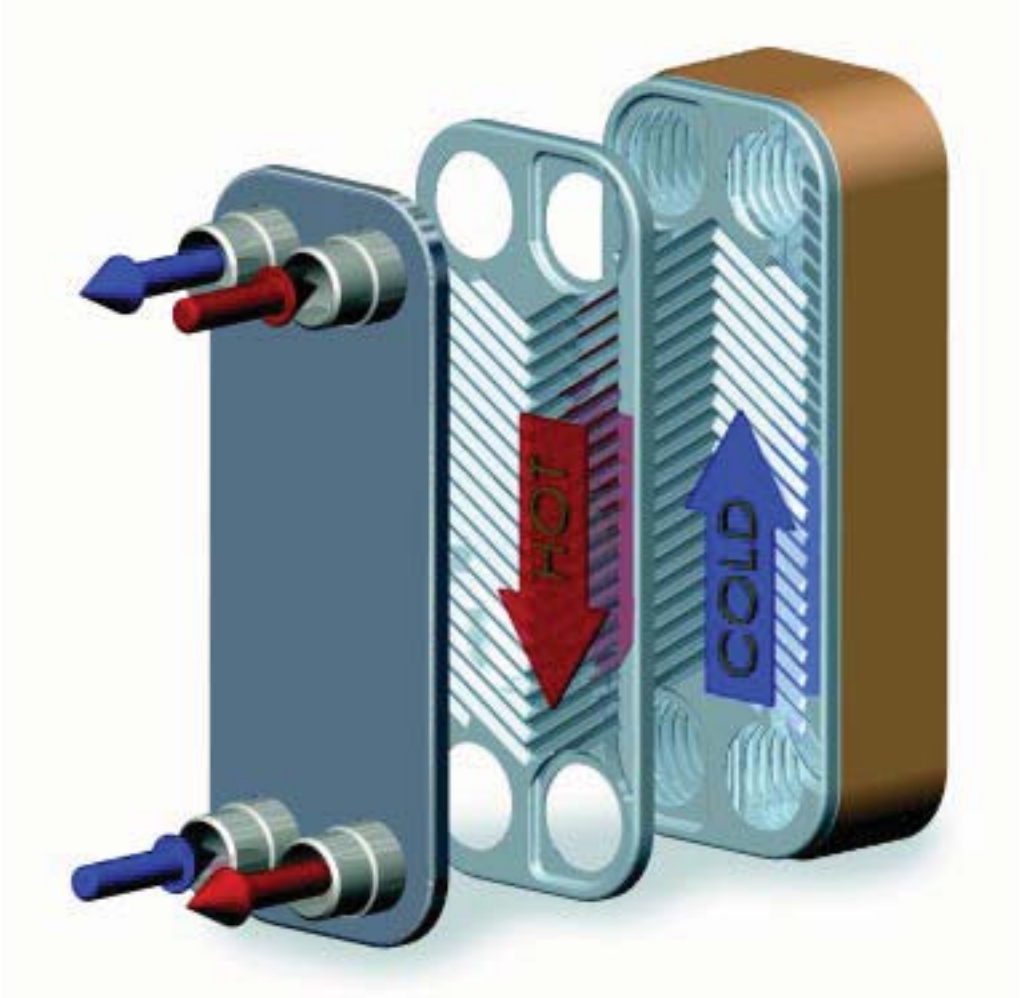
API Heat Transfer

API Schmidt-Bretten
SB Series Brazed Plate
Heat Exchanger
Installation Manual



Exploded view of API Schmidt-Bretten SB Brazed Plate Heat Exchanger.

WARNING

Before proceeding with installation and operation read entire manual carefully. Failure to do so can cause injury or property damage

Table of Contents

Product Information

Description 1
Common Applications 1
Technical Data, Dimensions 5

Installation Guide

General Information 6
Piping Indsructions 6-9
Soldering & Welding Connections 9

Maintenance

Start-up and Shut Down 10
Fouling & Cleaning 10
Corrosion Resistance 10

Application Submittal Form 11

Product Information - Description

API Schmidt-Bretten SB brazed plate heat exchangers are designed with up to 150 plates - embossed plates of corrosion resistant stainless steel. The plates are brazed together, with every other plate inverted to create contact points between all of the plates. When these points are vacuum brazed together a compact and pressure resistant heat exchanger is formed in which virtually all the material is utilized for heat transfer.

Thermal Efficiency

The flow patterns produce very high fluid turbulence to increase the effective heat transfer rate. The fluids are in true counter-current flow, resulting in the largest possible temperature difference between the fluids and superior heat transfer rates across the stainless steel plates. Counter-current flow also allows very close approach temperatures between the two circuits. A fluid can be cooled or heated to within just a few degrees of the other fluid. There is no outer shell, as in traditional shell and tube equipment, so virtually the entire heat exchanger *is* heat transfer surface resuting in extraordinary thermal and economic efficiency.

Corrosion Free Duty

The plates and nozzles are made of Stainless Steel, known for very high corossion resistance. It is the same material used in sanitary, food processing and medical applications. The plates are high vacuum induction brazed with 99.9% pure copper. This produces high strength and very low corrosion potential.

Low Fouling

The SB brazed plate heat exchanger operates with high fluid turbulence which exhibites a scouring action as it impinges against the heat transfer plates. Turbulence inhibits the production of scale from minerals precipitating out of solution.

Common Applications

Steam heating of process liquids

Steam to water heating for district heating and other HVAC applications

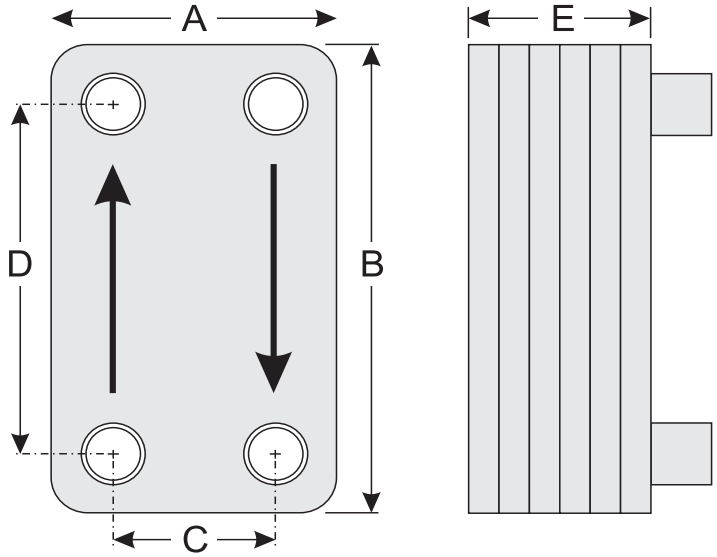
Heat recovery, due to the close-approach capability between the fluids

Industrial process cooling or heating of fluids and gases

Refrigerant gas evaporating or condensing

Hydraulic oil cooling (can be designed to use less cooling water)

Lube oil cooling of machinery



API Model Type	Dimensions in Inches					Max Number of Plates	Surface per Plate (sq. ft.)	Max Flow (gpm)	Weight Empty (lbs)
	A	B	C	D	E				
SB1	2.88	8	1.63	6.56	.013+ (.09 x N)	30	.13	20	1.65+(.11xN)
SB2	3.5	9.06	1.69	7.19	.013+ (.09 x N)	50	.15	20	2.42+(.13xN)
SB22	3.5	12.8	1.69	10.98	.013+ (.09 x N)	30	.24	20	3.14+(.18xN)
SB3	4.88	6.73	2.88	4.72	.013+ (.09 x N)	50	.16	50	2.64+(.13xN)
SB4	4.88	13.07	2.88	11.06	.013+ (.09 x N)	100	.32	50	3.52+(.26xN)
SB5	4.88	20.83	2.88	18.81	.013+ (.09 x N)	100	.53	50	4.4+(.53xN)
SB7	10.59	20.83	7.88	18.13	.013+ (.09 x N)	150	1.46	175	12.1+(1.32xN)
SB8	10.59	20.83	6.34	16.57	.013+(.09 x N)	150	1.29	385	12.1+(1.32xN)

API Model Type	Dimensions in Millimeters					Max Number of Plates	Surface per Plate (sq. m.)	Max Flow (m^3/h)	Weight Empty (Kg)
	A	B	C	D	E				
SB1	73	203	40	170	7+(2.3xN)	30	.012	4.5	.75+(.05xN)
SB2	89	230	43	182	7+(2.3xN)	50	.014	4.5	1.3+(.08xN)
SB22	89	325	43	279	7+(2.3xN)	30	.022	4.5	1.3+(.08xN)
SB3	124	171	73	120	7+(2.3xN)	50	.015	11	1.2+(.06xN)
SB4	124	332	73	281	7+(2.3xN)	100	.03	11	1.6+(.12xN)
SB5	124	529	73	478	7+(2.3xN)	100	.049	11	2.0+(.24xN)
SB7	269	529	200	460	7+(2.3xN)	150	.136	40	5.5+(.6xN)
SB8	269	529	161	421	7+(2.3 x N)	150	.120	88	5.5+(.6xN)

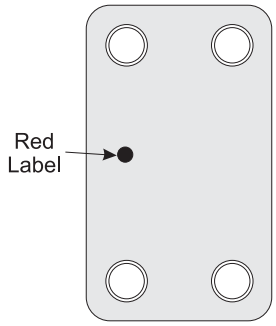
Installation Guide

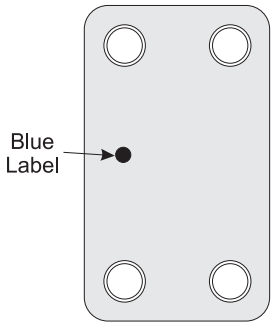
API Schmidt-Bretten Heat Exchangers should be installed so that there is sufficient space around each unit to perform maintenance.

Mounting Positions

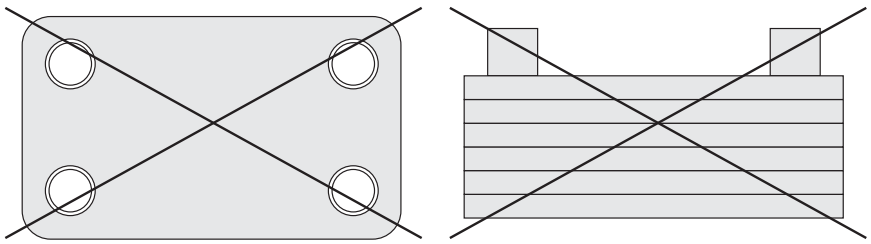
Heating Applications - The primary side is indicated by a RED label. For heating applications the heat exchanger can be mounted in any position, however, for any position other than vertical, a loss in performance is possible.

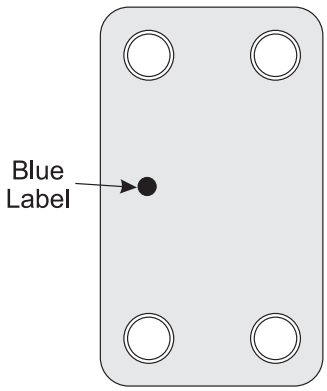
Refrigeration Applications - The refrigerant side is indicated by a BLUE label. In evaporating and condensing applications, install the heat exchanger in a vertical position to optimize it's performance.





Recommended Position for Refrigerant Applications





Bracket Mounting and Vibration Isolation

It is preferable for the heat exchanger to be supported by a bracket or mounted onto a console. Do not support the unit by the fittings. All items should be supported independently. Transmitted vibrations and pulsations should be minimized by installing a vibration isolator in the fluid lines and by installing a rubber buffer pad between the heat exchanger and its mounting surface.

WARNING

The heat exchanger may have sharp edges. Exercise caution whern handling.

PIPING CONNECTIONS

Connections to the heat exchanger are identified by a color label.

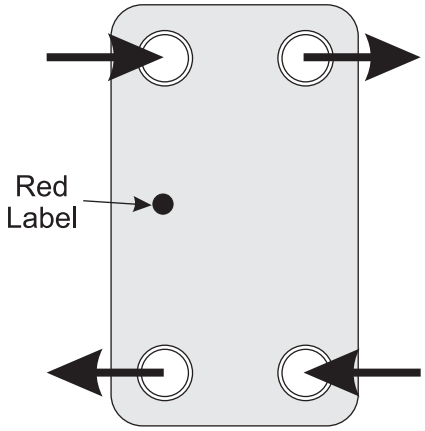
Red Label - Primary Side in heating systems: hot inlet/outlet
Blue Label - Primary Side in refrigeration applications: refrigerant inlet/outlet

Counter-Flow Piping

Standard heating connections are NPT threaded.

Standard refrigerant connections are ODF solder ports.

All connections are on the fron side except for two-circuit refrigerant designs where water connections are on the back side.

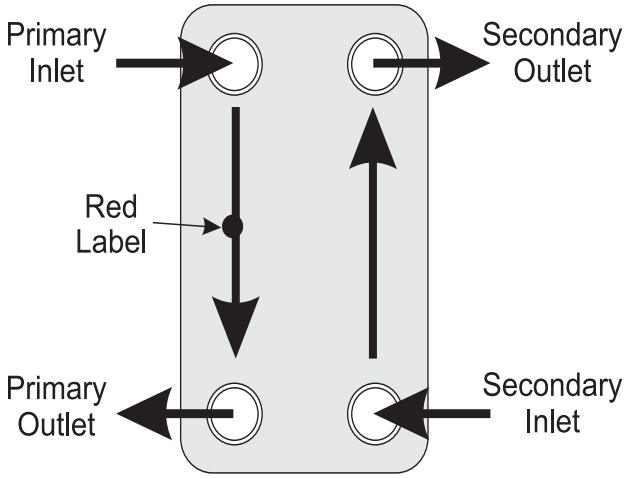


Optional Connections

API Brazed plate heat exchangers can be supplied with sets of unions, brass unions with external thread or inner solder, steel unions for welding.

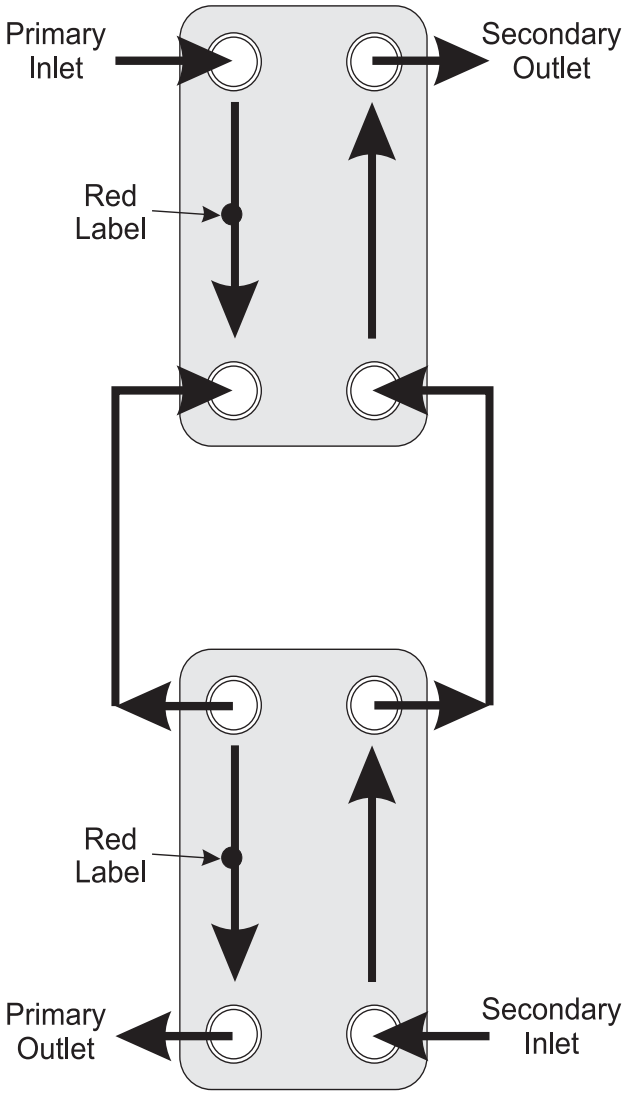
Typical heating application connections

The primary side liquid/gas enters at the top of the left side as indicated by the red label and exits at the bottom. To acheive optimum performance pipe the secondary circuit in counter-flow with the liquid entering at the bottom and leaving at the top of the heat exchanger.



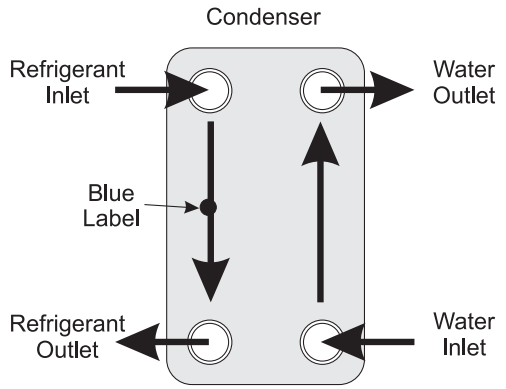
Typical arrangement with series connections to increase thermal length

Thermal length is a term that refers to the addition of heat transfer surface while preserving the internal fluid velocity to maximize the effective heat transfer rate.



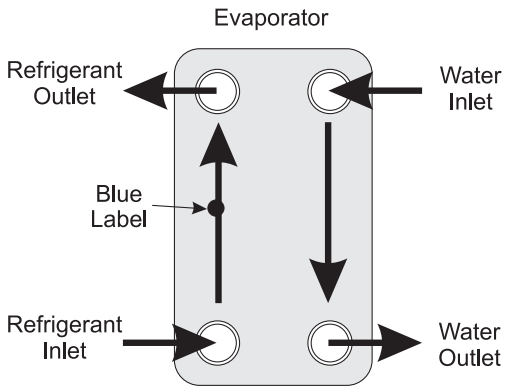
Typical refrigerant condenser connections

The refrigerant gas enters at the top and the condensate (liquid) exits at the bottom. To acheive optimum performance pipe the water circuit in counter-flow with the water entering at the bottom and leaving at the top of the heat exchanger.



Typical refrigerant evaporator connections

The refrigerant liquid/gas mixture enters at the bottom on the left side as indicated by the blue label and exits at the top as a vapor.



Soldering and Welding Connections

The temperature of the brazing or welding process must not exceed the melting point of the internal brazing material. Use a wet towel around the connection and the plate pack to reduce the amount of heat transmitted to the pack during installation.

1. Clean the soldering assembly surface at the copper tube and heat exchanger connections.
   Remove oil or other buildup with a degreasing agent.
   Polish the surfaces to remove oxide.
2. Apply the flux to the surface with a brush to remove and prevent oxidation
3. For refrigerant applications, use dry nitrogen gas on the refrigerant side.
4. Heat the soldering area to the soldering temperature, about 1,200°F. Temperatures above this can melt the SB brazing materials and result in damage.
5. Keep the tube in a fixed position and apply the filler material.

Welding

1. Prepare the edge of the tube for welding with a 30° angle.
2. Place the piping into the connection.
3. TIG or MIG weld the tube into the connection, filling the groove formed by the two edges. This method minimizes the heat zone.

Start-up and shut-down procedure

Start-Up Venting - During the filling process the unit must be vented to eliminate any trapped air. This will assure proper performance and lonegevity of the unit.

Shut Down - The two sides should be shut down simultaneously and slowly. If this is not possible the hot side should be shut down first. If the unit is shut down for an extended period of time, it must be drained and cleaned. This is especially true of there is a risk of frost or if there is the presence of any aggressive media inside the heat exchanger.

Fouling and Cleaning

Different factors may effect fouling such as fluid velocity, turbulence, flow distribution, surface finish and water quality. Proper maintenance and adequate water treatment can help reduce fouling. Properly sized strainers should be installed where particles are known to exist. Strainers with a mesh size of 16-20 will retain any particles over 0.04" in size.

In installations where high calcuim hardness or fluid contamination is expected, the heat exchanger should be cleaned periodically by flushing, back-flushing and cleaning of the strainers. Following are descriptions for two types of fouling:

Scaling Deposits of calcium on the heat transfer surface. This effect increases with temperature higher than 140°F and concentrations and pH. Assuring a turbulent flow and lower temperature can help reduce this effect.

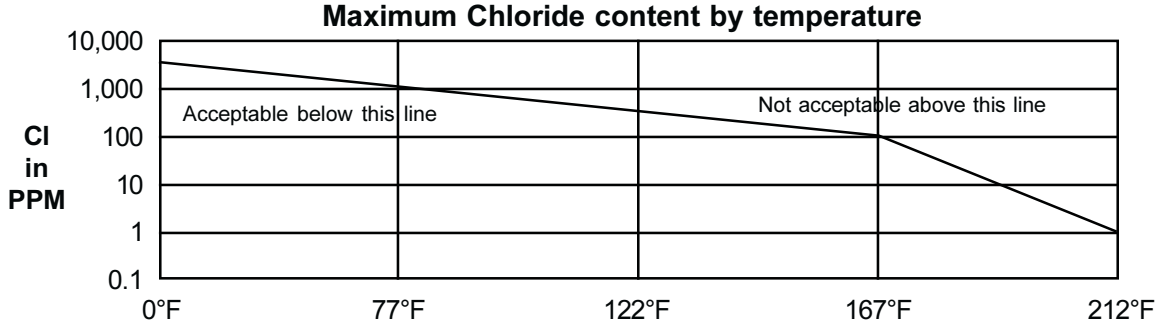
Particulate Solids in suspension in the heat transfer media. Particulate fouling can be influenced by velocity and media flow, roughness of the surface and physical size of the particles.

Corrosion Resistance

Corrosion is a complex process influenced by a number of factors. The chart and table below show the resistance of AISI 316 Stainless Steel and Copper against the most common chemicals:

Iron < 1.5 ppm	**Free Cabon Acid** < 20 ppm	**Mangan** < .05 ppm
Ammonia < 2ppm	**Sulfate** < 50 ppm	**Nitrate** < 100 ppm
Sulphide < 0 ppm	**pH-Value** - 6 - 9	**Chlorides** - See Below

Maximum Chloride content by temperature



Job:	***Date:***
Engineer:	***Submitted By:***
Contractor:	***Approved By:***

Product Description

API Schmidt-Bretten brazed plate heat exchangers consist of as many as 150 pattern embossed stainless steel plates. The plates are brazed together with every other plate turned 180° to create flow channels with two mediums in counter-current direction. The design of the plates creates a high fluid turbulence resulting in outstanding heat transfer rates. The result is a highly efficient heat exchanger that utilizes all of the material in the heat transfer process.

Materials of Construction

Plates ..... AISI 316L Stainless Steel
Brazing Materials ..... Copper (99.9% pure) or Nickel (optional)
Connections ..... Stainless Steel

Operating Conditions

Max Working Pressure ..... 450 psi for Copper, 380 psi for Nickel
Max Working Temperature ..... 365°F
Minimum Working Temperature ..... -148°F

PRODUCT SELECTION DATA

		Side One	Side Two
Medium	(Water, Glycol, Oil, etc.)	_____	_____
Concentration	(Percent)	_____	_____
State of Fluid	(Vapor or Liquid)	_____	_____
Inlet Temp.	(Degrees F)	_____	_____
Outlet Temp	(Degrees F)	_____	_____
Mass Flow Rate	(gpm)	_____	_____
Max Pressure Drop	(psi)	_____	_____
Total Heat Transfer	(BTUH)	_____	_____

Model of Heat Exchanger: _____ **Number of Plates:** _____

API Heat Transfer

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API Airtech Inc. *ISO-9001 Certified*

Air Cooled Aluminum Heat Exchangers

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Plate Heat Exchangers

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API Schmidt-Bretten GmbH.

ISO-9001 Certified

Plate Heat Exchangers

P.O. Box 1580 D-75005 Bretten

Pforzheimer Strasse 46

D-75015 Bretten, Germany

7252/53-101 • Fax: 7252/53-201

Call your local API Sales Representative or API directly toll-free at 1-877-API HEAT.

Other Products Available from API Heat Transfer

OptiDesign®

Straight-tube, removable bundle exchangers made from standard components. Floating tube sheet for seal leak detection and easy maintenance. Diameters from 3" (7.62 cm) to 42" (106.68 cm). ASME, API, TEMA, ABS and other codes available.

Pipeline Aftercoolers

Straight tube, counterflow aftercoolers designed to yield cool, dry compressed air. Available with or without accompanying moisture separators and constructed to a wide variety of design codes. Diameters from 6" (15.24 cm) to 42" (106.68 cm).

TEMA Shell and Tube

A wide variety of TEMA types are available using pre-engineered or custom designs in various sizes and materials. Shell diameters from 6" (15.24 cm) to 60" (152.4 cm), ASME, TEMA, API, ABS, TUV, ISPESL and other code constructions available.

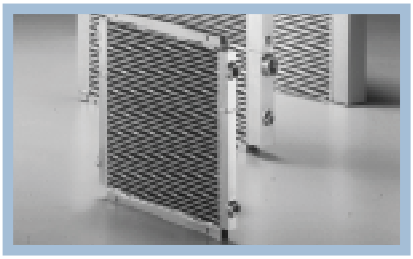
Refrigerant Evaporators & Condensers

Off-the-shelf, standard units reflect the latest in heat exchanger technology for maximum performance and low cost. Ideal for OEM or aftermarket applications. Numerous design and material options are available. Tonnage capacity ranges from 5 to over 400 tons.

Extended Surface

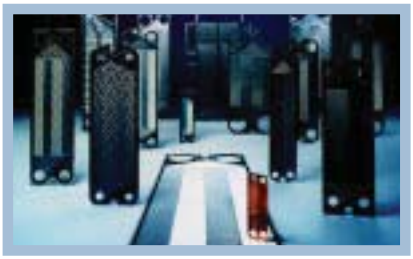
Unique, patented plate-fin design for centrifugal or axial compressor intercooler and aftercooler applications and minimal pressure loss. Design eliminates separators. ASME code design is standard. Diameters from 20" (50.8 cm) to 120" (304.8 cm).

Air-Cooled Heat Exchangers



High efficiency, brazed aluminum coolers for cooling a wide variety of liquids and gases with ambient air. Lightweight, yet rugged. Capable of cooling multiple fluids in single unit. Models can be supplied with cooling fan and a variety of drives.

Plate Heat Exchangers



Compact units provide excellent heat transfer and small size. Plates are pressed from stainless steel, titanium and other alloys. Gaskets of nitrile, EPDM, Viton®, compressed fiber and Teflon® are used. Gasket-free welded and brazed designs available.

ACME® Packaged Chillers

Packaged chillers with or without pumping systems from 3 to over 400 tons with PLC controls available. Standard and custom designed chiller-barrels and condensers to 2,500 tons with same-day shipment on many units. DX and flooded evaporators available.