representations of the parties are merged herein.

PENNSYLVANIA LAW TO APPLY. Any purchase order, shipment or contract resulting from Customer's acceptance of this offer of sale shall be deemed to have been executed and delivered in York County, Pennsylvania, and shall be construed under, and in accordance with, the laws of the Commonwealth of Pennsylvania.

WAIVER. One or more waivers of any breach of any term or condition herein shall not be construed as a waiver of any subsequent breach of the same term or condition. To be effective, any express waiver must be in writing.

COLLECTION COSTS. Should Customer default in the payment of any amount owing to Alcoil for products of services, and Alcoil is required to expend costs and expenses in collecting such amount, Alcoil shall be entitled to reimbursement for all such costs of collection (including reasonable attorney fees).

PRODUCT SELECTION AND USE. Customer shall be responsible for accurate design and operating conditions used in the selection and use of Alcoil products. Customer selection and use of Alcoil product from published literature or Alcoil Selection software shall be at the customer's risk as to appropriate application, design conditions and performance criteria use.

STANDARDS AND TOLERANCES. All Product Dimensions and published information is subject to change without notice. All Alcoil products furnished to Customer shall also be subject to tolerances and variations consistent with usages of the trade concerning dimensions, composition and mechanical properties, and normal variations in performance characteristics and quality.

SPECIAL ORDERS. On special orders and products of custom design, a minimum of 50% of the sale price may be required upon engineering approval by the customer.

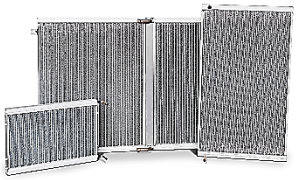
RESTOCKING AND CANCELLATION CHARGES. Alcoil reserves the right to collect costs against returned product and cancelled orders. Restocking charges of returned product costs shall be 25% of the product(s) sales price, and cancellation charges shall be a minimum of 25% of the product(s) sales price, or work in progress costs incurred by Alcoil, whichever is higher.

MicroChannel Coil Family

Alcoil has a full line of microchannel coil models for cooling and heat rejection for HVAC/R systems for R410a, R134a, R404a,, R717, and other refrigerants. Water and Glycol fluid models are available as both cooling coils and heating coils. Model sizes as small as 3"x 3" to 80" x 144" size.

Condensers ½ to 40 tons

Alcoil manufactures a full range of refrigerant condensers from ½ ton to 30 tons for the HVAC/R industry, rated for 450 psig and 650 psig applications. The C Series Condenser is a robust design with built-in mini-receiver and numerous design options.



Evaporator/Heat Pump ½ to 30 tons

Alcoil's E Series Evaporator and HP Series Heat Pump represent leading edge technology as a direct expansion (DX) cooling coil and/or reverse cycle heat pump coil. With a built-in refrigerant distributor and integrally high water condensate shedding, the E and HP Series provide high performance with all the advantages of microchannel technology.

Fluid Coils up to 50 gpm

For water and glycol systems, free cooling, heat recovery and other applications, Alcoil manufactures a high performance microchannel specifically for fluid to air. With advanced water shedding as a cooling coil or high performance as a heating or cooling coil, fluid models feature ¾", 1" and 1-1/2" connections. Rated for 300psig.

Specialty Coils up to 40 tons

Alcoil can configure microchannel coils for other required HVAC/R applications, including:

Reheat & Desuperheater Coils
Flooded & Pumped Loop Evaporators.
Subcoolers

MicroCoils™ up to ¾ ton

For electronics, medical, computer and small appliance products, Alcoil has a family of MicroCoils as condensers, evaporators and fluid coils. The MicroCoil is lightweight and ultra small for specialty products from 20 to 2000 watts. .

Alcoil products manufactured under Patent 8,662,148 and others pending in the U.S. Patents pending in Europe, China and other countries

Alcoil Sales Support

Alcoil serves the U.S., Canada and Mexico with regional Sales Engineers, Applications Engineers and HDQ personnel to assist OEM customers with product selection, applications, and production delivery.

Shipping is via Freight Carriers or UPS. Freight Pre-paid or Freight Collect.

All Prices are FOB, York, Pennsylvania, USA

General Inquiries	Email: Info@Alcoil.net
Production Lead-times	4 weeks typical; up to 6 weeks (seasonal) up to 6 weeks (large qty)
Purchase Orders	Email to: **Orders@Alcoil.net**
Expedited Orders	Contact your regional Sales Engineer or Alcoil Factory

Alcoil is leading manufacturer of Airside Microchannel Coils for the HVAC/R and process industries. Located in beautiful York, Pennsylvania, Alcoil employees take Pride in Workmanship, Quality and Customer Service. We sincerely appreciate the opportunity for Alcoil to be of service.

www.Alcoil.net

Alcoil
3627 Sandhurst Drive
York, PA 17406
Ph: 717-347-7500
Fax: 717-347-7383