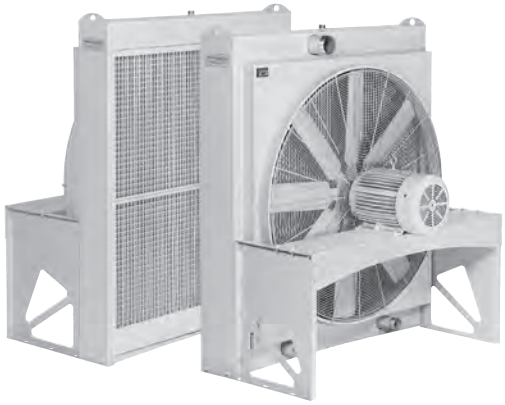
American Industrial Heat Transfer Inc.®

Manufacturer of Quality Heat Exchangers

www.aihti.com

Mission Statement

To manufacture Heat Transfer products by applying state-of-the-art technologies with the ability to serve a wide variety of industries through professional distribution affiliations throughout North America and abroad.



AOCS Series Heat Exchanger

30 Plus Years
Serving our customers since 1985

M Series Mobile Heat Exchanger

AB2000 Series Heat Exchanger

Custom Designs | Competitive Prices | Quick Delivery | Superior Quality | Large Selection

Online Catalog | ASME Certified | Unit Identification | Accessories

Shipping | Install & Maint. | App. Request | Policies

Information

Business Hours	8:00am - 5:30pm / Monday - Friday
Website Address	www.aihti.com
General Email	sales@aihti.com
Telephone	Virginia Manufacturing and Sales Office 434-757-1800
Virginia Fax	434-757-1810
Illinoise Sales Office	Telephone: 847-731-1000 / Fax: 847-731-1010
Technical Services Email	engineering@aihti.com
Street Address	355 American Industrial Drive, La Crosse VA, 23950 USA

website: www.aihti.com
general email: sales@aihti.com
technical email: engineering@aihti.com

To Our Valued Customers:

Welcome to American Industrial Heat Transfer, Inc. your number one source for high quality heat transfer products. Following is our new 2019-2020 highly defined products catalog that is intended to provide valuable information regarding engineering specifications, selection procedures, application assistance, installation instructions, terms and conditions, and much more.

Throughout its thirty-year history, American Industrial has consistently provided customers with high quality heat exchangers, unmatched service, and low prices. Our commitment to being a leading manufacturer is reflected by our investments in a state of the art manufacturing facility, cutting edge CNC manufacturing machinery, custom computer enterprise technology, skilled engineering services, global purchasing alliances, and strong distribution channels.

American Industrial manufactures ninety-five percent of all components used in its products at our facility in LaCrosse, Virginia. Finished components from the smallest to the largest are meticulously fabricated with precision CNC equipment and skilled craftsmen. For those reasons American Industrial is a true manufacturer with the ability to control design and quality allowing us to deliver products in far shorter period than the competition.

The 2019-2020 products catalog has several new additions, adding popular items to our regular standard product offering. American Industrial's standard catalog products account for about fifty percent of total manufacturing capacity, the remaining capacity is available for use to manufacture custom engineered heat exchangers or additional demand.

It is recommended to review the catalog in order to gain understanding of the various product types, their differences from one brochure to the other specifically in dimensions, materials, capabilities, and sizes. By reviewing the catalog prior to selection it will make it easier to understand the information needed to assure proper heat exchanger selection and usage and minimize the time and effort spent during the process.

Warm Regards,

Ghasem Sariri

Ghasem Sariri

President
American Industrial Heat Transfer, Inc.

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 355 American Industrial Drive LaCrosse, VA 23950 tel: 434-757-1800 fax: 434-757-1810 email: sales@aihti.com

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Conversions and Formulas

To Convert	Into	Multiply By
Cubic Feet (cu. ft.)	Gallons U.S. Liquid	7.48052
Liters Per Minute (LPM)	Gallons Per Minute (GPM)	0.2642
Gallons Per Minute (GPM)	Cubic Inches Per Minute	231
Kilowatts (Kw)	Btu / hr	3415
Horse Power (HP)	Btu / hr	2545
Joules	Btu	.000948
Kilogram Calories	Btu	3.968
Kilograms	Pounds U.S. (lbs)	2.205
Degrees Celcius	Degrees Fahrenheit	(1.8) + 32
Tons of Cooling (chiller)	Btu / hr	12000
Tons of Cooling (cooling tower)	Btu / hr	18000
Gallons U.S. (water)	Pounds U.S. (lbs)	8.3453
Milimeters	Inches U.S.	25.4
Centimeters	Inches U.S.	2.54
Bar	Pounds Per Square Inch (PSI)	14.5
Inches of Water	Pounds Per Square Inch (PSI)	.03613
Inches of Mercury (Hg)	Pounds Per Square Inch (PSI)	.4912

Formula For	Word Formula	Letter Formula
Reservoir Cooling Capacity	Heat (Btu/hr) = 2 x Temperature Difference Between Reservoir Walls and Air (^oF) x Area of Reservoir (Sq. ft.)	Btu/hr = 2.0 x $\triangle T$ x A
Heat In Hydraulic Oil (approx.) due to system inefficiencies (SG = .89 - .92)	Heat (Btu/hr) = Flow Rate (GPM) x 210 x Temperature Difference (^oF)	Btu/hr Q = GPM x 210 x $\triangle T$
Heat In Fresh Water (approx.)	Heat (Btu/hr) = Flow Rate (GPM) x 500 x Temperature Difference (^oF)	Btu/hr Q = GPM x 500 x $\triangle T$
Heat In 50% Ethylene Glycol and Water (approx.)	Heat (Btu/hr) = Flow Rate (GPM) x 450 x Temperature Difference (^oF)	Btu/hr Q = GPM x 450 x $\triangle T$
Heat In Dry Air (approx.)	Standard Cubic Feet Per Minute x 1.13 x Temperature Difference (^oF)	SCFM x 1.13 x Temperature Difference (^oF)
Fluid Power In Horse Power	Horse Power = $\frac{\text{Pressure (PSI) x Flow (GPM)}}{1714}$	HP = $\frac{PQ}{1714}$
Velocity Through Piping (in feet / second velocity)	Velocity = $\frac{\text{.3208 x Flow Rate through I.D. (GPM)}}{\text{Internal Area (Square Inches)}}$	V = $\frac{.3208Q}{A}$
Internal Area of a Pipe (square inches)	Internal Area = Pipe I.D. squared x .7854	A = d^2 x .7854
Specific Gravity of a Fluid	Specific Gravity = $\frac{\text{Weight of One Cubic Foot of a Fluid}}{\text{Weight of One Cubic Foot of Water}}$	SG = $\frac{W}{62.4283}$
Convert ACFM to SCFM	SCFM = $\frac{\text{ACFM x (Pounds Per Square Inch Gauge + Atmospheric Pressure) x 528}}{\text{(Temperature of Air Inlet + 460) x Atmospheric Pressure}}$	SCFM = $\frac{\text{ACFM x PSIG + 14.7 x 528}}{T_1 + 460 \text{ x } 14.7}$
Steam Required (lbs / hr)	lbs / hr = $\frac{\text{Btu per hour}}{\text{Enthalpy of Steam at Operating Pressure}}$	lbs/hr = $\frac{\text{Btu/hr}}{\text{Btu/lb}}$
F_s or Btu / lb ^oF	F_s = $\frac{\text{Horse Power to be Removed x 2545 x Correction Viscosity}}{(\text{Oil Leaving } ^oF - \text{Ambient Air Entering } ^oF)}$	F_s = $\frac{HP \text{ x } 2545 \text{ x } Cv}{T_2 - t_a}$

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American Industrial Heat Transfer Inc.
Manufacturer of Quality Heat Exchangers

website : www.aihti.com
general email : sales@aihti.com
technical email : engineering@aihti.com

Shell & Tube Application Request: *(For liquid to liquid heat exchangers)*

Please fill out form as completely as possible.

Email form to: sales@aihti.com or engineering@aihti.com or fax to 434-757-1810

Contact Name _____ Telephone _____ Date _____

Company Name _____ Email _____

Address: _____ Fax _____

_____

Hot Side

Fluid Type _____

If available:
Density _____ lb/ft3
Viscosity _____ cP
Conductivity _____ Btu/hr.ft.°F
Specific Heat _____ Btu/lb.°F

1. Flow Rate _____
2. Temperature In _____
3. Desired Temperature Out _____
4. Heat Load _____

Cold Side

Fluid Type _____

If available:
Density _____ lb/ft3
Viscosity _____ cP
Conductivity _____ Btu/hr.ft.°F
Specific Heat _____ Btu/lb.°F

1. Flow Rate _____
2. Temperature In _____

Maximum Allowable Pressure Drop:

Hot Side _____ Cold Side _____

To properly size the heat exchanger we need 3 of the 4 perameter on the Hot Side and 2 on the Cold Side.

Shell Material Construction:

Brass ☐ Steel ☐ Stainless Steel ☐

Tube Material Construction:

Copper ☐ 90/10 Copper Nickel ☐ Stainless Steel ☐

ASME Code and Certified Yes ☐ No ☐

Require All Stainless Steel Heat Exchanger Yes ☐ No ☐

Comment: _____

_____

_____

American Industrial Heat Transfer Inc.
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technical email : engineering@aihti.com

Air Cooled Liquid Cooler Application Request:

Please fill out form as completely as possible.

Email form to: sales@aihti.com or engineering@aihti.com or fax to 434-757-1810

Contact Name _____ Telephone _____ Date _____

Company Name _____ Email _____

Address: _____ Fax _____

_____

Hot Side

Fluid Type _____

If available:
Density _____ lb/ft3
Viscosity _____ cP
Thermal Conductivity _____ Btu/hr.ft.°F
Specific Heat _____ Btu/lb.°F

1. Flow Rate _____
2. Temperature In _____
3. Desired Temperature Out _____
4. Heat Load _____

Cold Side

Ambient Air _____

Altitude _____

1. Operating Pressure _____
2. Allowable Pressure Drop _____

ASME Code and Certified Yes ☐ No ☐

To properly size the heat exchanger we need 3 of the 4 perameters on the Hot Side.

Cabinet Material:
Standard : Steel ☐
Options: Galvanized Steel ☐
Stainless Steel ☐

Tubing Material:
Standard : Copper ☐
Options: Stainless Steel ☐
90/10 Copper Nickel ☐

Motor:
60Hz: 230/460 Volt, 3 Phase ☐
115/230 Volt, 1 Phase ☐
575 Volt, 3 Phase ☐
50Hz 230/400 Volt, 3 Phase ☐
110/220 Volt, 1 Phase ☐
Hydraulic Motor ☐

Coating
Standard Enameled Gray Paint ☐
Options: Epoxy Paint ☐

Fins
Standared Aluminum ☐
Options: Copper ☐
Optional Coating: Heresite ☐

Comment: _____

_____

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American Industrial Heat Transfer Inc.
Manufacturer of Quality Heat Exchangers

website : www.aihti.com
general email : sales@aihti.com
technical email : engineering@aihti.com

Air Cooled After-Cooler Application Request:

Please fill out form as completely as possible.

Email form to: sales@aihti.com or engineering@aihti.com or fax to 434-757-1810

Contact Name _____ Telephone _____ Date _____

Company Name _____ Email _____

Address: _____ Fax _____

_____

Hot Side

Air / Gas Type _____

If available:

Density _____ lb/ft^3

Viscosity _____ cP

Thermal Conductivity _____ Btu/hr.ft.°F

Specific Heat _____ Btu/lb.°F

1. Flow Rate _____

2. Temperature In _____

3. Desired Temperature Out _____

4. Heat Load _____

5. Inlet Pressure _____

Cold Side

Ambient Air _____

Altitude _____

1. Allowable Pressure Drop _____

ASME Code and Certified Yes ☐ No ☐

To properly size the heat exchanger we need 3 of the 4 perameters on the Hot Side.

Cabinet Material:

Standard : Steel ☐

Options: Galvanized Steel ☐ | Stainless Steel ☐

Tubing Material:

Standard : Copper ☐

Options: Stainless Steel ☐ | 90/10 Copper Nickel ☐

Motor:

60Hz: 230/460 Volt, 3 Phase ☐ | 115/230 Volt, 1 Phase ☐ | 575 Volt, 3 Phase ☐

50Hz 230/400 Volt, 3 Phase ☐ | 110/220 Volt, 1 Phase ☐

Hydraulic Motor ☐

Coating

Standard Enamaled Gray Paint ☐

Options: Epoxy Paint ☐

Fins

Standared Aluminum ☐

Options: Copper ☐

Optional Coating: Heresite ☐

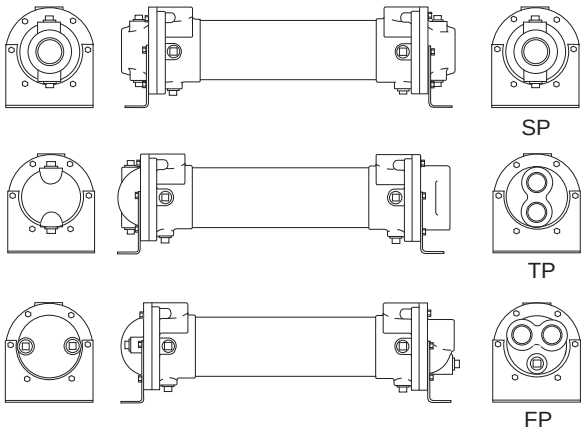
Comment: _____

_____

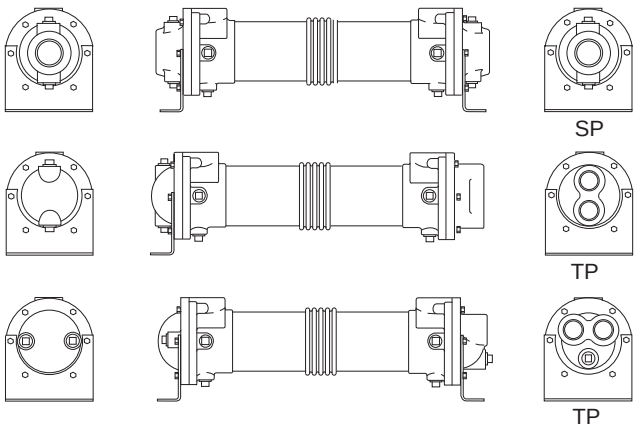
Heat Exchanger Identification Chart

Use the following chart to identify existing heat exchangers without model tags. Below each sketch is the American Industrial equivalent model series. To match dimensional and material specifications see specific matching Series section located within this catalog.

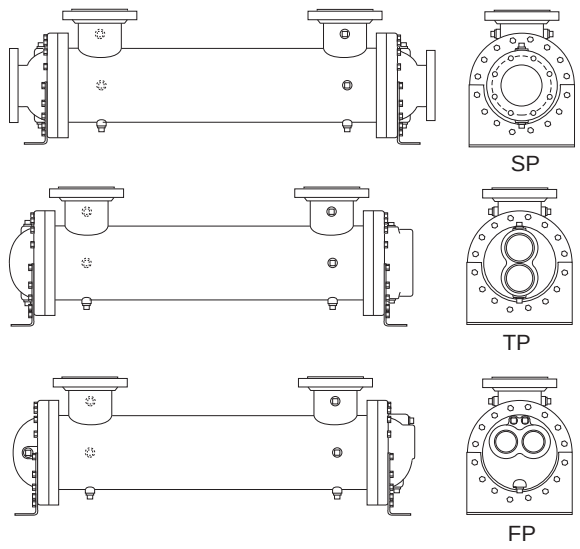
AB, SAE, & STS Series



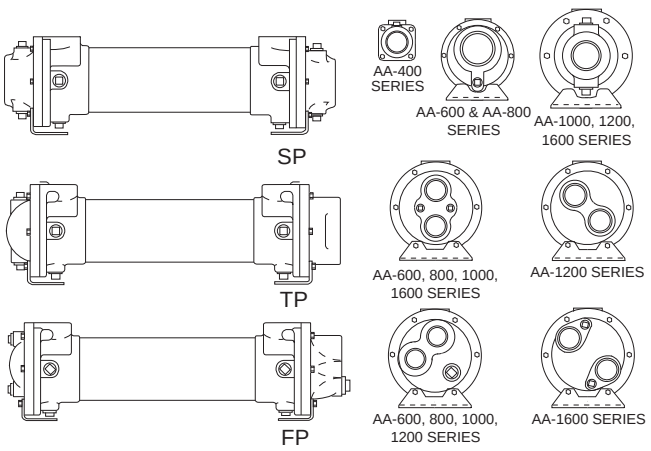
EAB Series



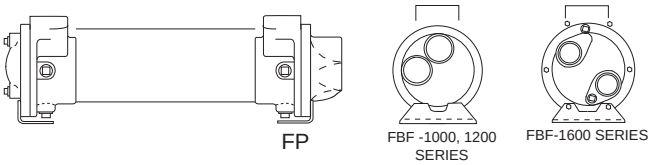
AB - 2000 Series



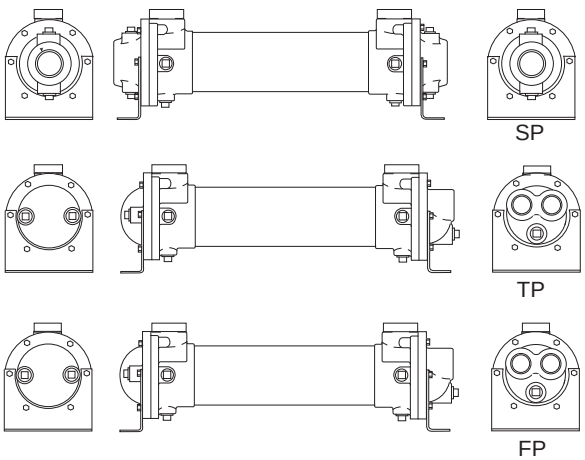
AA & STA Series - SP



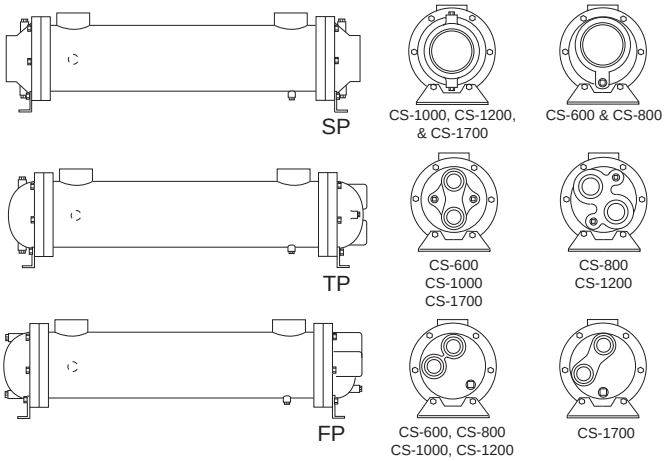
FBF Series



SAE-1600 Series



CS & STC Series



SP = Single Pass,
TP = Two Pass,
FP = Four Pass

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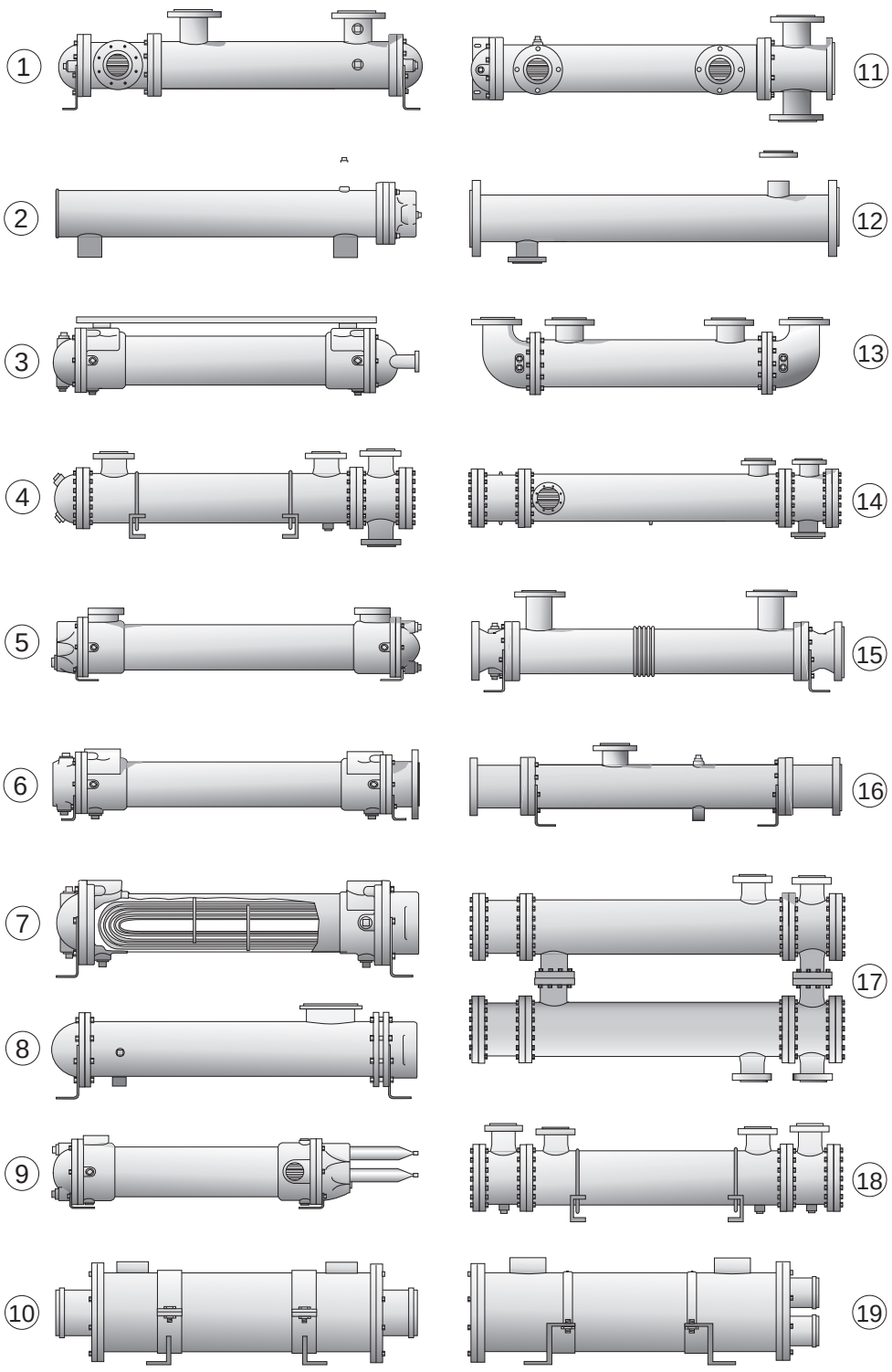
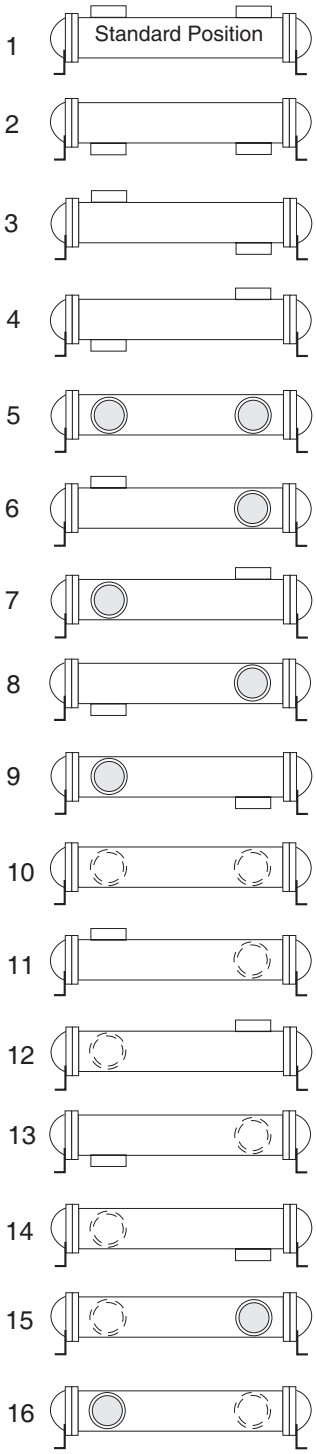
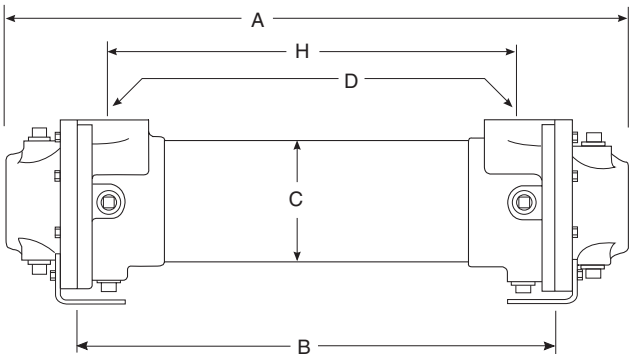
Heat Exchanger Identification Chart

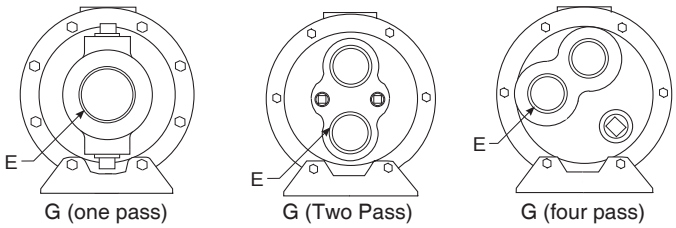
Following are samples of custom heat exchangers that are provided as guidance in identifying models without model codes or labels. If the heat exchanger required does not fit our standard catalog models the following samples can be selected to give American Industrial a starting point to help identify your heat exchanger. Choose the heat exchanger below that best represents the configuration of the existing unit.



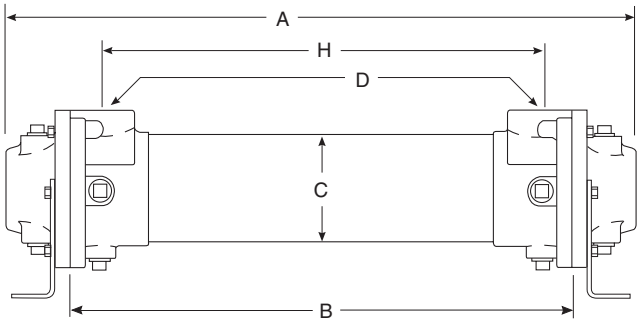


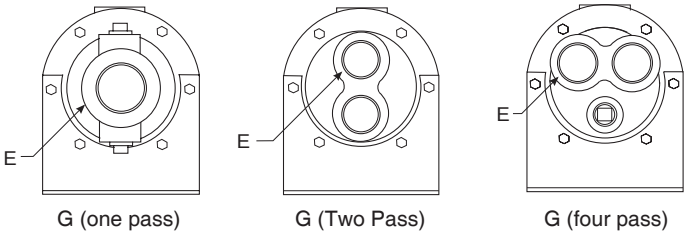
CUSTOMIZATION CHART *shell & tube*





AA Series





AB Series

If Available:

A Overall Length _____

B Flange to Flange Length _____

C Shell Diameter _____

D Shell Side Port Size _____

E Tube Side Port Size _____

G Number of Passes _____

H Center to Center Shell _____

I Shell Material: Brass ☐ Stainless Steel ☐ Steel ☐

J Tube Material: Copper ☐ 90/10 Copper Nickel ☐ Stainless Steel ☐

K End Bonnet Material: Cast Iron ☐ Cast Bronze ☐ Stainless Steel ☐

Manufacturer _____

Model Number _____

Tube Side Flow Rate _____

Shell Side Flow Rate _____

Tube Side Liquid _____

Shell Side Liquid _____

Tube Size (O.D.) / No. of Tubes _____

Comment:

_____

_____

_____

note: AIHTI reserves the right to make reasonable design changes without notice.

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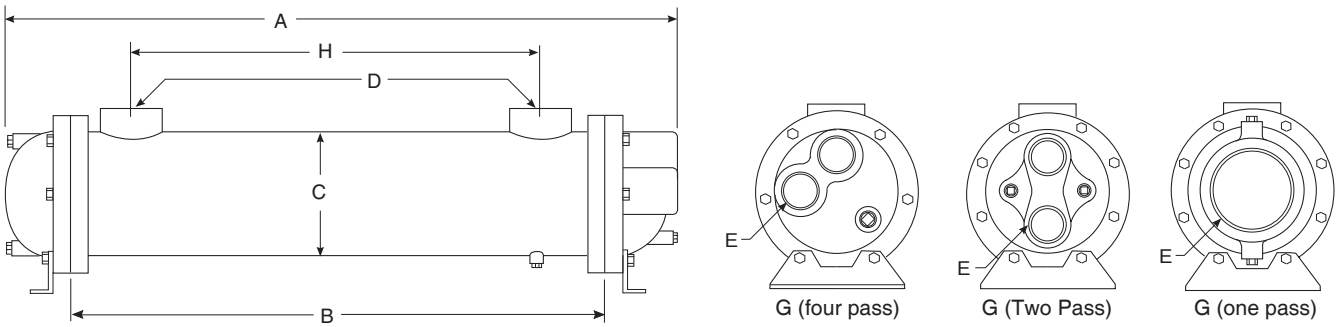
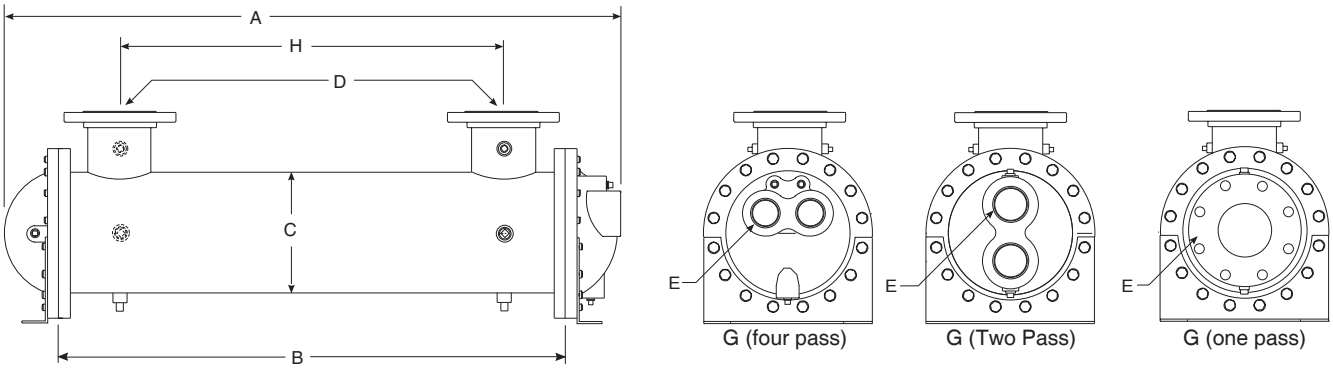


CS Series



AB 2000 / CS 2000 Series

If Available:

A Overall Length _____

B Flange to Flange Length _____

C Shell Diameter _____

D Shell Side Port Size _____

E Tube Side Port Size _____

G Number of Passes _____

H Center to Center Shell _____

I Shell Material: Steel ☐ Stainless Steel ☐

J Tube Material: Copper ☐ 90/10 Copper Nickel ☐ Stainless Steel ☐

K End Bonnet Material: Cast Iron ☐ Cast Bronze ☐ Stainless Steel ☐

Manufacturer _____

Model Number _____

Tube Side Flow Rate _____

Shell Side Flow Rate _____

Tube Side Liquid _____

Shell Side Liquid _____

Tube Size (O.D.) / No. of Tubes _____

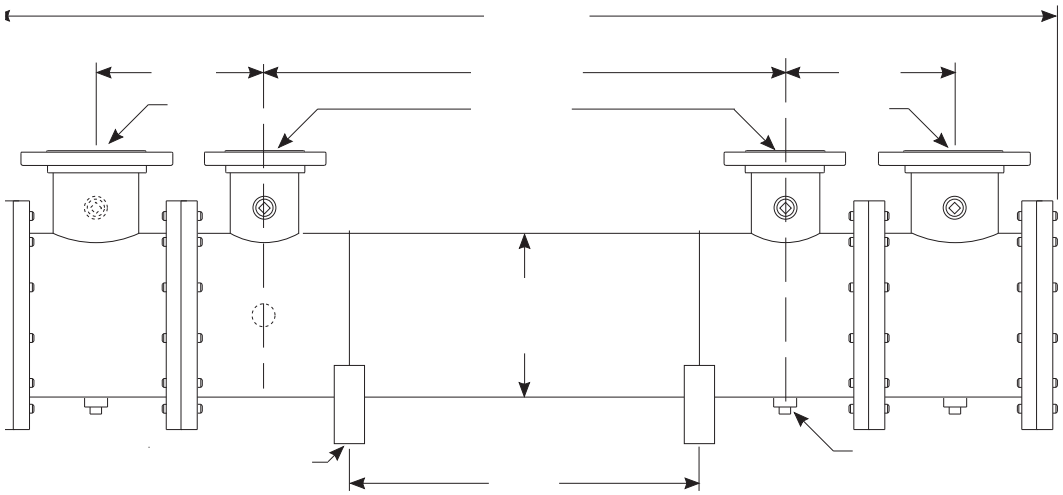
Comment:

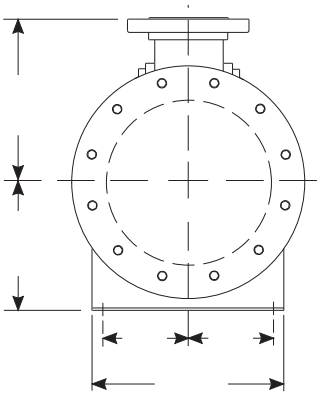
_____

_____

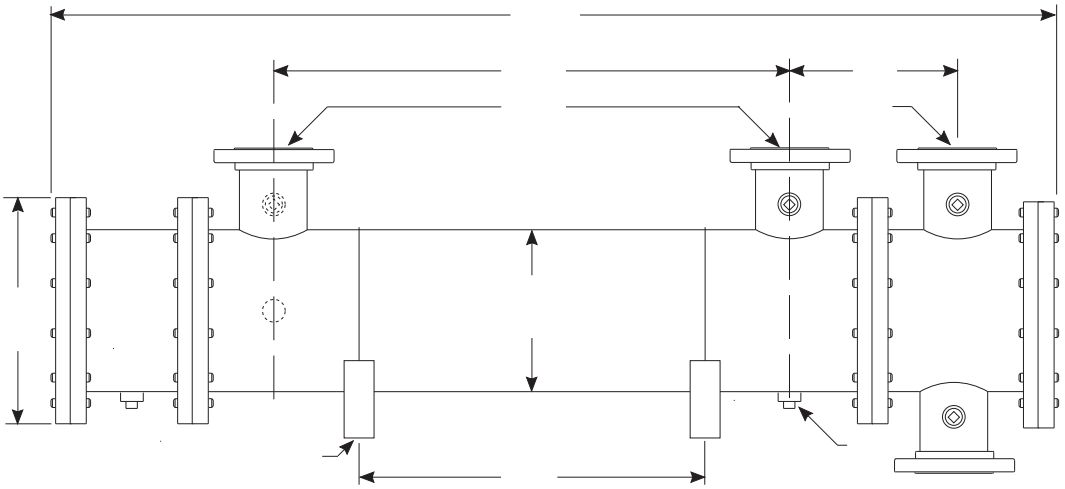
_____

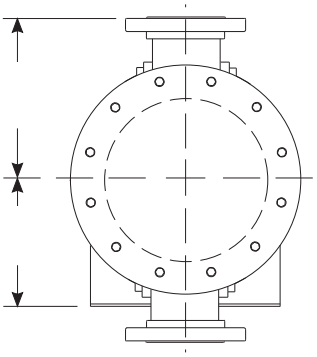
REPLACEMENT IDENTIFICATION *shell & tube*





Single Pass





Two Pass

Fixed Tube Bundle ☐ Removable Tube Bundle ☐ U-Tube Fixed Tube Bundle ☐ U-Tube Removable Tube Bundle ☐

Shell Material Construction:

Steel ☐ Stainless Steel ☐

Tube Sheet Material

Steel ☐ Stainless Steel ☐

Brass ☐ (Applies to removable bundle only)

Tube Material Construction:

Copper ☐

90/10 Copper Nickel ☐

Stainless Steel ☐

End Bonnets Material:

Steel ☐

Stainless Steel ☐

Require All Stainless Steel Heat Exchanger Yes ☐ No ☐

ASME Code and Certified Yes ☐ No ☐

Comment: _____

_____

_____

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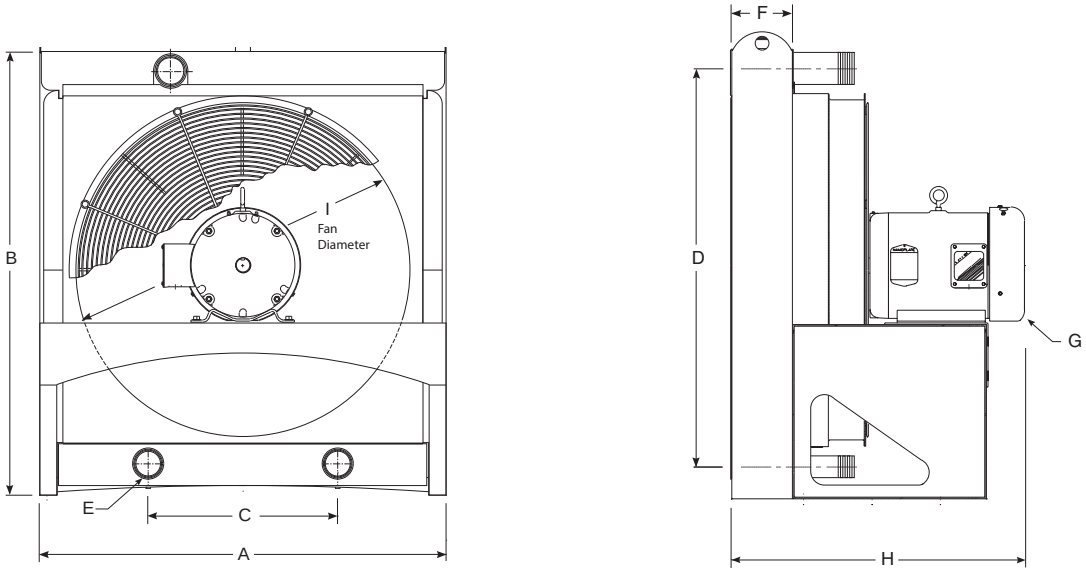
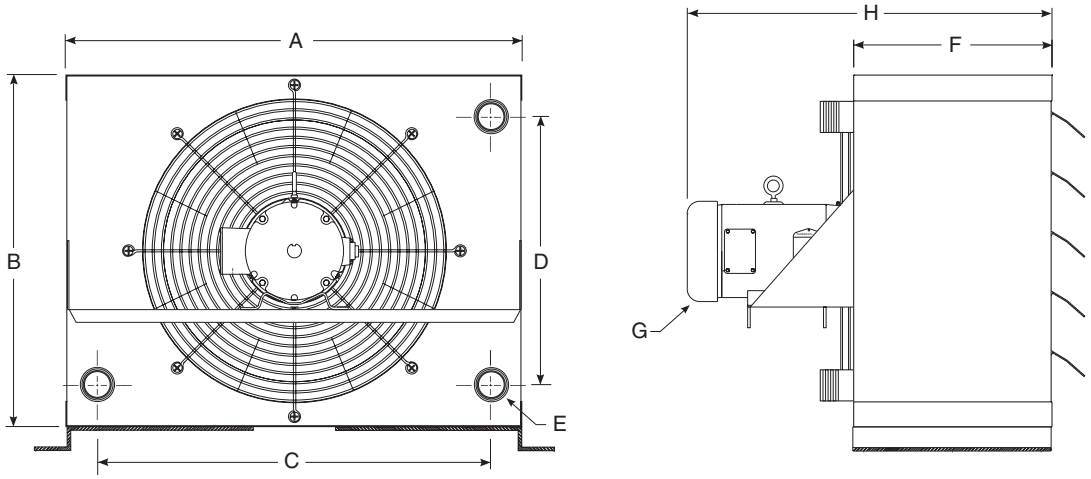


AOCS Series



AC / AOCH Series

A Width _____

B Height _____

C Center to Center of Ports _____

D Center to Center of Ports _____

E Port Size _____

F Depth of heat exchanger _____

G Motor Type ☐ Electric ☐ Hydraulic

H Total Depth _____

I Fan Diameter _____

J Motor Horse Power _____

If Available:

Manufacturer _____

Model Number _____

Liquid Flow Rate _____

Fluid Type _____

ASME Code and Certified Yes ☐ No ☐

Comment:

_____

_____

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general email : sales@aihti.com
technical email : engineering@aihti.com

Shell & Tube Application Request: *(For liquid to liquid heat exchangers)*

For AB - SAE - STS - EAB Series

Email form to: sales@aihti.com or engineering@aihti.com or fax to 434-757-1810

Contact Name _____ Telephone _____ Date _____

Company Name _____ Email _____

Address: _____ Fax _____

_____

Hot Side

Fluid Type _____

If available:

Density _____ lb/ft3
Viscosity _____ cP
Conductivity _____ Btu/hr.ft.°F
Specific Heat _____ Btu/lb.°F

1. Flow Rate _____
2. Temperature In _____
3. Desired Temperature Out _____
4. Heat Load _____

Cold Side

Fluid Type _____

If available:

Density _____ lb/ft3
Viscosity _____ cP
Conductivity _____ Btu/hr.ft.°F
Specific Heat _____ Btu/lb.°F

1. Flow Rate _____
2. Temperature In _____

Maximum Allowable Pressure Drop:

Hot Side _____ Cold Side _____

To properly size the heat exchanger we need 3 of the 4 perameter on the Hot Side and 2 on the Cold Side.

Shell Material Construction:

Brass ☐ Steel ☐ Stainless Steel ☐

Tube Material Construction:

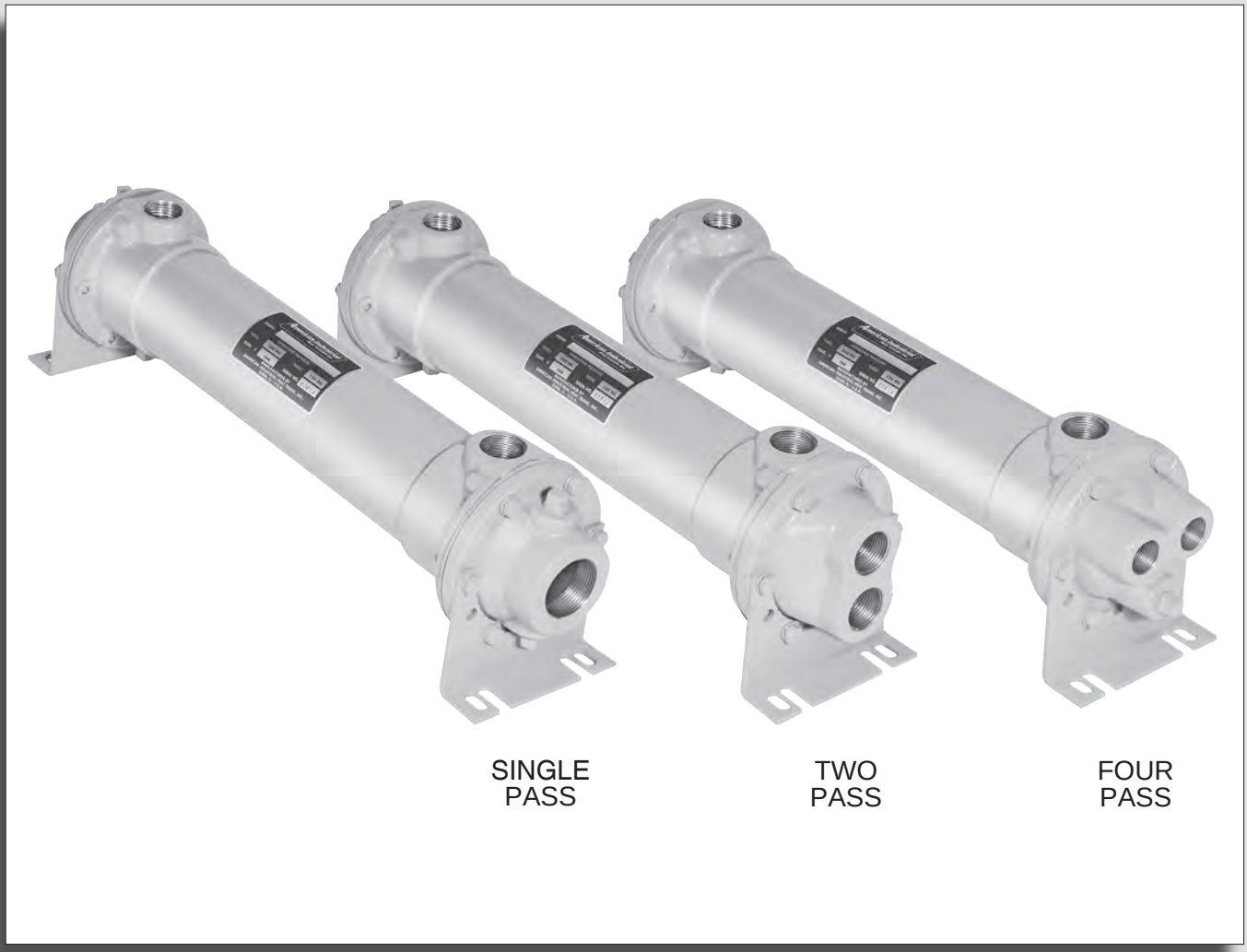
Copper ☐ 90/10 Copper Nickel ☐ Stainless Steel ☐

ASME Code and Certified Yes ☐ No ☐

Require All Stainless Steel Heat Exchanger Yes ☐ No ☐

Comment: _____

_____



Fixed Tube Bundle / Liquid Cooled

HEAT EXCHANGERS

- Computer generated data sheet available for any application
- Operating pressure for tubes 150 PSI.
- Operating pressure for shell 300 PSI.
- Operating temperature 300 °F.
- Can be customized to fit any applications.
- Cools: Fluid power systems, rock crushers, presses, shears, lubrication equipment for paper machinery, gear drives, marine transmissions, etc.

AB, SAE, STS, & EAB Series *overview*

AB Series

Fixed tube construction heat exchangers with NPT connections. Made of brass with copper cooling tubes and cast iron end bonnets. Standard sizes from 2" through 8" diameters, and from 1.4 to 308 sq.ft. Standard one, two, and four pass models are available. Options include 90/10 copper nickel and 316 stainless steel cooling tubes, bronze bonnets and zinc anodes. Can be customized to fit your requirements.

Optional 10” diameter units in brass are available upon request.

SAE Series

Similar to AB series with the exception of the shell ports. SAE series from 2” through 6” diameter has SAE O-ring strait thread shell port connections. Size 8” diameter has SAE code 61 four bolt flange shell port connections.

STS Series

Similar in design to AB series with fixed tube construction and NPT connections made of all 316 stainless steel. Standard sizes from 2" through 8" diameters, and from 1.4 to 308 sq.ft. Standard one, two and four pass models are available. Larger diameters available upon request. Can be customized to fit your requirements.

EAB Series

Expansion bellow minimizes the effects of differential expansion and contraction between the shell and cooling tubing, prolonging the overall life of the heat exchanger by reducing fatigue. Fixed tube construction heat exchangers with NPT connections. Made of brass with 90/10 copper nickel cooling tubes, stainless steel expansion bellows, and cast iron end bonnets. Standard sizes from 3.5" through 8" diameters, and from 3.6 to 308 sq.ft. Standard one, two and four pass models are available.

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AB, SAE, STS, & EAB Series *construction*

TUBE JOINT
Roller expanded tube joint to integral forged hub.

THREAD
CNC precision threading to provide accurate leak-proof connections.

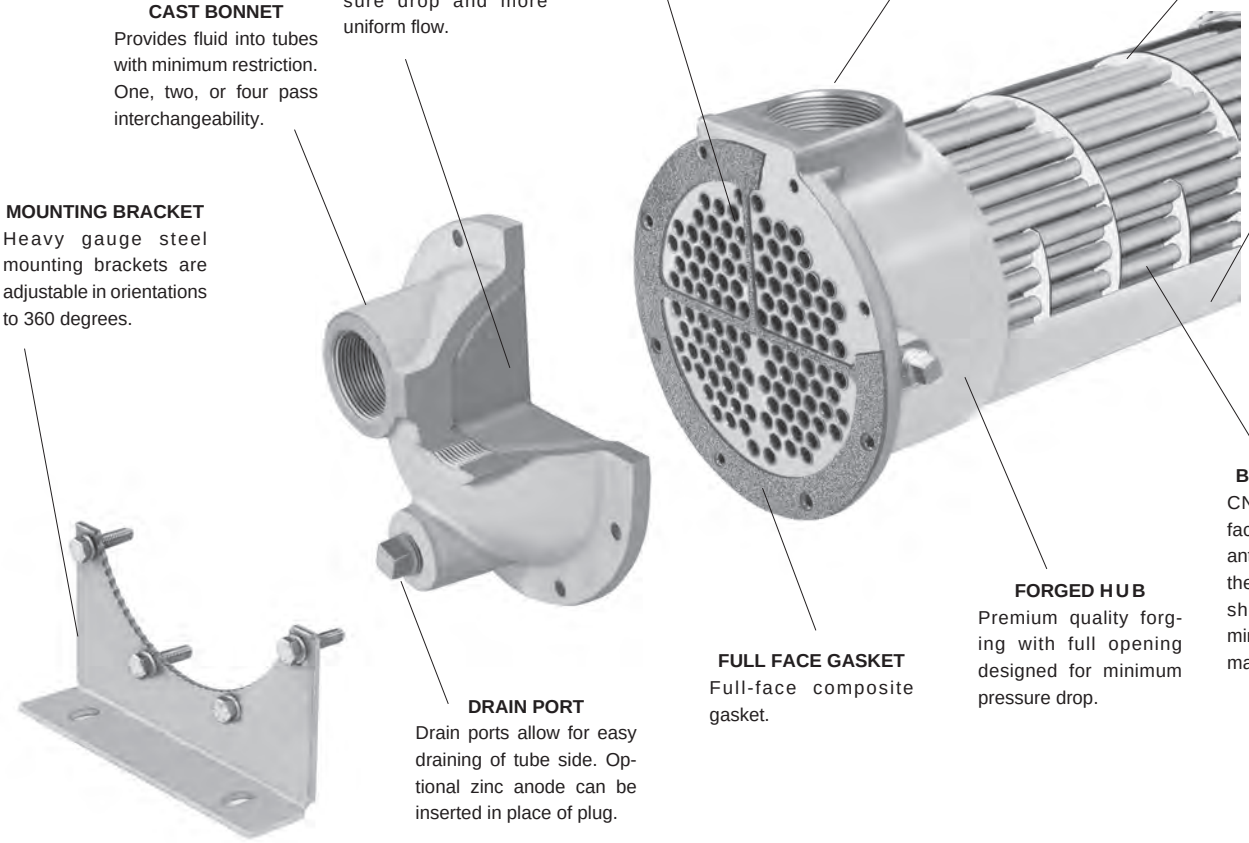
BAFFLES
CNC manufactured baffles to provide maximum turbulence and heat transfer with a minimum fluid pressure drop.

FLOW CAVITY
Generously sized to allow for minimum pressure drop and more uniform flow.

CAST BONNET
Provides fluid into tubes with minimum restriction. One, two, or four pass interchangeability.

FINISH
Gray semigloss enamel. Can be used as a base for additional coats.

MOUNTING BRACKET
Heavy gauge steel mounting brackets are adjustable in orientations to 360 degrees.



BUNDLE ASSEMBLY
CNC precision manufactured parts to guarantee a close fit between the baffles, tubes, and shell. Clearances are minimized to provide for maximum heat transfer.

FORGED HUB
Premium quality forging with full opening designed for minimum pressure drop.

FULL FACE GASKET
Full-face composite gasket.

DRAIN PORT
Drain ports allow for easy draining of tube side. Optional zinc anode can be inserted in place of plug.

UNIT CODING

Example Model

Options

AB - 1204 - C 4 - TP - CNT - B - Z

Model
AB
SAE
STS
EAB

Shell Diameter
400 = 2.13"
700 = 3.65"
1000 = 5.13"
1200 = 6.13"
1600 = 8.00"

Effective Tube Length
(9" increments)

Baffle Spacing Code
A = 1 1/8"
B = 2 1/4"
C = 4 1/2"
D = 9 "
E = 18 "

Cooling Tube Diamenter
4 = 1/4"
6 = 3/8"
10 = 5/8"

Tube Side Passes
SP = 1 pass
TP = 2 pass
FP = 4 pass

Tubing
Blank = Copper
Options
CNT= 90/10 Cu Ni
STS = Stainless Steel
C = Carbon Steel

End Bonnets
Blank = Cast Iron
Options
B = Bronze
SB = Stainless Steel

Zinc Anode
Z = 1 Zinc Anode
2Z = 2 Zinc Anode etc.

STANDARD CONSTRUCTION MATERIALS & RATINGS

Standard Model	AB Series	SAB & SSAE Series★	SAE Series	STS Series	EAB Series	Standard Unit Ratings
Shell	Brass	Steel	Brass	316 Stainless Steel	Steel	Operating Pressure
Tubes	Copper	Copper	Copper	316 Stainless Steel	90/10 Copper Nickel	Tubes.....150 psig
Baffle	Brass	Steel	Brass	316 Stainless Steel	Brass	
Integral End Hub	Forged Brass	Forged Brass	Forged Brass	316 Stainless Steel	Forged Brass	Operating Pressure
End Bonnets	Cast Iron	Cast Iron	Cast Iron	316 Stainless Steel	Cast Iron	Shell.....300 psig
Mounting Brackets	Steel	Steel	Steel	Steel	Steel	
Gasket	Hypalon Composite	Hypalon Composite	Hypalon Composite	Hypalon Composite	High Temp Gasket	Operating Temperature
Expansion Bellows	–	–	–	–	Stainless Steel	300 ºF

★Offered in 5" through 8" shell diameter.

STEP 1: Calculate the heat load

The heat load in BTU/HR or (Q) can be derived by using several methods. To simplify things, we will consider general specifications for hydraulic system oils and other fluids that are commonly used with shell & tube heat exchangers.

Terms

GPM = Gallons Per Minute
CN = Constant Number for a given fluid
△T = Temperature differential across the potential
PSI = Pounds per Square Inch (pressure) of the operating side of the system
MHP = Horsepower of the electric motor driving the hydraulic pump
Kw = Kilowatt (watts x 1000)
T_{in} = Hot fluid entering temperature in °F
T_{out} = Hot fluid exiting temperature in °F
t_{in} = Cold fluid temperature entering in °F
t_{out} = Cold fluid temperature exiting in °F
Q = BTU / HR

For example purposes, a hydraulic system has a 125 HP (93Kw) electric motor installed coupled to a pump that produces a flow of 80 GPM @ 2500 PSIG. The temperature differential of the oil entering the pump *vs* exiting the system is about 5.3°F. Even though our return line pressure operates below 100 psi, we must calculate the system heat load potential (Q) based upon the prime movers (pump) capability. We can use one of the following equations to accomplish this:

To derive the required heat load (Q) to be removed by the heat exchanger, apply ONE of the following. Note: The calculated heat loads may differ slightly from one formula to the next. This is due to assumptions made when estimating heat removal requirements. The factor *(v)* represents the percentage of the overall input energy to be rejected by the heat exchanger. The *(v)* factor is generally about 30% for most hydraulic systems, however it can range from 20%-70% depending upon the installed system components and heat being generated (ie. servo valves, proportional valves, etc…will increase the percentage required).

FORMULA	EXAMPLE
A) Q = GPM x CN x actual △T	A) Q =80 x 210 x 5.3°F = 89,040 BTU/HR
B) Q = [(PSI x GPM) / 1714] x (*v*) x 2545	B) Q =[(2500x80)/1714] x .30 x 2545 = 89,090 BTU/HR
C) Q = MHP x (*v*) x 2545	C) Q =125 x .30 x 2545 = 95,347 BTU/HR
D) Q = Kw to be removed x 3415	D) Q =28 x 3415 = 95,620 BTU/HR
E) Q = HP to be removed x 2545	E) Q =37.5 x 2545 = 95,437 BTU/HR

Constant for a given fluid (CN)

1) Oil ..... CN = 210
2) Water..... CN = 500
3) 50% E. Glycol..... CN = 450

STEP 2: Calculate the Mean Temperature Difference

When calculating the MTD you will be required to choose a liquid flow rate to derive the Cold Side △T. If your water flow is unknown you may need to assume a number based on what is available. As a normal rule of thumb, for oil to water cooling a 2:1 oil to water ratio is used. For applications of water to water or 50 % Ethylene Glycol to water, a 1:1 ratio is common.

FORMULA

HOT FLUID △T Oil = $\frac{Q}{CN \times GPM}$

COLD FLUID △ t Water = $\frac{BTU / hr}{CN \times GPM}$

EXAMPLE

$\triangle T = \frac{89{,}090\ BTU/hr\ (\text{from step 1, example B})}{210\ CN \times 80GPM} = 5.3°F = \triangle T\ Rejected$

$\triangle t = \frac{89{,}090\ BTU/hr}{500\ CN \times 40GPM\ (\text{for a 2:1 ratio})} = 4.5°F = \triangle t\ Absorbed$

T_{in} = Hot Fluid entering temperature in degrees F
T_{out} = Hot Fluid exiting temperature in degrees F
t_{in} = Cold Fluid entering temperature in degrees F
t_{out} = Cold Fluid exiting temperature in degrees F

T_{in} = 125.3 °F
T_{out} = 120.0 °F
t_{in} = 70.0 °F
t_{out} = 74.5 °F

$\frac{T_{out} - t_{in}}{T_{in} - t_{out}} = \frac{S[\text{smaller temperature difference}]}{L\ [\text{larger temperature difference}]} = \left(\frac{S}{L}\right)$

$\frac{120.0°F - 70.0°F = 50.0°F}{125.3°F - 74.5°F = 50.8°F} = \frac{50.0°F}{50.8°F} = .984$

STEP 3: Calculate Log Mean Temperature Difference (LMTD)

To calculate the LMTD please use the following method;

L = Larger temperature difference from step 2.
M = S/L number (LOCATED IN TABLE A).

$LMTD_i$ = L x M

$LMTD_i$ = 50.8 x .992 (FROM TABLE A) = 50.39

To correct the $LMTD_i$ for a multipass heat exchangers calculate **R** & **K** as follows:

FORMULA

$\mathbf{R} = \frac{T_{in} - T_{out}}{t_{out} - t_{in}}$

$\mathbf{K} = \frac{t_{out} - t_{in}}{T_{in} - t_{in}}$

EXAMPLE

$\mathbf{R} = \frac{125.3°F - 120°F}{74.5°F - 70°F} = \frac{5.3°F}{4.5°F} =$ **{1.17=R}**

$\mathbf{K} = \frac{74.5°F - 70°F}{124.5°F - 70°F} = \frac{4.5°F}{55.4°F} =$ **{0.081=K}**

Locate the correction factor CF_B (FROM TABLE B)
$LMTD_c = LMTD_i \times CF_B$
$LMTD_c$ = 50.39 x 1 = **50.39**

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STEP 4: Calculate the area required

Required Area sq.ft. = $\frac{\text{Q (BTU / HR)}}{\text{LMTD}_c \text{ x U (FROM TABLE C)}}$ $\frac{89{,}090}{50.39 \text{ x } 100}$ = **17.68 sq.ft.**

STEP 5: Selection

a) From TABLE E choose the correct series size, baffle spacing, and number of passes that best fits your flow rates for both shell and tube side. Note that the tables suggest minimum and maximum information. Try to stay within the 20-80 percent range of the indicated numbers.

Example

Oil Flow Rate = 80 GPM = Series Required from Table E = **1200 Series**
Baffle Spacing from Table E = **C baffle**
Water Flow Rate = 40 GPM = Passes required in 1200 series = **4 (FP)**

b) From TABLE D choose the heat exchanger model size based upon the sq.ft. or surface area in the series size that will accommodate your flow rate.

Example

Required Area = 17.68sq.ft Closest model required based upon sq.ft. & series= **AB-1202-C6-FP**

If you require a computer generated data sheet for the application, or if the information that you are trying to apply does not match the corresponding information, please contact our engineering department for further assistance.

TABLE A- FACTOR M/LMTD = L x M

S/L	M	S/L	M	S/L	M	S/L	M
		.25	.541	.50	.721	.75	.870
.01	.215	.26	.549	.51	.728	.76	.874
.02	.251	.27	.558	.52	.734	.77	.879
.03	.277	.28	.566	.53	.740	.78	.886
.04	.298	.29	.574	.54	.746	.79	.890
.05	.317	.30	.582	.55	.753	.80	.896
.06	.334	.31	.589	.56	.759	.81	.902
.07	.350	.32	.597	.57	.765	.82	.907
.08	.364	.33	.604	.58	.771	.83	.913
.09	.378	.34	.612	.59	.777	.84	.918
.10	.391	.35	.619	.60	.783	.85	.923
.11	.403	.36	.626	.61	.789	.86	.928
.12	.415	.37	.634	.62	.795	.87	.934
.13	.427	.38	.641	.63	.801	.88	.939
.14	.438	.39	.648	.64	.806	.89	.944
.15	.448	.40	.655	.65	.813	.90	.949
.16	.458	.41	.662	.66	.818	.91	.955
.17	.469	.42	.669	.67	.823	.92	.959
.18	.478	.43	.675	.68	.829	.93	.964
.19	.488	.44	.682	.69	.836	.94	.970
.20	.497	.45	.689	.70	.840	.95	.975
.21	.506	.46	.695	.71	.848	.96	.979
.22	.515	.47	.702	.72	.852	.97	.986
.23	.524	.48	.709	.73	.858	.98	.991
.24	.533	.49	.715	.74	.864	.99	.995

LMTD correction factor for Multipass Exchangers

R \ K	.05	.1	.15	.2	.25	.3	.35	.4	.45	.5	.6	.7	.8	.9	1.0
.2	1	1	1	1	1	1	1	.999	.993	.984	.972	.942	.908	.845	.71
.4	1	1	1	1	1	1	.994	.983	.971	.959	.922	.855	.70		
.6	1	1	1	1	1	.992	.980	.965	.948	.923	.840				
.8	1	1	1	1	.995	.981	.965	.945	.916	.872					
1.0	1	1	1	1	.988	.970	.949	.918	.867	.770					
2.0	1	1	.977	.973	.940	.845	.740								
3.0	1	1	.997	.933	.835										
4.0	1	.993	.950	.850											
5.0	1	.982	.917												
6.0	1	.968	.885												
8.0	1	.930													
10.0	.996	.880													
12.0	.985	.720													
14.0	.972														
16.0	.958														
18.0	.940														
20.0	.915														

TABLE D- Surface Area

Model Number	Surface Area in Sq.ft.			Model Number	Surface Area in Sq.ft.		
	1/4" O.D Tubing	3/8" O.D Tubing	5/8 O.D Tubing		1/4" O.D Tubing	3/8" O.D Tubing	5/8 O.D Tubing
AB-401	1.52	–	–	AB-1602	43.96	30.03	17.66
AB-402	3.04	–	–	AB-1603	65.94	45.04	26.49
AB-403	4.56	–	–	AB-1604	87.92	60.05	35.33
				AB-1605	109.90	75.07	44.16
AB-701	3.73	2.65	–	AB-1606	131.88	90.08	52.99
AB-702	7.46	5.30	–	AB-1607	153.86	105.09	61.82
AB-703	11.19	7.95	–	AB-1608	175.84	120.11	70.65
AB-704	14.92	10.60	–	AB-1609	197.82	135.12	79.48
AB-705	18.64	13.25	–	AB-1610	219.80	150.13	88.31
				AB-1611	241.78	165.14	97.14
AB-1002	17.66	11.78	5.89	AB-1612	263.76	180.16	105.98
AB-1003	26.49	16.66	8.83	AB-1613	285.74	195.17	114.81
AB-1004	35.33	23.55	11.78				
AB-1005	44.16	29.44	14.72	AB-2004	155.43	110.69	60.84
AB-1006	52.99	35.33	17.66	AB-2005	194.29	138.36	76.05
				AB-2006	233.15	166.03	91.26
AB-1202	25.32	17.66	8.8	AB-2007	272.00	193.70	106.47
AB-1203	37.97	26.49	13.25	AB-2008	310.86	221.37	121.68
AB-1204	50.63	35.33	17.66	AB-2009	349.72	249.04	136.88
AB-1205	63.29	44.16	22.08	AB-2010	388.58	276..71	152.09
AB-1206	75.95	52.99	26.49	AB-2011	427.43	304.38	167.30
AB-1207	88.61	61.82	30.91	AB-2012	466.29	332.06	182.51
AB-1208	101.27	70.65	35.33	AB-2013	505.15	359.73	197.72
AB-1209	113.92	79.48	39.74	AB-2014	544.01	387.40	212.93
AB-1210	126.58	88.31	44.16	AB-2015	582.86	415.07	228.14

TABLE E- Flow Rate for Shell & Tube

Shell dia .	Max. Liquid Flow - Shell Side					Liquid Flow - Tube Side					
	Baffle Spacing					SP		TP		FP	
Code	A	B	C	D	E	Min.	Max.	Min.	Max.	Min.	Max.
400	10	15	20	–	–	3.5	21	–	–	–	–
700	17	29	30	35	–	9	61	4.5	30	2.2	15
1000	24	48	68	70	–	20	120	10	70	5.0	37
1200	29	56	105	115	120	30	250	15	112	7.5	56
1600	38	70	150	200	220	57	460	29	180	14	90
2000	–	–	190	370	550	90	650	45	320	25	160

TABLE C

U	TUBE FLUID	SHELL FLUID
400	Water	Water
350	Water	50% E. Glycol
100	Water	Oil
300	50% E. Glycol	50% E. Glycol
90	50% E. Glycol	Oil

note: AIHTI reserves the right to make reasonable design changes without notice.

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AB, SAE, STS, & EAB Series *performance*

Instructions

The selection chart provided contains an array of popular sizes for quick sizing. It does not provide curves for all models available. Refer to page 4 & 5 for detailed calculation information.

Computer selection data sheets for standard or special models are available through the engineering department of American Industrial. To use the followings graphs correctly, refer to the instruction notes "1-5".

1) HP Curves are based upon a 40°F approach temperature; for example: oil leaving a cooler at 125°F, using 85°F cooling water (125°F – 85°F = 40°F).

2) The oil to water ratio of 1:1 or 2:1 means that for every 1 gallon of oil circulated, a minimum of 1 or 1/2 gallon (respectively) of 85°F water must be circulated to match the curve results.

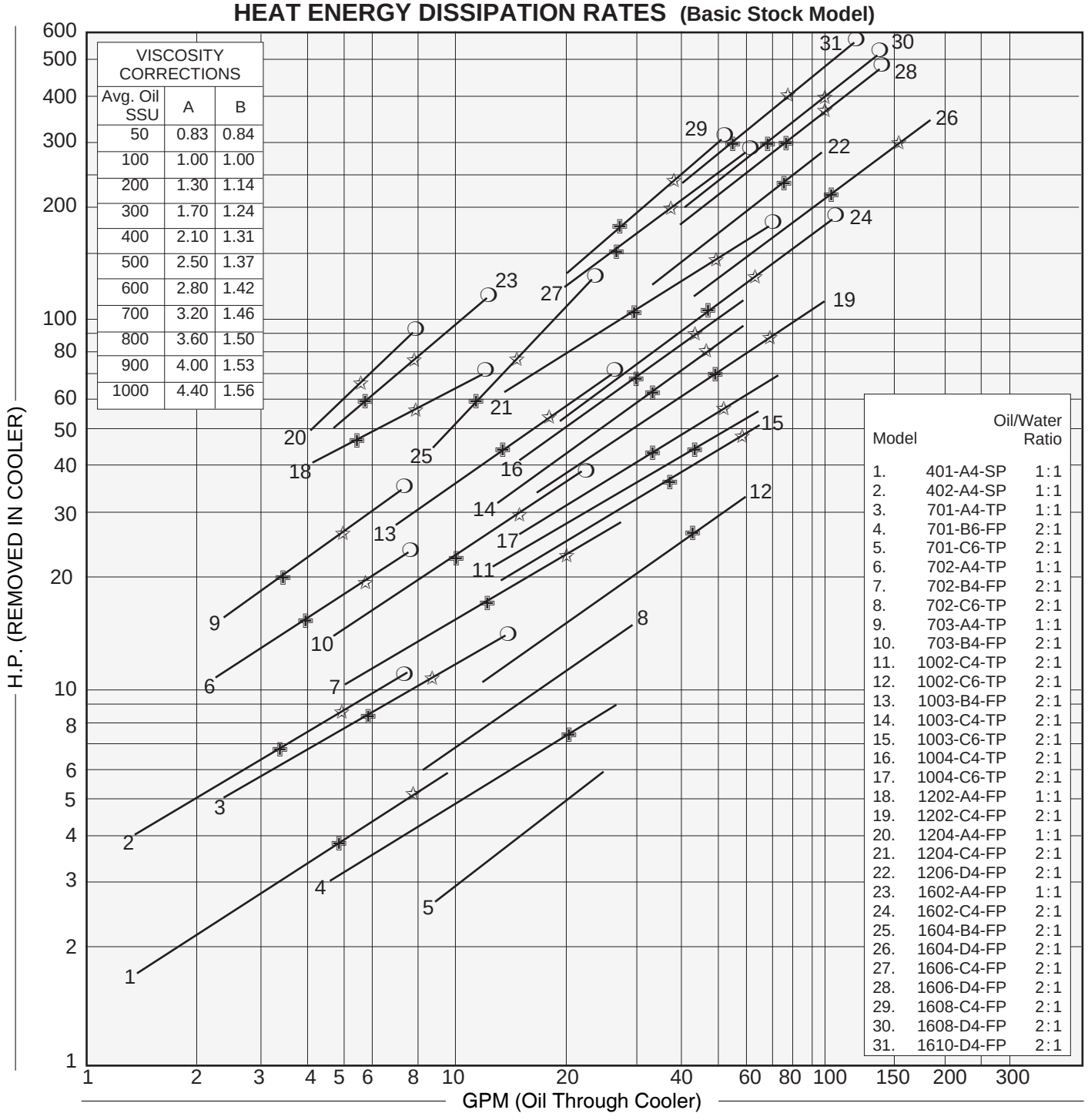
3) OIL PRESSURE DROP CODING: ✙ = 5 psi; ☆= 10 psi; ❍ = 20 psi; △ = 50psi. Curves that have no pressure drop code symbols indicate that the oil pressure drop is less than 5 psi for the flow rate shown.

4) Pressure Drop is based upon oil with an average viscosity of 100 SSU. If the average oil viscosity is other than 100 SSU, then multiply the indicated Pressure Drop by the corresponding value from corrections table A.

5) Corrections for approach temperature and oil viscosity are as follows:

$$H.P._{(\text{Removed In Cooler})} = H.P._{(\text{Actual Heat Load})} \times \left(\frac{40}{\text{Actual Approach}}\right) \times B.$$

HEAT ENERGY DISSIPATION RATES (Basic Stock Model)



VISCOSITY CORRECTIONS		
Avg. Oil SSU	A	B
50	0.83	0.84
100	1.00	1.00
200	1.30	1.14
300	1.70	1.24
400	2.10	1.31
500	2.50	1.37
600	2.80	1.42
700	3.20	1.46
800	3.60	1.50
900	4.00	1.53
1000	4.40	1.56

	Model	Oil/Water Ratio
1.	401-A4-SP	1:1
2.	402-A4-SP	1:1
3.	701-A4-TP	1:1
4.	701-B6-FP	2:1
5.	701-C6-TP	2:1
6.	702-A4-TP	1:1
7.	702-B4-FP	2:1
8.	702-C6-TP	2:1
9.	703-A4-TP	1:1
10.	703-B4-FP	2:1
11.	1002-C4-TP	2:1
12.	1002-C6-TP	2:1
13.	1003-B4-FP	2:1
14.	1003-C4-TP	2:1
15.	1003-C6-TP	2:1
16.	1004-C4-TP	2:1
17.	1004-C6-TP	2:1
18.	1202-A4-FP	1:1
19.	1202-C4-FP	2:1
20.	1204-A4-FP	1:1
21.	1204-C4-FP	2:1
22.	1206-D4-FP	2:1
23.	1602-A4-FP	1:1
24.	1602-C4-FP	2:1
25.	1604-B4-FP	2:1
26.	1604-D4-FP	2:1
27.	1606-C4-FP	2:1
28.	1606-D4-FP	2:1
29.	1608-C4-FP	2:1
30.	1608-D4-FP	2:1
31.	1610-D4-FP	2:1

note: AIHTI reserves the right to make reasonable design changes without notice.

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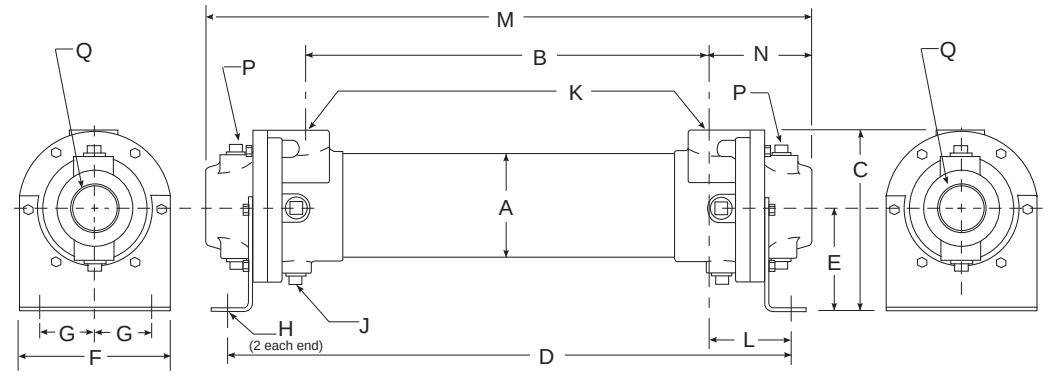
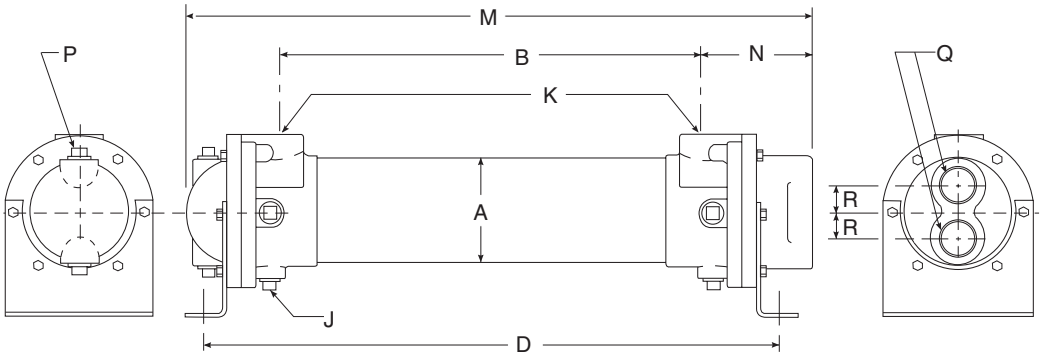
AB Series *dimensions*



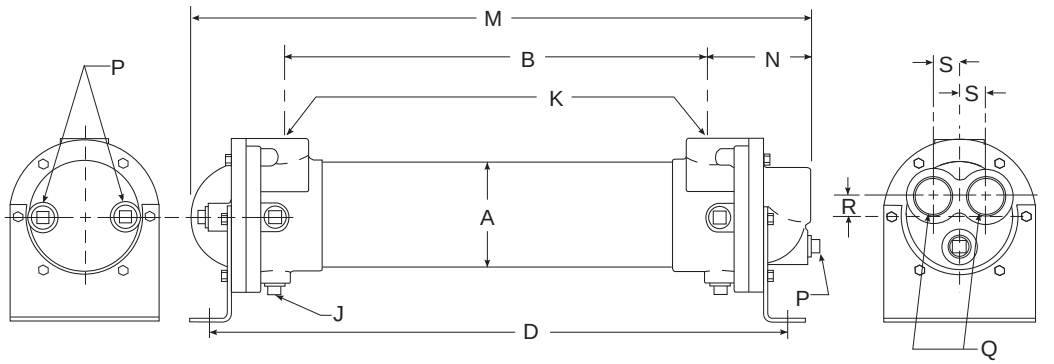
SINGLE PASS (SP)

Model	M	N	P NPT	Q NPT
AB-401	11.24	1.81	-	1.00
AB-402	20.24			
AB-701	13.47	3.24	(4) .38	1.50
AB-702	22.47			
AB-703	31.47			
AB-704	40.47			
AB-1002	23.60	4.05	(4) .38	2.00
AB-1003	32.60			
AB-1004	41.60			
AB-1202	24.38	4.88	(4) .50	3.00
AB-1203	33.25			
AB-1204	42.12			
AB-1205	51.12			
AB-1206	60.25			
AB-1207	69.25			
AB-1208	78.12			
AB-1209	87.12			
AB-1210	96.12			
AB-1602	26.62	6.52	(4) .50	4.00
AB-1603	35.62			
AB-1604	44.62			
AB-1605	53.62			
AB-1606	62.62			
AB-1607	71.62			
AB-1608	80.62			
AB-1609	89.62			
AB-1610	98.62			



TWO PASS (TP)

Model	M	N	P NPT	Q NPT	R
AB-701	13.28	3.30	(2) .38	1.00	.88
AB-702	22.28				
AB-703	31.28				
AB-704	40.28				
AB-1002	23.29	3.80	(2) .38	1.50	1.19
AB-1003	32.29				
AB-1004	41.29				
AB-1202	23.94	4.56	(2) .50	2.00	1.44
AB-1203	32.81				
AB-1204	41.69				
AB-1205	50.69				
AB-1206	59.81				
AB-1207	68.81				
AB-1208	77.69				
AB-1209	86.69				
AB-1210	95.69				
AB-1602	25.10	6.08	(2) .50	2.50	1.88
AB-1603	34.10				
AB-1604	43.10				
AB-1605	52.10				
AB-1606	61.10				
AB-1607	70.10				
AB-1608	79.10				
AB-1609	88.10				
AB-1610	97.10				



FOUR PASS (FP)

Model	M	N	P NPT	Q NPT	R	S
AB-701	13.42	3.24	(3) .38	.75	.62	.88
AB-702	22.42					
AB-703	31.42					
AB-704	40.42					
AB-1002	23.55	4.06	(3) .38	1.00	.75	1.19
AB-1003	32.55					
AB-1004	41.55					
AB-1202	24.44	4.90	(3) .50	1.50	1.06	1.44
AB-1203	33.31					
AB-1204	42.19					
AB-1205	51.19					
AB-1206	60.31					
AB-1207	69.31					
AB-1208	78.19					
AB-1209	87.19					
AB-1210	96.19					
AB-1602	26.72	6.48	(3) .50	2.00	1.38	1.88
AB-1603	35.72					
AB-1604	44.72					
AB-1605	53.72					
AB-1606	62.72					
AB-1607	71.72					
AB-1608	80.72					
AB-1609	89.72					
AB-1610	98.72					

COMMON DIMENSIONS & WEIGHTS

Model	A	B	C	D	E	F	G	H	J NPT	K NPT	L	Approx. Weight	Model
AB-401	2.13	7.62	3.50	10.91	1.94	2.62	.88	.41ϕ	-	.50	1.72	7	AB-401
AB-402		16.62		20.91								10	AB-402
AB-701	3.66	7.00	6.25	12.38	3.62	5.25	1.50	.44ϕ x 1.00	(2) .38	1.00	2.69	23	AB-701
AB-702		16.00		21.38								29	AB-702
AB-703		25.00		30.38								33	AB-703
AB-704		34.00		39.38								49	AB-704
AB-1002	5.13	15.50	7.38	21.62	4.00	6.75	2.00	.44ϕ x 1.00	(6) .38	1.50	3.06	54	AB-1002
AB-1003		24.50		30.62								76	AB-1003
AB-1004		33.50		39.62								82	AB-1004
AB-1202	6.13	14.62	8.81	21.50	4.75	7.50	2.50	.44ϕ x 1.00	(6) .38	2.00	3.44	79	AB-1202
AB-1203		23.50		30.38								98	AB-1203
AB-1204		32.38		39.25								115	AB-1204
AB-1205		41.38		48.25								130	AB-1205
AB-1206		50.50		57.38								150	AB-1206
AB-1207		59.50		66.38								170	AB-1207
AB-1208		68.38		75.25								190	AB-1208
AB-1209		77.38		84.25								210	AB-1209
AB-1210		86.38		93.25								230	AB-1210
AB-1602	8.00	13.60	12.13	22.38	6.50	10.00	3.50	.44ϕ x 1.00	(6) .38	3.00	4.39	145	AB-1602
AB-1603		22.60		31.38								170	AB-1603
AB-1604		31.60		40.38								200	AB-1604
AB-1605		40.60		49.38								225	AB-1605
AB-1606		49.60		58.38								250	AB-1606
AB-1607		58.60		67.38								275	AB-1607
AB-1608		67.60		76.38								315	AB-1608
AB-1609		76.60		85.38								350	AB-1609
AB-1610		85.60		94.38								390	AB-1610

note: AIHTI reserves the right to make reasonable design changes without notice.

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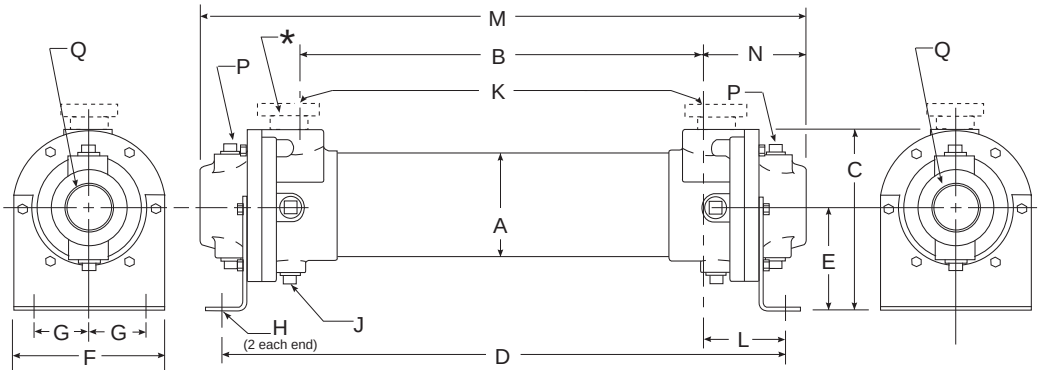
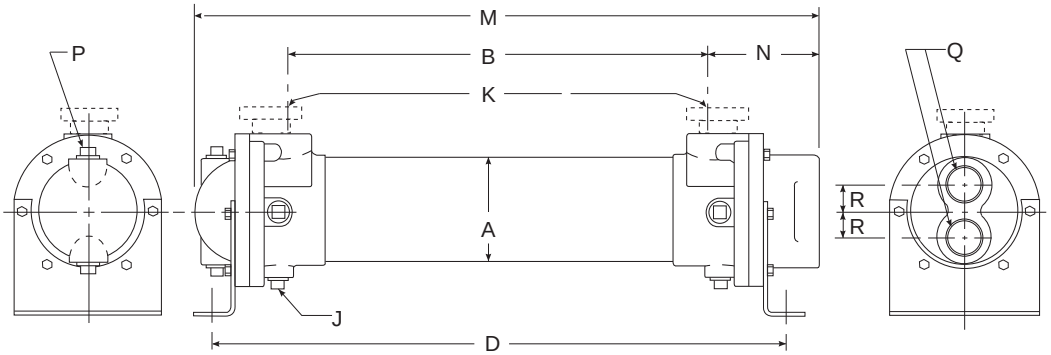
SAE Series *dimensions*



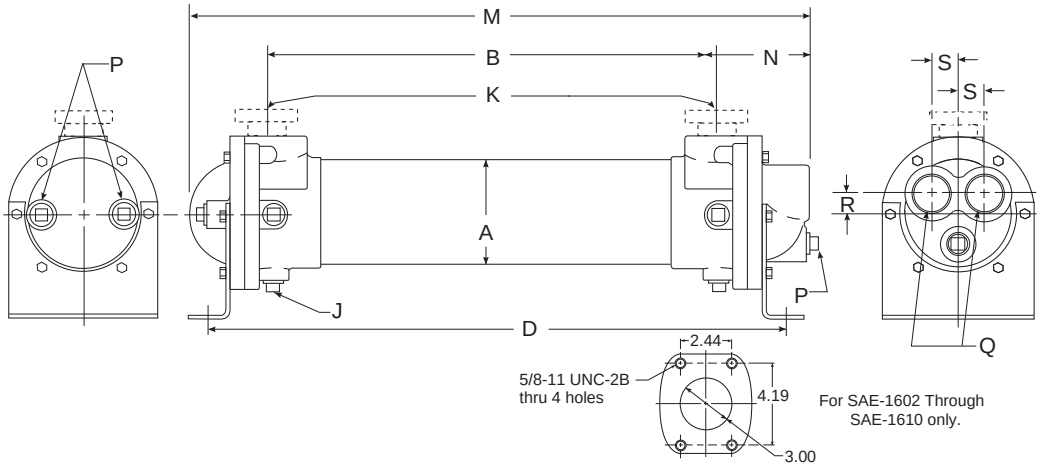
SINGLE PASS (SP)

Model	M	N	P NPT	Q NPT
SAE-401	11.24	1.81	-	1.00
SAE-402	20.24			
SAE-701	13.47	3.24	(4) .38	1.50
SAE-702	22.47			
SAE-703	31.47			
SAE-704	40.47			
SAE-1002	23.60	4.05	(4) .38	2.00
SAE-1003	32.60			
SAE-1004	41.60			
SAE-1202	24.38	4.88	(4) .50	3.00
SAE-1203	33.25			
SAE-1204	42.12			
SAE-1205	51.12			
SAE-1206	60.25			
SAE-1207	69.25			
SAE-1208	78.12			
SAE-1209	87.12			
SAE-1210	96.12			
SAE-1602	26.62	6.52	(4) .50	4.00
SAE-1603	35.62			
SAE-1604	44.62			
SAE-1605	53.62			
SAE-1606	62.62			
SAE-1607	71.62			
SAE-1608	80.62			
SAE-1609	89.62			
SAE-1610	98.62			



TWO PASS (TP)

Model	M	N	P NPT	Q NPT	R
SAE-701	13.28	3.30	(2) .38	1.00	.88
SAE-702	22.28				
SAE-703	31.28				
SAE-704	40.28				
SAE-1002	23.29	3.80	(2) .38	1.50	1.19
SAE-1003	32.29				
SAE-1004	41.29				
SAE-1202	23.94	4.56	(2) .50	2.00	1.44
SAE-1203	32.81				
SAE-1204	41.69				
SAE-1205	50.69				
SAE-1206	59.81				
SAE-1207	68.81				
SAE-1208	77.69				
SAE-1209	86.69				
SAE-1210	95.69				
SAE-1602	25.10	6.08	(2) .50	2.50	1.88
SAE-1603	34.10				
SAE-1604	43.10				
SAE-1605	52.10				
SAE-1606	61.10				
SAE-1607	70.10				
SAE-1608	79.10				
SAE-1609	88.10				
SAE-1610	97.10				



FOUR PASS (FP)

Model	M	N	P NPT	Q NPT	R	S
SAE-701	13.42	3.24	(3) .38	.75	.62	.88
SAE-702	22.42					
SAE-703	31.42					
SAE-704	40.42					
SAE-1002	23.55	4.06	(3) .38	1.00	.75	1.19
SAE-1003	32.55					
SAE-1004	41.55					
SAE-1202	24.44	4.90	(3) .50	1.50	1.06	1.44
SAE-1203	33.31					
SAE-1204	42.19					
SAE-1205	51.19					
SAE-1206	60.31					
SAE-1207	69.31					
SAE-1208	78.19					
SAE-1209	87.19					
SAE-1210	96.19					
SAE-1602	26.72	6.48	(3) .50	2.00	1.38	1.88
SAE-1603	35.72					
SAE-1604	44.72					
SAE-1605	53.72					
SAE-1606	62.72					
SAE-1607	71.72					
SAE-1608	80.72					
SAE-1609	89.72					
SAE-1610	98.72					

COMMON DIMENSIONS & WEIGHTS

Model	A	B	C	D	E	F	G	H	J NPT	K SAE	L	Approx. Weight	Model
SAE-401	2.13	7.62	3.50	10.91	1.94	2.62	.88	.41ϕ	-	#8	1.72	7	SAE-401
SAE-402		16.62		20.91						3/4-16		10	SAE-402
SAE-701	3.66	7.00	6.25	12.38	3.62	5.25	1.50	.44ϕ x 1.00	(2) .38	#16 1 5/16-12	2.69	23	SAE-701
SAE-702		16.00		21.38								29	SAE-702
SAE-703		25.00		30.38								33	SAE-703
SAE-704		34.00		39.38								49	SAE-704
SAE-1002	5.13	15.50	7.38	21.62	4.00	6.75	2.00	.44ϕ x 1.00	(6) .38	#24 1 7/8-12	3.06	54	SAE-1002
SAE-1003		24.50		30.62								76	SAE-1003
SAE-1004		33.50		39.62								82	SAE-1004
SAE-1202	6.13	14.62	8.81	21.50	4.75	7.50	2.50	.44ϕ x 1.00	(6) .38	#32 2 1/2-12	3.44	79	SAE-1202
SAE-1203		23.50		30.38								98	SAE-1203
SAE-1204		32.38		39.25								115	SAE-1204
SAE-1205		41.38		48.25								130	SAE-1205
SAE-1206		50.50		57.38								150	SAE-1206
SAE-1207		59.50		66.38								170	SAE-1207
SAE-1208		68.38		75.25								190	SAE-1208
SAE-1209		77.38		84.25								210	SAE-1209
SAE-1210		86.38		93.25								230	SAE-1210
SAE-1602	8.00	13.60	12.13	22.38	6.50	10.00	3.50	.44ϕ x 1.00	(6) .38	3.0" Four bolt Flange	4.39	145	SAE-1602
SAE-1603		22.60		31.38								170	SAE-1603
SAE-1604		31.60		40.38								200	SAE-1604
SAE-1605		40.60		49.38								225	SAE-1605
SAE-1606		49.60		58.38								250	SAE-1606
SAE-1607		58.60		67.38								275	SAE-1607
SAE-1608		67.60		76.38								315	SAE-1608
SAE-1609		76.60		85.38								350	SAE-1609
SAE-1610		85.60		94.38								390	SAE-1610

note: AIHTI reserves the right to make reasonable design changes without notice.

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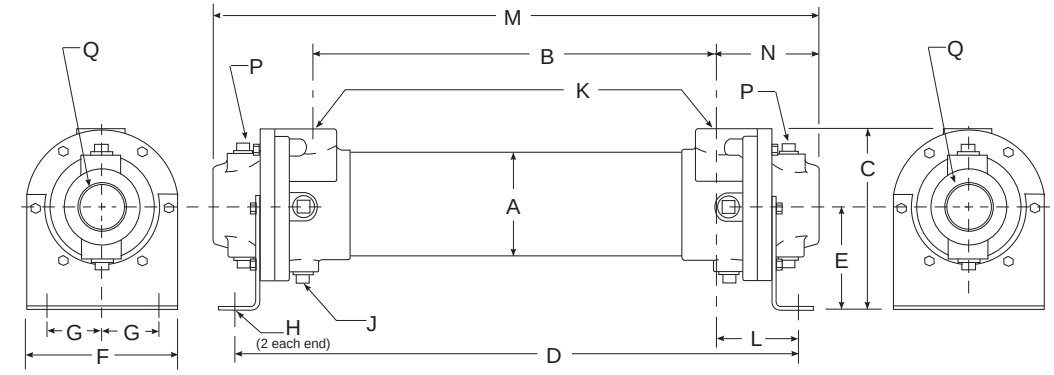
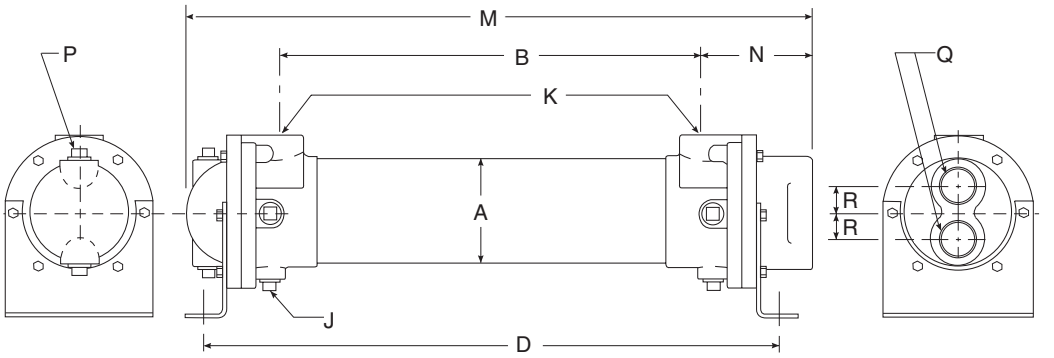


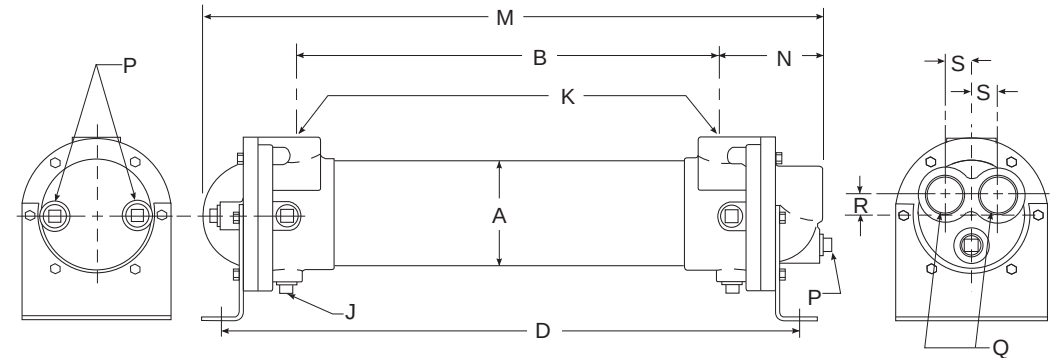
SINGLE PASS (SP)

Model	M	N	P NPT	Q NPT
STS-401	11.24	1.81	-	1.00
STS-402	20.24			
STS-701	13.47	3.24	(4) .38	1.50
STS-702	22.47			
STS-703	31.47			
STS-704	40.47			
STS-1002	23.60	4.05	(4) .38	2.00
STS-1003	32.60			
STS-1004	41.60			
STS-1202	24.38	4.88	(4) .50	3.00
STS-1203	33.25			
STS-1204	42.12			
STS-1205	51.12			
STS-1206	60.25			
STS-1207	69.25			
STS-1208	78.12			
STS-1209	87.12			
STS-1210	96.12			
STS-1602	26.62	6.52	(4) .50	4.00
STS-1603	35.62			
STS-1604	44.62			
STS-1605	53.62			
STS-1606	62.62			
STS-1607	71.62			
STS-1608	80.62			
STS-1609	89.62			
STS-1610	98.62			



TWO PASS (TP)

Model	M	N	P NPT	Q NPT	R
STS-701	13.28	3.30	(2) .38	1.00	.88
STS-702	22.28				
STS-703	31.28				
STS-704	40.28				
STS-1002	23.29	3.80	(2) .38	1.50	1.19
STS-1003	32.29				
STS-1004	41.29				
STS-1202	23.94	4.56	(2) .50	2.00	1.44
STS-1203	32.81				
STS-1204	41.69				
STS-1205	50.69				
STS-1206	59.81				
STS-1207	68.81				
STS-1208	77.69				
STS-1209	86.69				
STS-1210	95.69				
STS-1602	25.10	6.08	(2) .50	2.50	1.88
STS-1603	34.10				
STS-1604	43.10				
STS-1605	52.10				
STS-1606	61.10				
STS-1607	70.10				
STS-1608	79.10				
STS-1609	88.10				
STS-1610	97.10				



FOUR PASS (FP)

Model	M	N	P NPT	Q NPT	R	S
STS-701	13.42	3.24	(3) .38	.75	.62	.88
STS-702	22.42					
STS-703	31.42					
STS-704	40.42					
STS-1002	23.55	4.06	(3) .38	1.00	.75	1.19
STS-1003	32.55					
STS-1004	41.55					
STS-1202	24.44	4.90	(3) .50	1.50	1.06	1.44
STS-1203	33.31					
STS-1204	42.19					
STS-1205	51.19					
STS-1206	60.31					
STS-1207	69.31					
STS-1208	78.19					
STS-1209	87.19					
STS-1210	96.19					
STS-1602	26.72	6.48	(3) .50	2.00	1.38	1.88
STS-1603	35.72					
STS-1604	44.72					
STS-1605	53.72					
STS-1606	62.72					
STS-1607	71.72					
STS-1608	80.72					
STS-1609	89.72					
STS-1610	98.72					

COMMON DIMENSIONS & WEIGHTS

Model	A	B	C	D	E	F	G	H	J NPT	K NPT	L	Approx. Weight	Model
STS-401	2.13	7.62	3.50	10.91	1.94	2.62	.88	.41ϕ	-	.50	1.72	7	STS-401
STS-402		16.62		20.91								10	STS-402
STS-701	3.66	7.00	6.25	12.38	3.62	5.25	1.50	.44ϕ x 1.00	(2) .38	1.00	2.69	23	STS-701
STS-702		16.00		21.38								29	STS-702
STS-703		25.00		30.38								33	STS-703
STS-704		34.00		39.38								49	STS-704
STS-1002	5.13	15.50	7.38	21.62	4.00	6.75	2.00	.44ϕ x 1.00	(6) .38	1.50	3.06	54	STS-1002
STS-1003		24.50		30.62								76	STS-1003
STS-1004		33.50		39.62								82	STS-1004
STS-1202	6.13	14.62	8.81	21.50	4.75	7.50	2.50	.44ϕ x 1.00	(6) .38	2.00	3.44	79	STS-1202
STS-1203		23.50		30.38								98	STS-1203
STS-1204		32.38		39.25								115	STS-1204
STS-1205		41.38		48.25								130	STS-1205
STS-1206		50.50		57.38								150	STS-1206
STS-1207		59.50		66.38								170	STS-1207
STS-1208		68.38		75.25								190	STS-1208
STS-1209		77.38		84.25								210	STS-1209
STS-1210		86.38		93.25								230	STS-1210
STS-1602	8.00	13.60	12.13	22.38	6.50	10.00	3.50	.44ϕ x 1.00	(6) .38	3.00	4.39	145	STS-1602
STS-1603		22.60		31.38								170	STS-1603
STS-1604		31.60		40.38								200	STS-1604
STS-1605		40.60		49.38								225	STS-1605
STS-1606		49.60		58.38								250	STS-1606
STS-1607		58.60		67.38								275	STS-1607
STS-1608		67.60		76.38								315	STS-1608
STS-1609		76.60		85.38								350	STS-1609
STS-1610		85.60		94.38								390	STS-1610

note: AIHTI reserves the right to make reasonable design changes without notice.

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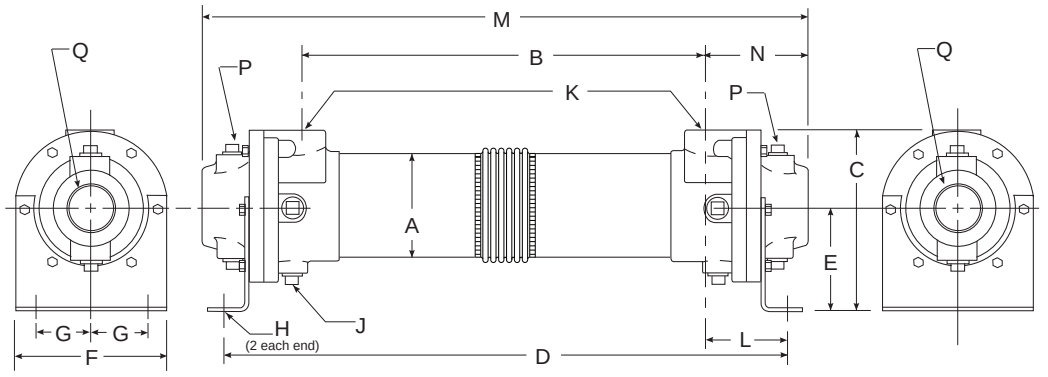
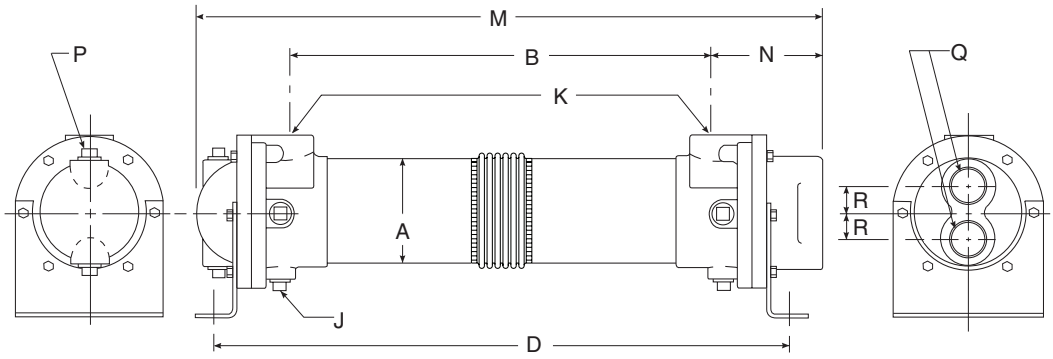
EAB Series *dimensions*



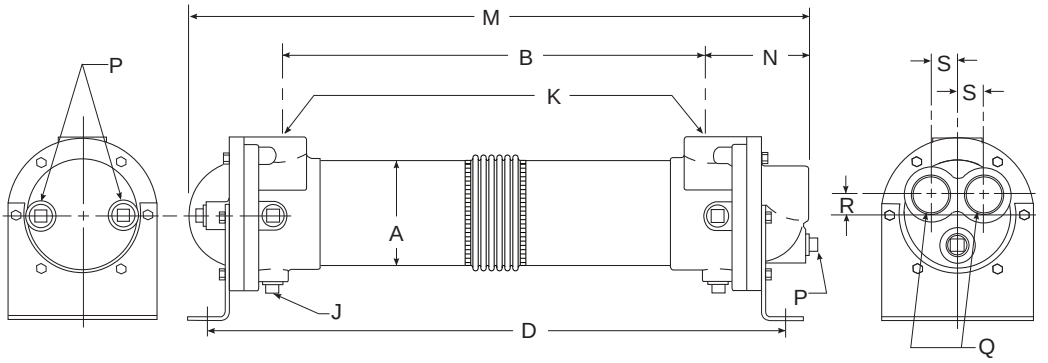
Single Pass (SP)

Model	M	N	P NPT	Q NPT
EAB-701	13.47	3.24	(4) .38	1.50
EAB-702	22.47			
EAB-703	31.47			
EAB-704	40.47			
EAB-1002	23.60	4.05	(4) .38	2.00
EAB-1003	32.60			
EAB-1004	41.60			
EAB-1202	24.38	4.88	(4) .50	3.00
EAB-1203	33.25			
EAB-1204	42.12			
EAB-1205	51.12			
EAB-1206	60.25			
EAB-1207	69.25			
EAB-1208	78.12			
EAB-1209	87.12			
EAB-1210	96.12			
EAB-1602	26.62	6.52	(4) .50	4.00
EAB-1603	35.62			
EAB-1604	44.62			
EAB-1605	53.62			
EAB-1606	62.62			
EAB-1607	71.62			
EAB-1608	80.62			
EAB-1609	89.62			
EAB-1610	98.62			



Two Pass (TP)

Model	M	N	P NPT	Q NPT	R
EAB-701	13.28	3.30	(2) .38	1.00	.88
EAB-702	22.28				
EAB-703	31.28				
EAB-704	40.28				
EAB-1002	23.29	3.80	(2) .38	1.50	1.19
EAB-1003	32.29				
EAB-1004	41.29				
EAB-1202	23.94	4.56	(2) .50	2.00	1.44
EAB-1203	32.81				
EAB-1204	41.69				
EAB-1205	50.69				
EAB-1206	59.81				
EAB-1207	68.81				
EAB-1208	77.69				
EAB-1209	86.69				
EAB-1210	95.69				
EAB-1602	25.10	6.08	(2) .50	2.50	1.88
EAB-1603	34.10				
EAB-1604	43.10				
EAB-1605	52.10				
EAB-1606	61.10				
EAB-1607	70.10				
EAB-1608	79.10				
EAB-1609	88.10				
EAB-1610	97.10				



Four Pass (FP)

Model	M	N	P NPT	Q NPT	R	S
EAB-701	13.42	3.24	(3) .38	.75	.62	.88
EAB-702	22.42					
EAB-703	31.42					
EAB-704	40.42					
EAB-1002	23.55	4.06	(3) .38	1.00	.75	1.19
EAB-1003	32.55					
EAB-1004	41.55					
EAB-1202	24.44	4.90	(3) .50	1.50	1.06	1.44
EAB-1203	33.31					
EAB-1204	42.19					
EAB-1205	51.19					
EAB-1206	60.31					
EAB-1207	69.31					
EAB-1208	78.19					
EAB-1209	87.19					
EAB-1210	96.19					
EAB-1602	26.72	6.48	(3) .50	2.00	1.38	1.88
EAB-1603	35.72					
EAB-1604	44.72					
EAB-1605	53.72					
EAB-1606	62.72					
EAB-1607	71.72					
EAB-1608	80.72					
EAB-1609	89.72					
EAB-1610	98.72					

COMMON DIMENSIONS & WEIGHTS

Model	A	B	C	D	E	F	G	H	J NPT	K NPT	L	Approx. Weight	Model
EAB-701	3.66	7.00	6.25	12.38	3.62	5.25	1.50	.44ϕ x 1.00	(2) .38	1.00	2.69	23	EAB-701
EAB-702		16.00		21.38								29	EAB-702
EAB-703		25.00		30.38								33	EAB-703
EAB-704		34.00		39.38								49	EAB-704
EAB-1002	5.13	15.50	7.38	21.62	4.00	6.75	2.00	.44ϕ x 1.00	(6) .38	1.50	3.06	54	EAB-1002
EAB-1003		24.50		30.62								76	EAB-1003
EAB-1004		33.50		39.62								82	EAB-1004
EAB-1202	6.13	14.62	8.81	21.50	4.75	7.50	2.50	.44ϕ x 1.00	(6) .38	2.00	3.44	79	EAB-1202
EAB-1203		23.50		30.38								98	EAB-1203
EAB-1204		32.38		39.25								115	EAB-1204
EAB-1205		41.38		48.25								130	EAB-1205
EAB-1206		50.50		57.38								150	EAB-1206
EAB-1207		59.50		66.38								170	EAB-1207
EAB-1208		68.38		75.25								190	EAB-1208
EAB-1209		77.38		84.25								210	EAB-1209
EAB-1210		86.38		93.25								230	EAB-1210
EAB-1602	8.00	13.60	12.13	22.38	6.50	10.00	3.50	.44ϕ x 1.00	(6) .38	3.00	4.39	145	EAB-1602
EAB-1603		22.60		31.38								170	EAB-1603
EAB-1604		31.60		40.38								200	EAB-1604
EAB-1605		40.60		49.38								225	EAB-1605
EAB-1606		49.60		58.38								250	EAB-1606
EAB-1607		58.60		67.38								275	EAB-1607
EAB-1608		67.60		76.38								315	EAB-1608
EAB-1609		76.60		85.38								350	EAB-1609
EAB-1610		85.60		94.38								390	EAB-1610

note: AIHTI reserves the right to make reasonable design changes without notice.

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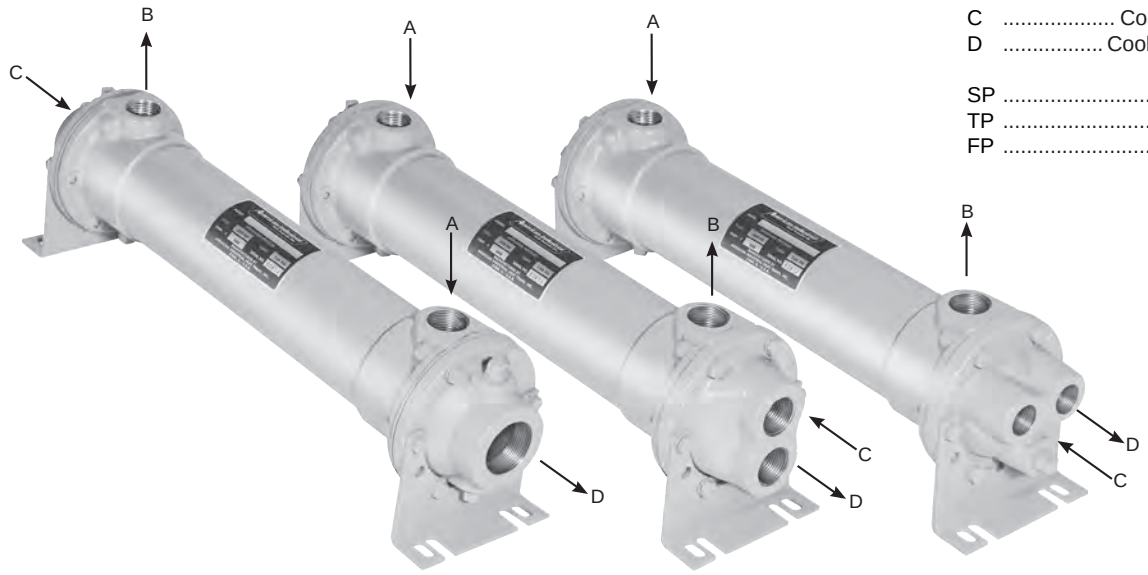
PIPING HOOK-UP

A ..... Hot fluid to be cooled
B ..... Cooled fluid
C ..... Cooling water in
D ..... Cooling water out

SP ..... Single Pass
TP ..... Two Pass
FP .....Four Pass



Single Pass **Two Pass** **Four Pass**

Receiving / Installation

a) Inspect unit for any shipping damage before uncrating. Indicate all damages to the trucking firms' delivery person, and mark it on the receiving bill before accepting the freight. Make sure that there is no visible damage to the outside surface of the heat exchanger. The published weight information located in this brochure is approximate. True shipment weights are determined at the time of shipping and may vary. Approximate weight information published herein is for engineering approximation purposes and should not be used for exact shipping weight. Since the warranty is based upon the unit date code located on the model identification tags, removal or manipulation of the identification tags will void the manufacturers warranty.

b) When handling the shell & tube heat exchanger, special care should be taken to avoid dropping the unit since mishandling could cause the heat exchanger to crack and leak externally. Mishandling of the unit is not covered under the manufacturers warranty. All units are shipped with partial wood/corrugated cardboard containers for safe handling.

c) Storage: American Industrial heat exchangers are protected against the elements during shipment. If the heat exchanger cannot be installed and put into operation immediately upon receipt, certain precautions are required to prevent deterioration during storage. The responsibility for integrity of the heat exchanger(s) is assumed by the user. American Industrial will not be responsible for damage, corrosion, or other deterioration of the heat exchanger during transit or storage.
Proper storage practices are important when considering the high costs of repair or replacement, and the possible delays for items which require long lead times for manufacture. The following listed practices are provided solely as a convenience to the user, who shall make their own decision on whether to use all or any of them.

1) Heat exchangers not to be placed in immediate service, require precautionary measures to prevent corrosion or contamination.
2) Heat exchangers made of ferrous materials, may be pressure-tested using compressed air at the factory. Residual oil coating on the inside surfaces of the heat exchanger(s) as a result of flushing does not discount the possibility of internal corrosion. Upon receipt, fill the heat exchanger(s) with the appropriate grade of oil or apply a corrosion preventing inhibitor for storage.
3) Corrosion protection compounds for interior surfaces for long term storage or other applications are applied solely at the request of customers. Upon request, American Industrial can provide a customer approved corrosion preventative if available when included in the original purchase order specifications.
4) Remove all dirt, water, ice, or snow and wipe dry before moving heat exchanger(s) into storage. Heat exchangers are generally shipped empty, open drain plugs to remove any accumulated condensation moisture, then reseal. Accumulation of moisture usually indicates corrosion has already started and remedial action should be taken.
5) Store in a covered, environmentally stable area. The ideal storage environment for heat exchangers is in a dry, low-humidity atmosphere which is sealed to prevent the entry of blowing dust, rain, or snow. Maintain in atmospheric temperatures between 70°F and 105°F (Large temperature swings may cause condensation and moisture to form on steel components, threads, shell, etc...) Use thermometers and humidity indicators and maintain the atmosphere at 40% relative humidity, or lower.

d) Standard Enamel Coating: American Industrial provides its standard products with a normal base coat of oil base air cure enamel paint. The enamel paint is applied as a temporary protective and esthetic coating prior to shipment. While the standard enamel coating is durable, American Industrial does not warranty it as a long-term finish coating. It is strongly suggested that a more durable final coating be applied after installation or prior to long-term storage in a corrosive environment to cover any accidental scratches, enhance esthetics, and further prevent corrosion. It is the responsibility of the customer to provide regular maintenance against chips, scratches, etc... and regular touch up maintenance must be provided for long-term benefits and corrosion prevention.

e) Special Coatings: American Industrial offers as customer options, Air-Dry Epoxy, and Heresite (Air-Dry Phenolic) coatings at additional cost. American Industrial offers special coatings upon request, however American Industrial does not warranty coatings to be a permanent solution for any equipment against corrosion. It is the responsibility of the customer to provide regular maintenance against chips, scratches, etc... and regular touch up maintenance must be provided for long-term benefits and corrosion prevention.

f) American Industrial recommends that the equipment supplied should be installed by qualified personnel who have solid understanding of system design, pressure and temperature ratings, and piping assembly. Verify the service conditions of the system prior to applying any shell & tube heat exchanger. If the system pressure or temperature does not fall within the parameters on model rating tag located on the heat exchanger, contact our factory prior to installation or operation.

g) Plan the installation to meet the requirements indicated on the piping installation diagram as illustrated above. It is recommended to put the hot fluid to be cooled through the shell side and the cold fluid through the tube side. The indicated port assembly sequence in the diagram maxi-

mizes the performance, and minimizes the possibility of thermal shock. In instances where the fluids are required to be reversed, *hot fluid in the tubes and cold fluid in the shell* the heat exchanger will work with reduced performance. Installation may be vertical or horizontal or a combination thereof. However, the installation must allow for complete draining of the heat exchanger regardless of Single Pass, Two Pass, or four pass construction. Complete drainage is important to prevent the heat exchanger from freezing, over-heating of a fluid, or mineral deposit buildup.
For fixed bundle heat exchangers, provide sufficient clearance at one end to allow for the removal or replacement of tubes. On the opposite end, provide enough space to allow removal of the complete bonnet to provide sufficient clearance to permit tube rolling and cleaning. Allow accessible room for scheduled cleaning as needed. Include thermometer wells and pressure gauge pipe ports in piping to and from the heat exchanger located as close to the heat exchanger as possible. For more information please contact American Industrial.

h) When installing a series EAB heat exchanger (expansion bellow), it is recommended to use a shoulder bolt to allow the heat exchanger to move freely while expanding and contracting due to high differential temperatures.

i) It is recommended to use flexible hose wherever possible to reduce vibration and allow slight movement. However, hoses are not required. Hydraulic carrying lines should be sized to handle the appropriate flow and to meet system pressure drop requirements based upon the systems parameters, and not based upon the units supply and return connection size. We recommend that a low cracking pressure direct acting relief valve be installed at the heat exchanger inlet to protect it from pressure spikes by bypassing oil in the event the system experiences a high flow surge. If preventative filtration is used it should be located ahead of the cooler on both shell and tube side to catch any scale or sludge from the system before it enters the cooler. Failure to install filters ahead of the heat exchanger could lead to possible heat exchanger failure due to high pressure if the system filters plug.

j) Standard shell & tube coolers are built with a rolled tube-sheet construction. However, the differential operating temperature between the entering shell side fluid and the entering tube side fluid should not exceed 150°F. If this condition exists, a severe thermal shock could occur leading to product failure and mixing of the fluids. For applications with a differential temperatures of 150°F or more, we recommend using a series with a floating tube-sheet, u-tube, or expansion joint to reduce the potential for the effects of thermal shock.

k) Water requirements vary from location to location. If the source of cooling water is from other than a municipal water supply, it is recommended that a water strainer be installed ahead of the heat exchanger to prevent dirt and debris from entering and clogging the flow passages. If a water modulating valve is used it is recommended to be installed at the inlet to the cooler to regulate the water flow.

l) For steam service, or other related applications, please consult our engineering department for additional information.

Maintenance
a) Inspect the heat exchanger for loosened bolts, connections, rust spots, corrosion, and for internal or external fluid leakage. Any corroded surfaces should be cleaned and recoated with paint.

b) Shell side: In many cases with clean hydraulic system oils it will not be necessary to flush the interior of the shell side of the cooler. In circumstances where the quality of hydraulic fluid is in question, the shell side should be disconnected and flushed on a yearly basis with a clean flushing oil/solvent to remove any sludge that has been deposited. For severe cases where the unit is plugged and cannot be flushed clean with solvent, the heat exchanger should be replaced to maintain the proper cooling performance.

c) Tube side: In many cases it will be necessary to clean the tube side of the heat exchanger due to poor fluid quality, debris, calcium deposits, corrosion, mud, sludge, seaweed, etc.... To clean the tube side, flush with clean water or any good quality commercial cleaner that does not attack the particular material of construction. With straight tube heat exchangers you can use a rod to carefully push any debris out of the tubes.

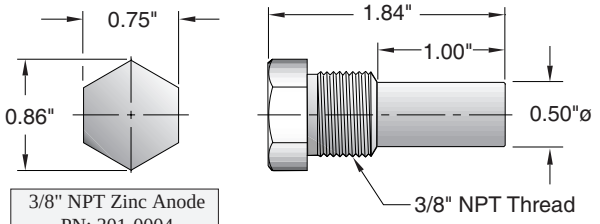
d) Zinc anodes are normally used to reduce the risk of failure due to electrolysis. Zinc anodes are a sacrificial component designed to wear and dissolve through normal use. Normally, zinc anodes are applied to the water supply side of the heat exchanger. Depending upon the amount of corrosive action, one, two, three, or more anodes can be applied to help further reduce the risk of failure. American Industrial Heat Transfer, Inc. offers zinc anodes as an option, to be specified and installed at the request our customers. It is the responsibility of the customer to periodically check and verify the condition of the zinc anode and replace it as needed.

Applications vary due to water chemical makeup and quality, material differences, temperature, flow rate, piping arrangements, and machine grounding. For those reasons, zinc anodes do not follow any scheduled factory predetermined maintenance plan moreover they must be checked routinely by the customer, and a maintenance plan developed based upon the actual wear rate.

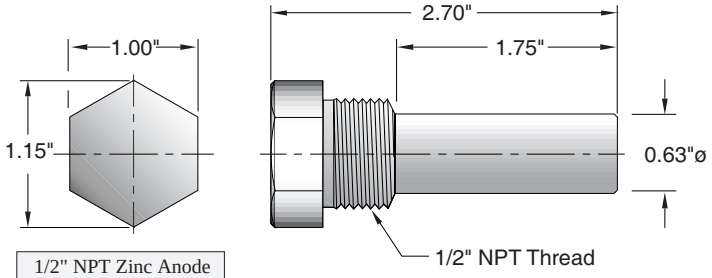
If substantial wear occurs or zinc dissolves without replacement, premature failure or permanent damage may occur to the heat exchanger. American Industrial does not warranty customer applications. It is the responsibility of the customer to verify and apply the proper system materials of construction and overall system requirements. Failures resulting from properly applied or misapplied use of zinc anode(s) into non-specified or specified applications will be the sole responsibility of the customer.

e) A routine maintenance schedule should be developed and adjusted to meet your systems requirements based upon water quality, etc…. Failure to regularly maintain and clean your heat exchanger can result in a reduction in operational performance and life expectancy.

Note: *Since applications can vary substantially, the installation and maintenance information contained in this catalog should be used as a basic guideline. The safe installation, maintenance, and use of any American Industrial Heat Transfer, Inc. heat exchanger are solely the responsibility of the user.*



3/8" NPT Zinc Anode PN: 301-0004
AB-400 thru AB-1000 AA-400 thru AA-1000 CS-600 thru CS-1000



1/2" NPT Zinc Anode PN: 301-0003
AB-1200 thru AB-2000 AA-1200 thru AA-1600 CS-1200 thru CS-1700

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website : www.aihti.com
general email : sales@aihti.com
technical email : engineering@aihti.com

Notes:

American Industrial Heat Transfer Inc.
Manufacturer of Quality Heat Exchangers

website : www.aihti.com
general email : sales@aihti.com
technical email : engineering@aihti.com

Shell & Tube Application Request: *(For liquid to liquid heat exchangers)*

For AB2000 Series

Email form to: sales@aihti.com or engineering@aihti.com or fax to 434-757-1810

Contact Name _____ Telephone _____ Date _____

Company Name _____ Email _____

Address: _____ Fax _____

_____

Hot Side

Fluid Type _____

If available:

Density _____ lb/ft3
Viscosity _____ cP
Conductivity _____ Btu/hr.ft.°F
Specific Heat _____ Btu/lb.°F

1. Flow Rate _____
2. Temperature In _____
3. Desired Temperature Out _____
4. Heat Load _____

Cold Side

Fluid Type _____

If available:

Density _____ lb/ft3
Viscosity _____ cP
Conductivity _____ Btu/hr.ft.°F
Specific Heat _____ Btu/lb.°F

1. Flow Rate _____
2. Temperature In _____

Maximum Allowable Pressure Drop:

Hot Side _____ Cold Side _____

To properly size the heat exchanger we need 3 of the 4 perameter on the Hot Side and 2 on the Cold Side.

Shell Material Construction:

Steel ☐ Stainless Steel ☐

Tube Material Construction:

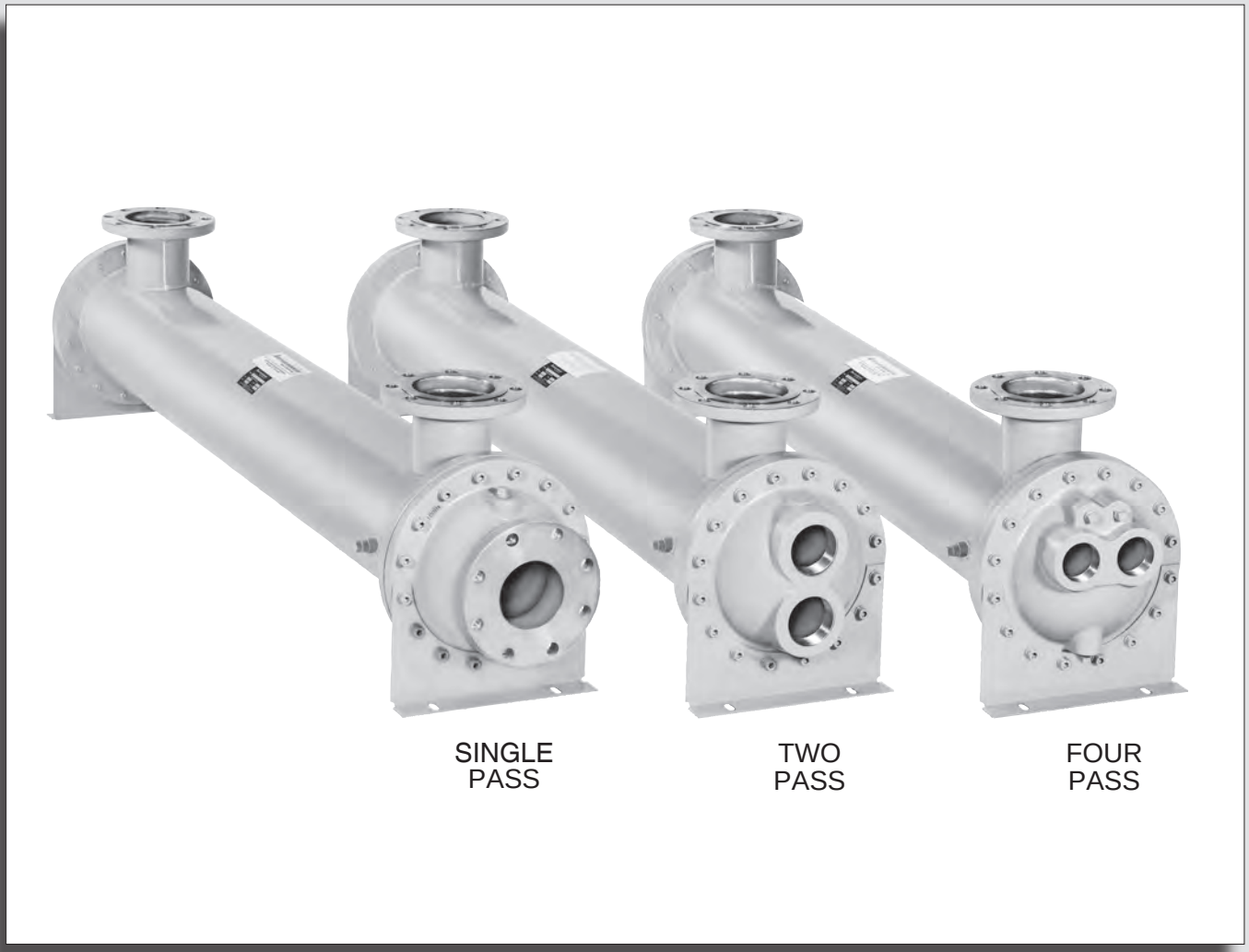
Copper ☐ 90/10 Copper Nickel ☐ Stainless Steel ☐

ASME Code and Certified Yes ☐ No ☐

Require All Stainless Steel Heat Exchanger Yes ☐ No ☐

Comment: _____

_____



Fixed Tube Bundle / Liquid Cooled

HEAT EXCHANGERS

- High thermal capacity.
- Large flow capacity.
- Operating pressure for tubes 150 PSI.
- Operating pressure for shell 300 PSI.
- Operating temperature 300 °F.
- Computer generated data sheet available for any application
- Can be customized to fit any applications.
- As an option, available in ASME code and certified

AB 2000 Series *selection*

STEP 1: Calculate the heat load

The heat load in BTU/HR or (Q) can be derived by using several methods. To simplify things, we will consider general specifications for hydraulic system oils and other fluids that are commonly used with shell & tube heat exchangers.

Terms

GPM = Gallons Per Minute
CN = Constant Number for a given fluid
△T = Temperature differential across the potential
PSI = Pounds per Square Inch (pressure) of the operating side of the system
MHP = Horsepower of the electric motor driving the hydraulic pump
Kw = Kilowatt (watts x 1000)
T_{in} = Hot fluid entering temperature in °F
T_{out} = Hot fluid exiting temperature in °F
t_{in} = Cold fluid temperature entering in °F
t_{out} = Cold fluid temperature exiting in °F
Q = BTU / HR

For example purposes, a hydraulic system has a 250 HP (186Kw) electric motor installed coupled to a pump that produces a flow of 200 GPM @ 2000 PSIG. The temperature differential of the oil entering the pump *vs* exiting the system is about 4.3°F. Even though our return line pressure operates below 100 psi, we must calculate the system heat load potential (Q) based upon the prime movers (pump) capability. We can use one of the following equations to accomplish this:

To derive the required heat load (Q) to be removed by the heat exchanger, apply ONE of the following. Note: The calculated heat loads may differ slightly from one formula to the next. This is due to assumptions made when estimating heat removal requirements. The factor *(v)* represents the percentage of the overall input energy to be rejected by the heat exchanger. The *(v)* factor is generally about 30% for most hydraulic systems, however it can range from 20%-70% depending upon the installed system components and heat being generated (ie. servo valves, proportional valves, etc…will increase the percentage required).

Formula	Example
A) Q = GPM x CN x actual △T	A) Q =200 x 210 x 4 .3°F = 180,600 BTU/HR
B) Q = [(PSI x GPM) / 1714] x (*v*) x 2545	B) Q =[(2000x200)/1714] x .30 x 2545 = 178,179 BTU/HR
C) Q = MHP x (*v*) x 2545	C) Q =250 x .30 x 2545 = 190,875 BTU/HR
D) Q = Kw to be removed x 3415	D) Q =186 x .30 x 3415 = 190,557 BTU/HR
E) Q = HP to be removed x 2545	E) Q =75 x 2545 = 190,875 BTU/HR

Constant for a given fluid (CN)

1) Oil ..... CN = 210
2) Water..... CN = 500
3) 50% E. Glycol..... CN = 450

STEP 2: Calculate the Mean Temperature Difference

When calculating the MTD you will be required to choose a liquid flow rate to derive the Cold Side △T. If your water flow is unknown you may need to assume a number based on what is available. As a normal rule of thumb, for oil to water cooling a 2:1 oil to water ratio is used. For applications of water to water or 50 % Ethylene Glycol to water, a 1:1 ratio is common.

Formula

HOT FLUID △T Oil $= \dfrac{Q}{CN \times GPM}$

COLD FLUID △ t Water $= \dfrac{BTU / hr}{CN \times GPM}$

Example

$\triangle T = \dfrac{190{,}875\ BTU/hr}{210\ CN \times 200GPM}$ (from step 1,item C) $= 4.54°F$ = △T Rejected

$\triangle t = \dfrac{190{,}875\ BTU/hr}{500\ CN \times 100GPM}$ (for a 2:1 ratio) $= 3.81°F$ = △t Absorbed

T_{in} = Hot Fluid entering temperature in degrees F
T_{out} = Hot Fluid exiting temperature in degrees F
t_{in} = Cold Fluid entering temperature in degrees F
t_{out} = Cold Fluid exiting temperature in degrees F

T_{in} = 104.54 °F
T_{out} = 100.0 °F
t_{in} = 90.0 °F
t_{out} = 93.81 °F

$\dfrac{T_{out} - t_{in}}{T_{in} - t_{out}} = \dfrac{S[\text{smaller temperature difference}]}{L\ [\text{larger temperature difference}]} = \left(\dfrac{S}{L}\right)$

$\dfrac{100.0°F - 90.0°F = 10.0°F}{104.54°F - 93.81°F = 10.73°F} = \dfrac{10.0°F}{10.73°F} = .931$

STEP 3: Calculate Log Mean Temperature Difference (LMTD)

To calculate the LMTD please use the following method;

$LMTD_i$ = L x M (L = Larger temperature difference from step 2.) x (M = S/L number (LOCATED IN TABLE A))

$LMTD_i$ = 10.73 x .964 (FROM TABLE A) = 10.34

To correct the $LMTD_i$ for a multipass heat exchangers calculate **R** & **K** as follows:

Formula

$\mathbf{R} = \dfrac{T_{in} - T_{out}}{t_{out} - t_{in}}$

$\mathbf{K} = \dfrac{t_{out} - t_{in}}{T_{in} - t_{in}}$

Example

$\mathbf{R} = \dfrac{104.54°F - 100°F}{93.81°F - 90°F} = \dfrac{4.54°F}{3.81°F} =$ **{1.191=R}**

$\mathbf{K} = \dfrac{93.81°F - 90°F}{104.54°F - 90°F} = \dfrac{3.81°F}{14.54°F} =$ **{0.262=K}**

Locate the correction factor CF_B (FROM TABLE B)
$LMTD_c = LMTD_i \times CF_B$
$LMTD_c$ = 10.34 x .98 = **10.13**

TABLE E- Flow Rate for Shell & Tube

Shell dia .	Max. Liquid Flow - Shell Side					Liquid Flow - Tube Side					
	Baffle Spacing					SP		TP		FP	
Code	A	B	C	D	E	Min.	Max.	Min.	Max.	Min.	Max.
2000	–	–	190	370	550	90	650	45	320	25	160

TABLE C

U	TUBE FLUID	SHELL FLUID
400	Water	Water
350	Water	50% E. Glycol
100	Water	Oil
300	50% E. Glycol	50% E. Glycol
90	50% E. Glycol	Oil

note: AIHTI reserves the right to make reasonable design changes without notice.

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STEP 4: Calculate the area required

Required Area sq.ft. = $\frac{\text{Q (BTU / HR)}}{\text{LMTD}_c \text{ x U (FROM TABLE C)}}$ $\frac{190{,}875}{10.13 \text{ x } 100}$ = **188.4 sq.ft.**

STEP 5: Selection

a) From TABLE E choose the correct series size, baffle spacing, and number of passes that best fits your flow rates for both shell and tube side. Note that the tables suggest minimum and maximum information. Try to stay within the 20-80 percent range of the indicated numbers.

Example

Oil Flow Rate = 200 GPM = Series Required from Table E = **2000 Series**
Baffle Spacing from Table E = **D baffle**
Water Flow Rate = 100 GPM = Passes required in 2000 series = **4 (FP)**

b) From TABLE D choose the heat exchanger model size based upon the sq.ft. or surface area in the series size that will accommodate your flow rate.

Example

Required Area = 188.4 sq.ft Closest model required based upon sq.ft. & series = **AB-2007-D6-FP**

If you require a computer generated data sheet for the application, or if the information that you are trying to apply does not match the corresponding information, please contact our engineering services department for further assistance.

TABLE A- FACTOR M/LMTD = L x M

S/L	M	S/L	M	S/L	M	S/L	M
		.25	.541	.50	.721	.75	.870
.01	.215	.26	.549	.51	.728	.76	.874
.02	.251	.27	.558	.52	.734	.77	.879
.03	.277	.28	.566	.53	.740	.78	.886
.04	.298	.29	.574	.54	.746	.79	.890
.05	.317	.30	.582	.55	.753	.80	.896
.06	.334	.31	.589	.56	.759	.81	.902
.07	.350	.32	.597	.57	.765	.82	.907
.08	.364	.33	.604	.58	.771	.83	.913
.09	.378	.34	.612	.59	.777	.84	.918
.10	.391	.35	.619	.60	.783	.85	.923
.11	.403	.36	.626	.61	.789	.86	.928
.12	.415	.37	.634	.62	.795	.87	.934
.13	.427	.38	.641	.63	.801	.88	.939
.14	.438	.39	.648	.64	.806	.89	.944
.15	.448	.40	.655	.65	.813	.90	.949
.16	.458	.41	.662	.66	.818	.91	.955
.17	.469	.42	.669	.67	.823	.92	.959
.18	.478	.43	.675	.68	.829	.93	.964
.19	.488	.44	.682	.69	.836	.94	.970
.20	.497	.45	.689	.70	.840	.95	.975
.21	.506	.46	.695	.71	.848	.96	.979
.22	.515	.47	.702	.72	.852	.97	.986
.23	.524	.48	.709	.73	.858	.98	.991
.24	.533	.49	.715	.74	.864	.99	.995

R

TABLE B- LMTD correction factor for Multipass Exchangers

	.05	.1	.15	.2	.25	.3	.35	.4	.45	.5	.6	.7	.8	.9	1.0
.2	1	1	1	1	1	1	1	.999	.993	.984	.972	.942	.908	.845	.71
.4	1	1	1	1	1	1	.994	.983	.971	.959	.922	.855	.70		
.6	1	1	1	1	1	.992	.980	.965	.948	.923	.840				
.8	1	1	1	1	.995	.981	.965	.945	.916	.872					
1.0	1	1	1	1	.988	.970	.949	.918	.867	.770					
2.0	1	1	.977	.973	.940	.845	.740								
3.0	1	1	.997	.933	.835										
4.0	1	.993	.950	.850											
5.0	1	.982	.917												
6.0	1	.968	.885												
8.0	1	.930													
10.0	.996	.880													
12.0	.985	.720													
14.0	.972														
16.0	.958														
18.0	.940														
20.0	.915														

K

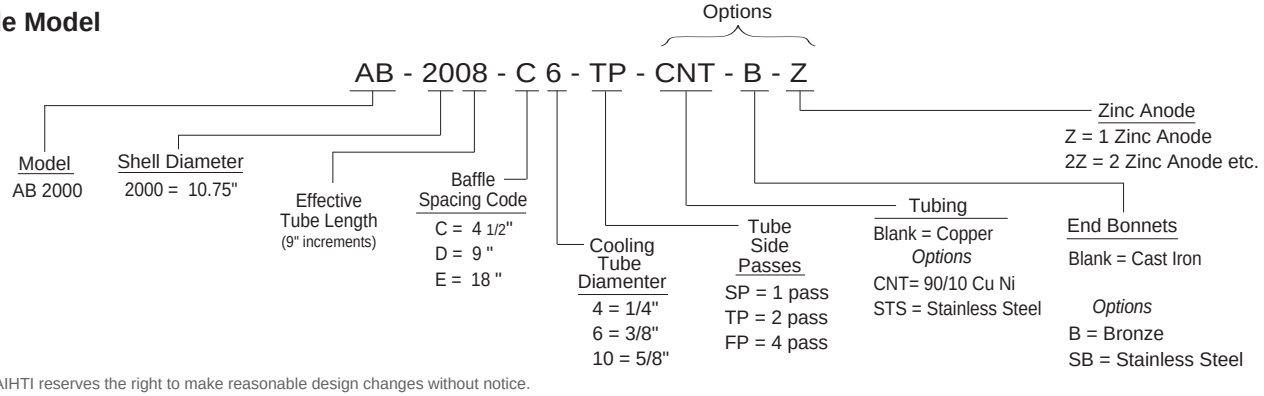
STANDARD CONSTRUCTION MATERIALS & RATINGS

Standard Model	AB-2000 Series	Standard Unit Ratings
Shell	Steel	Operating Pressure Tubes 150 psig Operating Pressure Shell 300 psig Operating Temperature 300 °F
Tubes	Copper	
Baffle	Steel	
Tube Sheet	Steel	
End Bonnets	Cast Iron	
Mounting Brackets	Steel	
Gasket	Hypalon Composite	

TABLE D- Surface Area

Model Number	Surface Area in Sq.ft.		
	1/4" O.D Tubing	3/8" O.D Tubing	5/8 O.D Tubing
AB-2004	155.43	110.69	60.84
AB-2005	194.29	138.36	76.05
AB-2006	233.15	166.03	91.26
AB-2007	272.00	193.70	106.47
AB-2008	310.86	221.37	121.68
AB-2009	349.72	249.04	136.88
AB-2010	388.58	276.71	152.09
AB-2011	427.43	304.38	167.30
AB-2012	466.29	332.06	182.51
AB-2013	505.15	359.73	197.72
AB-2014	544.01	387.40	212.93
AB-2015	582.86	415.07	228.14

Example Model



note: AIHTI reserves the right to make reasonable design changes without notice.

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AB 2000 Series *performance*

Instructions

The selection chart provided contains an array of popular sizes for quick sizing. It does not provide curves for all models available. Refer to page 14 & 15 for detailed calculation information.

Computer selection data sheets for standard or special models are available through the engineering department of American Industrial. To use the followings graphs correctly, refer to the instruction notes "1-5".

1) HP Curves are based upon a 40°F approach temperature; for example: oil leaving a cooler at 125°F, using 85°F cooling water (125°F – 85°F = 40°F).

2) The oil to water ratio of 1:1 or 2:1 means that for every 1 gallon of oil circulated, a minimum of 1 or 1/2 gallon (respectively) of 85°F water must be circulated to match the curve results.

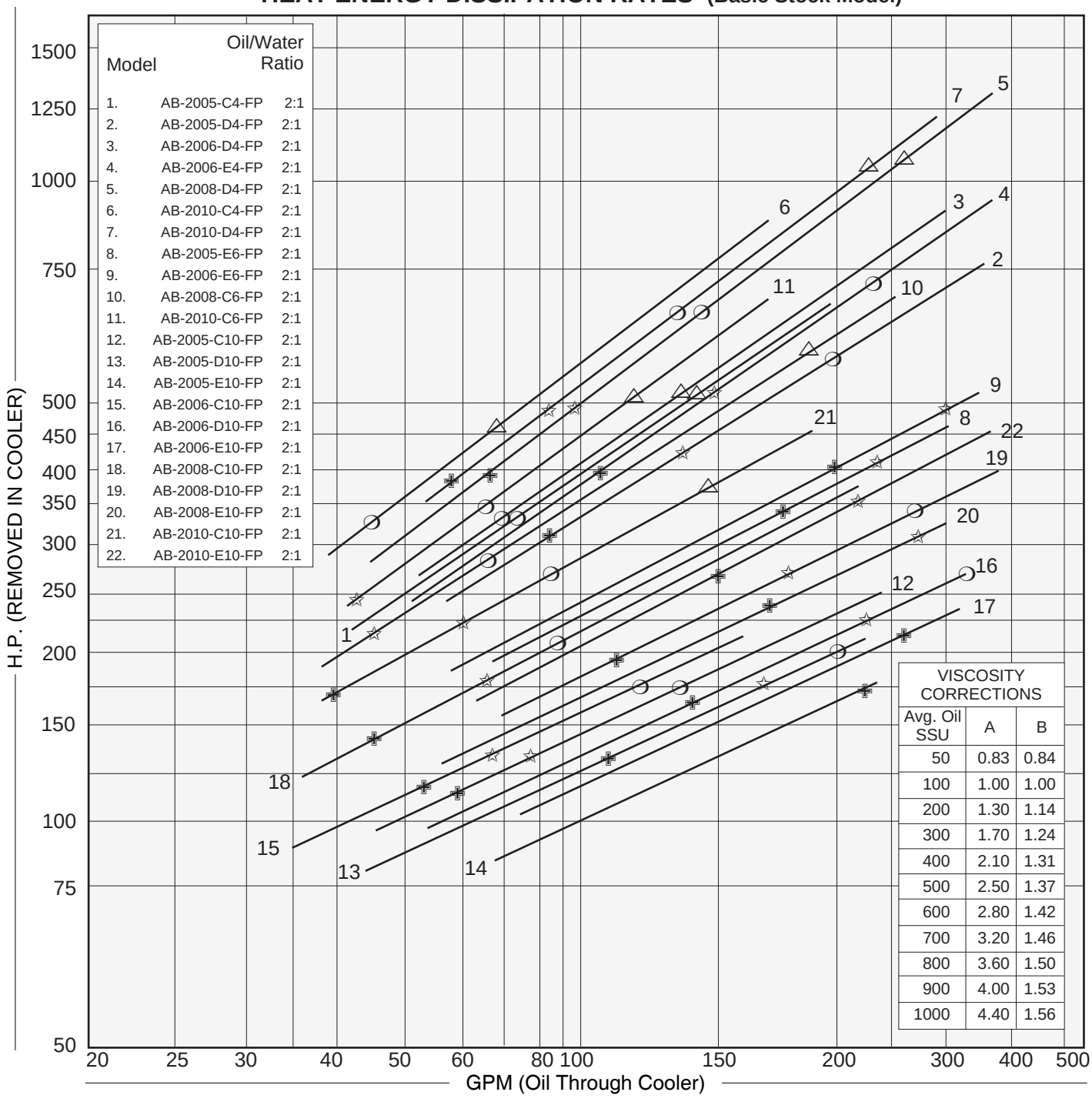
3) OIL PRESSURE DROP CODING: ✙ = 5 psi; ☆= 10 psi; ❍ = 20 psi; △ = 50psi. Curves that have no pressure drop code symbols indicate that the oil pressure drop is less than 5 psi for the flow rate shown.

4) Pressure Drop is based upon oil with an average viscosity of 100 SSU. If the average oil viscosity is other than 100 SSU, then multiply the indicated Pressure Drop by the corresponding value from corrections table A.

5) Corrections for approach temperature and oil viscosity are as follows:

$$H.P.\left(\begin{smallmatrix}\text{Removed}\\ \text{In Cooler}\end{smallmatrix}\right) = H.P.\left(\begin{smallmatrix}\text{Actual}\\ \text{Heat Load}\end{smallmatrix}\right) \times \left(\frac{40}{\text{Actual Approach}}\right) \times B.$$

HEAT ENERGY DISSIPATION RATES (Basic Stock Model)



Model		Oil/Water Ratio
1.	AB-2005-C4-FP	2:1
2.	AB-2005-D4-FP	2:1
3.	AB-2006-D4-FP	2:1
4.	AB-2006-E4-FP	2:1
5.	AB-2008-D4-FP	2:1
6.	AB-2010-C4-FP	2:1
7.	AB-2010-D4-FP	2:1
8.	AB-2005-E6-FP	2:1
9.	AB-2006-E6-FP	2:1
10.	AB-2008-C6-FP	2:1
11.	AB-2010-C6-FP	2:1
12.	AB-2005-C10-FP	2:1
13.	AB-2005-D10-FP	2:1
14.	AB-2005-E10-FP	2:1
15.	AB-2006-C10-FP	2:1
16.	AB-2006-D10-FP	2:1
17.	AB-2006-E10-FP	2:1
18.	AB-2008-C10-FP	2:1
19.	AB-2008-D10-FP	2:1
20.	AB-2008-E10-FP	2:1
21.	AB-2010-C10-FP	2:1
22.	AB-2010-E10-FP	2:1

VISCOSITY CORRECTIONS		
Avg. Oil SSU	A	B
50	0.83	0.84
100	1.00	1.00
200	1.30	1.14
300	1.70	1.24
400	2.10	1.31
500	2.50	1.37
600	2.80	1.42
700	3.20	1.46
800	3.60	1.50
900	4.00	1.53
1000	4.40	1.56

note: AIHTI reserves the right to make reasonable design changes without notice.

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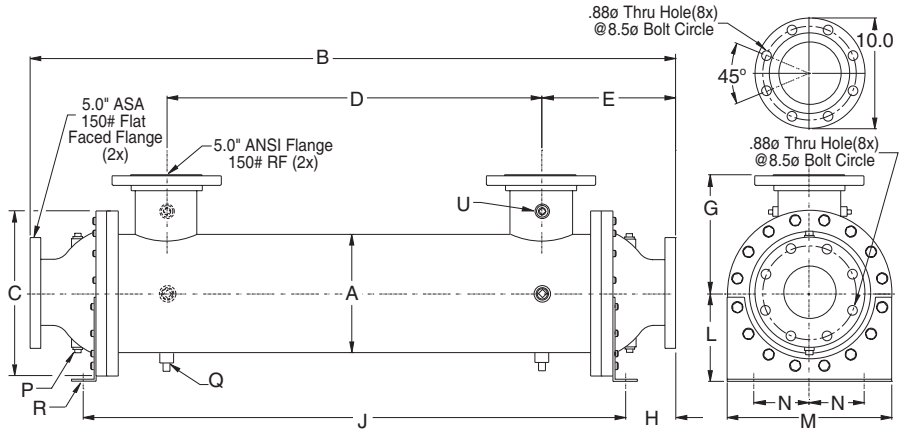
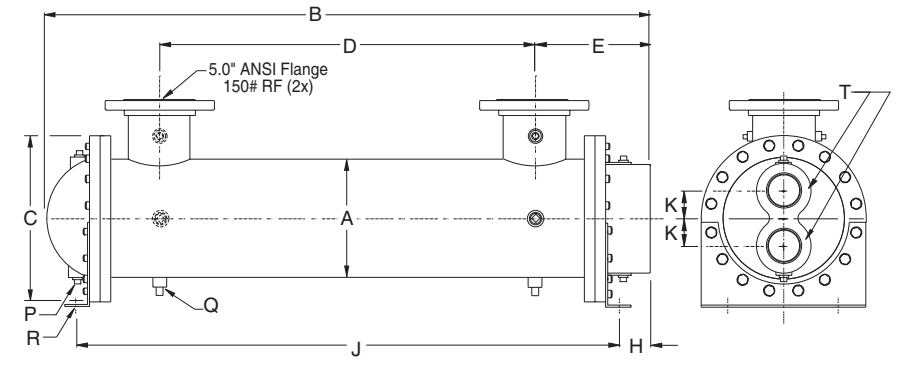


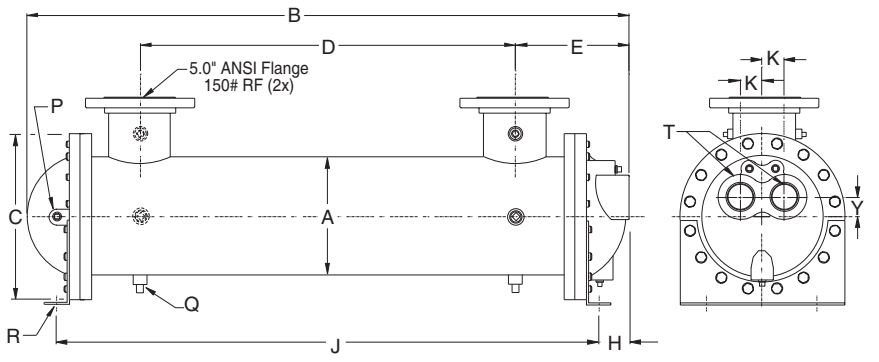
Single Pass (SP)

Model	B	E	H	P NPT
AB-2005	59.88	12.88	4.63	(4) .50
AB-2006	68.88			
AB-2007	77.88			
AB-2008	86.88			
AB-2009	95.88			
AB-2010	104.88			
AB-2011	113.88			
AB-2012	122.88			
AB-2013	131.88			
AB-2014	140.88			



Two Pass (TP)

Model	B	E	H	K	P NPT	T NPT
AB-2005	55.63	10.88	2.43	2.50	(4) .50	3.00
AB-2006	64.63					
AB-2007	73.63					
AB-2008	82.63					
AB-2009	91.63					
AB-2010	100.63					
AB-2011	109.63					
AB-2012	118.63					
AB-2013	127.63					
AB-2014	136.63					



FOUR PASS (FP)

Model	B	E	H	K	P NPT	Y	T NPT
AB-2005	55.63	10.88	2.50	2.00	(5) .50	1.75	2.50
AB-2006	64.63						
AB-2007	73.63						
AB-2008	82.63						
AB-2009	91.63						
AB-2010	100.63						
AB-2011	109.63						
AB-2012	118.63						
AB-2013	127.63						
AB-2014	136.63						

COMMON DIMENSIONS & WEIGHTS

Model	A	C	D	G	J	L	M	N	Q NPT	R	U NPT	Weight	Model
AB-2005	10.75	15.00	34.12	10.75	51.00	8.00	15.00	5.00	.50 (4x)	.75"ø x 1.25" Thru Slot	.38 (2x)	670	AB-2005
AB-2006			43.12		60.00							720	AB-2006
AB-2007			52.12		69.00							770	AB-2007
AB-2008			61.12		78.00							820	AB-2008
AB-2009			70.12		87.00							870	AB-2009
AB-2010			79.12		96.00							820	AB-2010
AB-2011			88.12		105.00							970	AB-2011
AB-2012			97.12		114.00							1020	AB-2012
AB-2013			106.12		123.00							1070	AB-2013
AB-2014			115.12		132.00							1120	AB-2014

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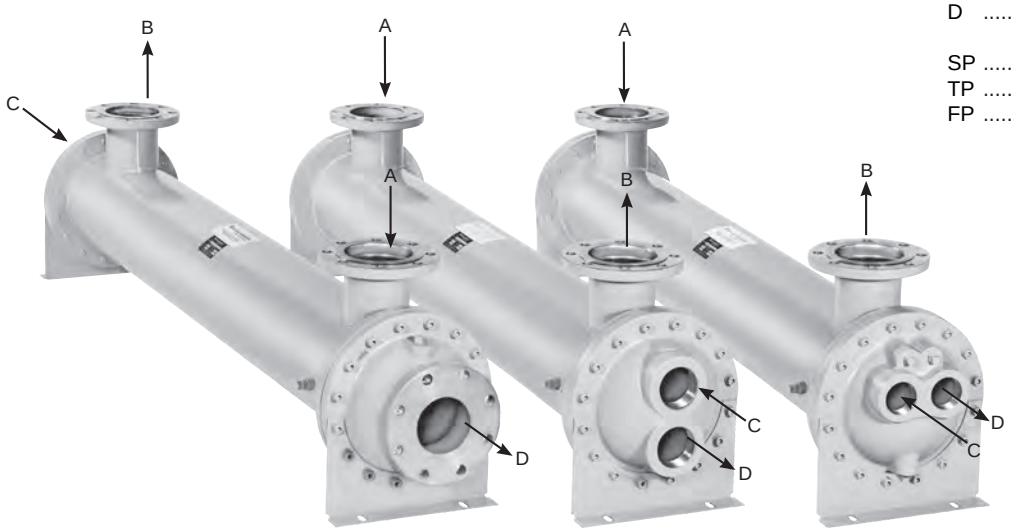
PIPING HOOK-UP

A ..... Hot fluid to be cooled
B ..... Cooled fluid
C ..... Cooling water in
D ..... Cooling water out

SP ..... Single Pass
TP ..... Two Pass
FP .....Four Pass



ONE PASS **TWO PASS** **FOUR PASS**

Receiving / Installation

a) Inspect unit for any shipping damage before uncrating. Indicate all damages to the trucking firms' delivery person, and mark it on the receiving bill before accepting the freight. Make sure that there is no visible damage to the outside surface of the heat exchanger. The published weight information located in this brochure is approximate. True shipment weights are determined at the time of shipping and may vary. Approximate weight information published herein is for engineering approximation purposes and should not be used for exact shipping weight. Since the warranty is based upon the unit date code located on the model identification tags, removal or manipulation of the identification tags will void the manufacturers warranty.

b) When handling the shell & tube heat exchanger, special care should be taken to avoid dropping the unit since mishandling could cause the heat exchanger to crack and leak externally. Mishandling of the unit is not covered under the manufacturers warranty. All units are shipped with partial wood/corrugated cardboard containers for safe handling.

c) Storage: American Industrial heat exchangers are protected against the elements during shipment. If the heat exchanger cannot be installed and put into operation immediately upon receipt, certain precautions are required to prevent deterioration during storage. The responsibility for integrity of the heat exchanger(s) is assumed by the user. American Industrial will not be responsible for damage, corrosion, or other deterioration of the heat exchanger during transit or storage.

Proper storage practices are important when considering the high costs of repair or replacement, and the possible delays for items which require long lead times for manufacture. The following listed practices are provided solely as a convenience to the user, who shall make their own decision on whether to use all or any of them.

1) Heat exchangers not to be placed in immediate service, require precautionary measures to prevent corrosion or contamination.
2) Heat exchangers made of ferrous materials, may be pressure-tested using compressed air at the factory. Residual oil coating on the inside surfaces of the heat exchanger(s) as a result of flushing does not discount the possibility of internal corrosion. Upon receipt, fill the heat exchanger(s) with the appropriate grade of oil or apply a corrosion preventing inhibitor for storage.
3) Corrosion protection compounds for interior surfaces for long term storage or other applications are applied solely at the request of customers. Upon request, American Industrial can provide a customer approved corrosion preventative if available when included in the original purchase order specifications.
4) Remove all dirt, water, ice, or snow and wipe dry before moving heat exchanger(s) into storage. Heat exchangers are generally shipped empty, open drain plugs to remove any accumulated condensation moisture, then reseal. Accumulation of moisture usually indicates corrosion has already started and remedial action should be taken.
5) Store in a covered, environmentally stable area. The ideal storage environment for heat exchangers is in a dry, low-humidity atmosphere which is sealed to prevent the entry of blowing dust, rain, or snow. Maintain in atmospheric temperatures between 70ºF and 105ºF (Large temperature swings may cause condensation and moisture to form on steel components, threads, shell, etc...) Use thermometers and humidity indicators and maintain the atmosphere at 40% relative humidity, or lower.

d) Standard Enamel Coating: American Industrial provides its standard products with a normal base coat of oil base air cure enamel paint. The enamel paint is applied as a temporary protective and esthetic coating prior to shipment. While the standard enamel coating is durable, American Industrial does not warranty it as a long-term finish coating. It is strongly suggested that a more durable final coating be applied after installation or prior to long-term storage in a corrosive environment to cover any accidental scratches, enhance esthetics, and further prevent corrosion. It is the responsibility of the customer to provide regular maintenance against chips, scratches, etc... and regular touch up maintenance must be provided for long-term benefits and corrosion prevention.

e) Special Coatings: American Industrial offers as customer options, Air-Dry Epoxy, and Heresite (Air-Dry Phenolic) coatings at additional cost. American Industrial offers special coatings upon request, however American Industrial does not warranty coatings to be a permanent solution for any equipment against corrosion. It is the responsibility of the customer to provide regular maintenance against chips, scratches, etc... and regular touch up maintenance must be provided for long-term benefits and corrosion prevention.

f) American Industrial recommends that the equipment supplied should be installed by qualified personnel who have solid understanding of system design, pressure and temperature ratings, and piping assembly. Verify the service conditions of the system prior to applying any shell & tube heat exchanger. If the system pressure or temperature does not fall within the parameters on model rating tag located on the heat exchanger, contact our factory prior to installation or operation.

g) Plan the installation to meet the requirements indicated on the piping installation diagram as illustrated above. It is recommended to put the hot fluid to be cooled through the shell side and the cold fluid through the tube side. The indicated port assembly sequence in the diagram maxi-

note: AIHTI reserves the right to make reasonable design changes without notice.
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mizes the performance, and minimizes the possibility of thermal shock. In instances where the fluids are required to be reversed, *hot fluid in the tubes and cold fluid in the shell* the heat exchanger will work with reduced performance. Installation may be vertical or horizontal or a combination thereof. However, the installation must allow for complete draining of the heat exchanger regardless of Single Pass, Two Pass, or four pass construction. Complete drainage is important to prevent the heat exchanger from freezing, over-heating of a fluid, or mineral deposit buildup.
For fixed bundle heat exchangers, provide sufficient clearance at one end to allow for the removal or replacement of tubes. On the opposite end, provide enough space to allow removal of the complete bonnet to provide sufficient clearance to permit tube rolling and cleaning. Allow accessible room for scheduled cleaning as needed. Include thermometer wells and pressure gauge pipe ports in piping to and from the heat exchanger located as close to the heat exchanger as possible. For more information please contact American Industrial.

h) It is recommended to use flexible hose wherever possible to reduce vibration and allow slight movement. However, hoses are not required. Hydraulic carrying lines should be sized to handle the appropriate flow and to meet system pressure drop requirements based upon the systems parameters, and not based upon the units supply and return connection size. We recommend that a low cracking pressure direct acting relief valve be installed at the heat exchanger inlet to protect it from pressure spikes by bypassing oil in the event the system experiences a high flow surge. If preventative filtration is used it should be located ahead of the cooler on both shell and tube side to catch any scale or sludge from the system before it enters the cooler. Failure to install filters ahead of the heat exchanger could lead to possible heat exchanger failure due to high pressure if the system filters plug.

i) Standard shell & tube coolers are built with a rolled tube-sheet construction. However, the differential operating temperature between the entering shell side fluid and the entering tube side fluid should not exceed 150°F. If this condition exists, a severe thermal shock could occur leading to product failure and mixing of the fluids. For applications with a differential temperatures of 150°F or more, we recommend using a series with a floating tube-sheet, u-tube, or expansion joint to reduce the potential for the effects of thermal shock.

j) Water requirements vary from location to location. If the source of cooling water is from other than a municipal water supply, it is recommended that a water strainer be installed ahead of the heat exchanger to prevent dirt and debris from entering and clogging the flow passages. If a water modulating valve is used it is recommended to be installed at the inlet to the cooler to regulate the water flow.

k) For steam service, or other related applications, please consult our engineering department for additional information.

Maintenance
a) Inspect the heat exchanger for loosened bolts, connections, rust spots, corrosion, and for internal or external fluid leakage. Any corroded surfaces should be cleaned and recoated with paint.

b) Shell side: In many cases with clean hydraulic system oils it will not be necessary to flush the interior of the shell side of the cooler. In circumstances where the quality of hydraulic fluid is in question, the shell side should be disconnected and flushed on a yearly basis with a clean flushing oil/solvent to remove any sludge that has been deposited. For severe cases where the unit is plugged and cannot be flushed clean with solvent, the heat exchanger should be replaced to maintain the proper cooling performance.

c) Tube side: In many cases it will be necessary to clean the tube side of the heat exchanger due to poor fluid quality, debris, calcium deposits, corrosion, mud, sludge, seaweed, etc.... To clean the tube side, flush with clean water or any good quality commercial cleaner that does not attack the particular material of construction. With straight tube heat exchangers you can use a rod to carefully push any debris out of the tubes.

d) Zinc anodes are normally used to reduce the risk of failure due to electrolysis. Zinc anodes are a sacrificial component designed to wear and dissolve through normal use. Normally, zinc anodes are applied to the water supply side of the heat exchanger. Depending upon the amount of corrosive action, one, two, three, or more anodes can be applied to help further reduce the risk of failure. American Industrial Heat Transfer, Inc. offers zinc anodes as an option, to be specified and installed at the request our customers. It is the responsibility of the customer to periodically check and verify the condition of the zinc anode and replace it as needed.

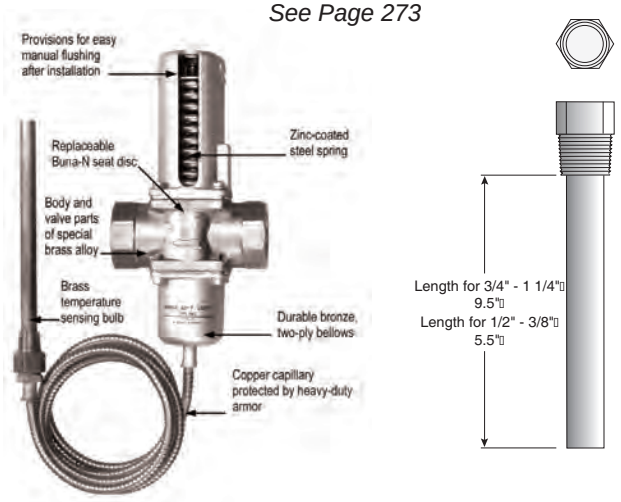
Applications vary due to water chemical makeup and quality, material differences, temperature, flow rate, piping arrangements, and machine grounding. For those reasons, zinc anodes do not follow any scheduled factory predetermined maintenance plan moreover they must be checked routinely by the customer, and a maintenance plan developed based upon the actual wear rate.

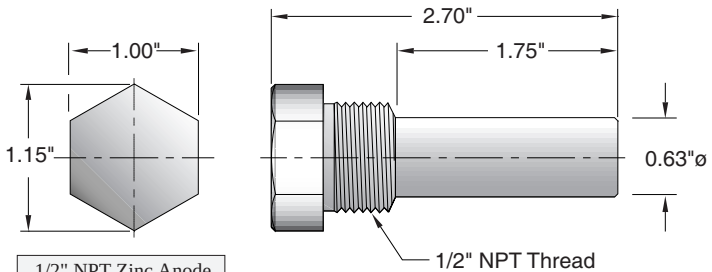
If substantial wear occurs or zinc dissolves without replacement, premature failure or permanent damage may occur to the heat exchanger. American Industrial does not warranty customer applications. It is the responsibility of the customer to verify and apply the proper system materials of construction and overall system requirements. Failures resulting from properly applied or misapplied use of zinc anode(s) into non-specified or specified applications will be the sole responsibility of the customer.

e) A routine maintenance schedule should be developed and adjusted to meet your systems requirements based upon water quality, etc…. Failure to regularly maintain and clean your heat exchanger can result in a reduction in operational performance and life expectancy.

Note: *Since applications can vary substantially, the installation and maintenance information contained in this catalog should be used as a basic guideline. The safe installation, maintenance, and use of any American Industrial Heat Transfer, Inc. heat exchanger are solely the responsibility of the user.*

ACCESSORIES: THERMOSTATIC MODULATING WATER VALVE WITH BULB WELL ASSEMBLY
(for Shell & Tube Heat Exchangers And Air/Oil Coolers)
See Page 273



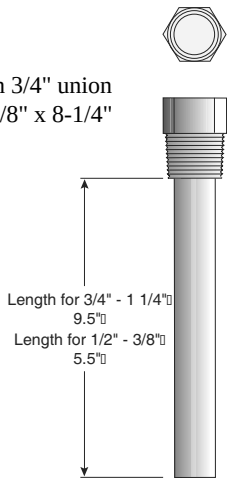


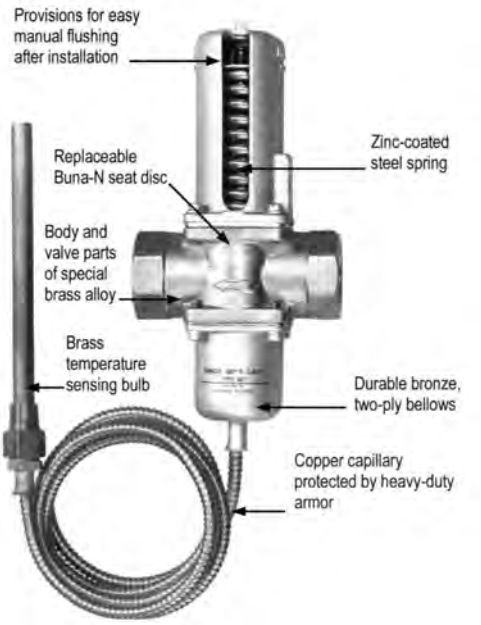
1/2" NPT Zinc Anode PN: 301-0003
AB-1200 thru AB-2000 AA-1200 thru AA-1600 CS-1200 thru CS-1700

56T THERMOSTATIC MODULATING WATER VALVE WITH BULB WELL ASSEMBLY (for Shell & Tube Heat Exchangers And Air/Oil Coolers)

SPECIFICATIONS

Sizes	0.375", 0.50", 0.75", 1.00", 1.25" FPT
Fluid Pressure	125psi (max.)
Standard Temperature	40° - 100° F., 60° - 140° F., 100° - 175° F., 125° - 200° F., 140° - 240° F., 200° - 275°F.
Body	Brass alloy casting
Valve Parts	Brass alloy
Standard Capillary Length	6' & 20' foot
Standard Bulbs	For 3/8" & 1/2" valve sizes: 5/8" x 6 with 3/4" union connections. For 3/4" & 1" valve sizes: 5/8" x 8-1/4" with 3/4" union connections. Stainless steel construction available.
Standard Bulb Mounting	3/4" NPT
Seat Disk	Buna-N-replaceable
Seat Bead	Stainless Steel - replaceable





APPLICATION INFORMATION

- Built for rugged machine tool and hydraulic applications.
- Adjustable temperature range to meet your requirements.
- Quick response to temperature changes.
- Extra heavy-duty direct acting bellows for longer service.

Note: Please consult factory if a non-cataloged temperature is required.

The type 56-T valve gives smooth regulation of water and other fluids. It's designed for the most rugged application. For example: hydraulic power packaging equipment, hydraulic presses, plastic molding equipment, and anywhere reliability in temperature control is demanded. The type 56-t valve is a better designed product that won't leak or chatter. To insure dependability, every valve is factory tested three times in different temperature baths. Extra performance can be expected of the bellows also. They are direct acting with sturdy walls, and the inner spring is zinc coated. The seat beads are stainless steel to resist the erosive effects of *wire drawing* and provide longer life for your needs. Additional features include mounting in any position, Buna-N seat disc, and manual flushing.

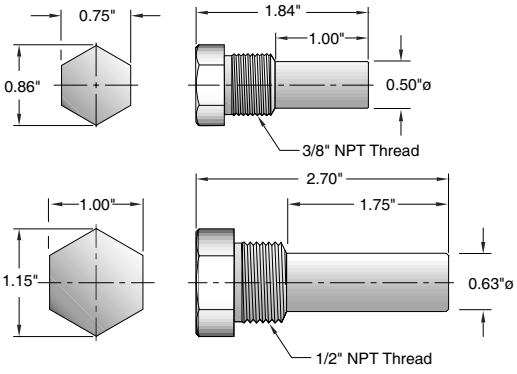
Thermostatic Modulating Water Valve

Part Number	Description	
	Size NPT	Temp. Range
310-1001	3/8"	60 °F - 140 °F
310-1004	1/2"	60 °F - 140 °F
310-1008	3/4"	60 °F - 140 °F
310-1014	1"	60 °F - 140 °F
310-1020	1-1/4"	60 °F - 140 °F
310-1046	1-1/2"	60 °F - 140 °F
310-1047	2"	60 °F - 140 °F
310-1025	3/8"	100 °F - 175 °F
310-1005	1/2"	100 °F - 175 °F
310-1010	3/4"	100 °F - 175 °F
310-1015	1"	100 °F - 175 °F
310-1026	1-1/4"	100 °F - 175 °F

Bulb Well	
Part Number Brass	Part Number Stainless Steel
310-2001	310-2003
310-2001	310-2003
310-2002	310-2004
310-2002	310-2004
310-2002	310-2004
310-2001	310-2003
310-2001	310-2003
310-2002	310-2004
310-2002	310-2004
310-2002	310-2004

Zinc Anode List Prices

Description	
Part Number	Size NPT
301-0004	3/8" NPT
301-0003	1/2" NPT



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website : www.aihti.com
general email : sales@aihti.com
technical email : engineering@aihti.com

Notes:

American Industrial Heat Transfer Inc.®

Manufacturer of Quality Heat Exchangers

website : www.aihti.com
general email : sales@aihti.com
technical email : engineering@aihti.com

Shell & Tube Application Request: *(For liquid to liquid heat exchangers)*

For AA - STA Series

Email form to: sales@aihti.com or engineering@aihti.com or fax to 434-757-1810

Contact Name _____ Telephone _____ Date _____

Company Name _____ Email _____

Address: _____ Fax _____

_____

Hot Side

Fluid Type _____

If available:

Density _____ lb/ft3
Viscosity _____ cP
Conductivity _____ Btu/hr.ft.°F
Specific Heat _____ Btu/lb.°F

1. Flow Rate _____
2. Temperature In _____
3. Desired Temperature Out _____
4. Heat Load _____

Cold Side

Fluid Type _____

If available:

Density _____ lb/ft3
Viscosity _____ cP
Conductivity _____ Btu/hr.ft.°F
Specific Heat _____ Btu/lb.°F

1. Flow Rate _____
2. Temperature In _____

Maximum Allowable Pressure Drop:

Hot Side _____ Cold Side _____

To properly size the heat exchanger we need 3 of the 4 perameter on the Hot Side and 2 on the Cold Side.

Shell Material Construction:

Brass ☐ Steel ☐ Stainless Steel ☐

Tube Material Construction:

Copper ☐ 90/10 Copper Nickel ☐ Stainless Steel ☐

ASME Code and Certified Yes ☐ No ☐

Require All Stainless Steel Heat Exchanger Yes ☐ No ☐

Comment: _____

_____

note: AIHTI reserves the right to make reasonable design changes without notice.

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AA - STA SERIES

Fixed Tube Bundle Liquid Cooled

HEAT EXCHANGERS

- Computer generated data sheet available for any application
- Operating pressure for tubes 150 PSI.
- Operating pressure for shell 300 PSI.
- Operating temperature 300 °F.
- Can be customized to fit any applications.
- Cools: Fluid power systems, rock crushers, presses, shears, lubrication equipment for paper machinery, gear drives, marine transmissions, etc.

AA & STA Series *overview*

AA SERIES

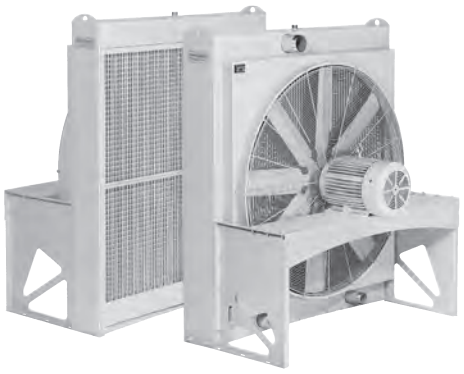
Fixed tube construction heat exchangers with NPT connections. Made of brass with copper cooling tubes and cast iron end bonnets. Standard sizes from 2" through 8" diameters, and from 1.3 to 200 sq.ft. Standard one, two, and four pass models are available. Options include 90/10 copper nickel and 316 stainless steel cooling tubes, bronze end bonnets and zinc anodes. Can be customized to fit your requirements.

Optional 10” diameter units in brass are available upon request.

STA SERIES

Similar in design to AA series with fixed tube construction and NPT connections made of all 316 stainless steel. Standard sizes from 2” through 8” diameters. From 1.3 to 200 sq. ft. Standard one, two and four pass models are available. Larger diameters available upon request. Can be customized to fit your requirements.

AC-ACF-ACHM Series



AOCS Series

ACL Series

EOC - EOCF Series

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CAST BONNET
Provides fluid into tubes with minimum restriction. One, two, or four pass interchangeability.

TUBE JOINT
Roller expanded tube joint to integral forged hub.

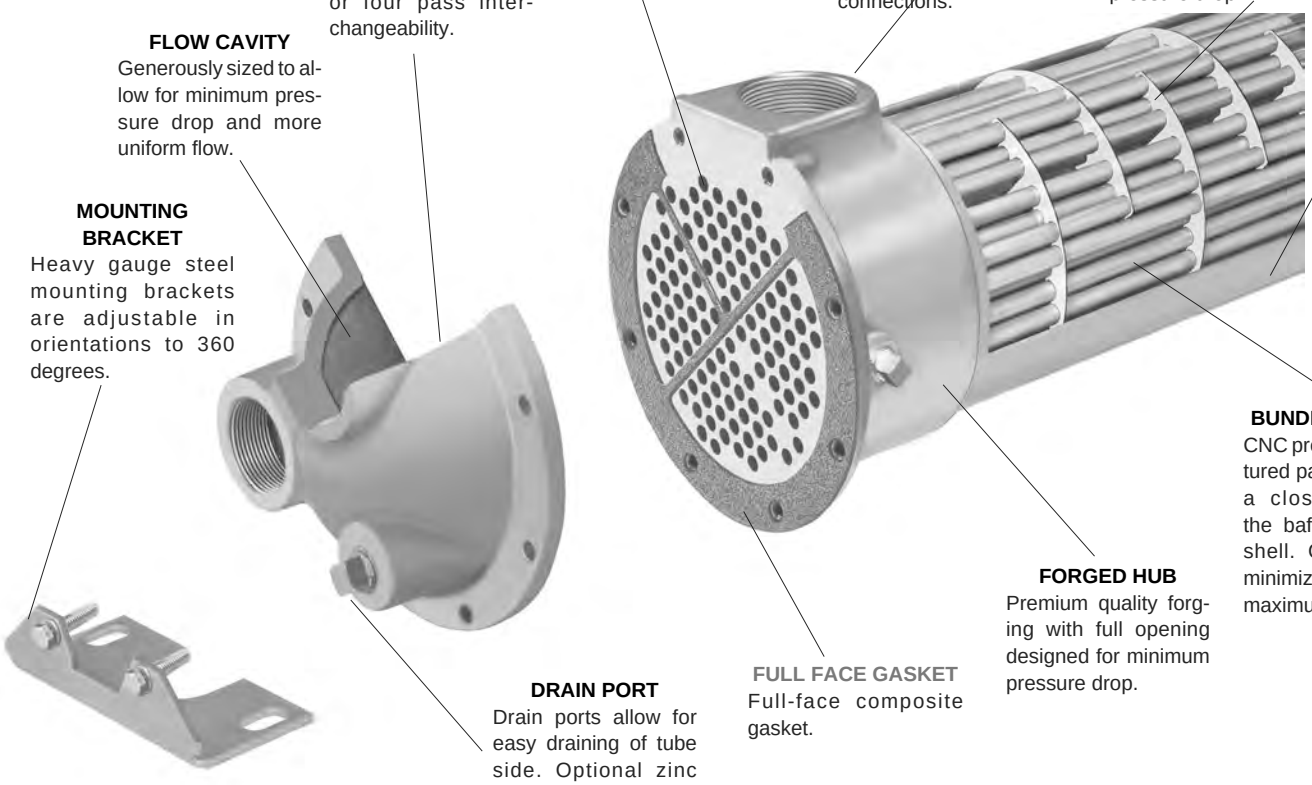
THREAD
CNC precision threading to provide accurate leakproof connections.

BAFFLES
CNC manufactured baffles to provide maximum turbulence and heat transfer with a minimum fluid pressure drop.

FLOW CAVITY
Generously sized to allow for minimum pressure drop and more uniform flow.

FINISH
Gray semi-gloss enamel. Can be used as a base for additional coats.

MOUNTING BRACKET
Heavy gauge steel mounting brackets are adjustable in orientations to 360 degrees.



BUNDLE ASSEMBLY
CNC precision manufactured parts to guarantee a close fit between the baffles, tubes, and shell. Clearances are minimized to provide for maximum heat transfer.

FORGED HUB
Premium quality forging with full opening designed for minimum pressure drop.

FULL FACE GASKET
Full-face composite gasket.

DRAIN PORT
Drain ports allow for easy draining of tube side. Optional zinc anode can be inserted in place of plug.

Example Model

Options

AA - 1224 - 4 - 6 - TP - CNT - B - Z

- **Model**: AA, SAA, STA
- **Shell Diameter**: 400 = 2.13", 600 = 3.13", 800 = 4.13", 1000 = 5.13", 1200 = 6.13", 1600 = 8.00"
- **Effective Tube Length** (12" increments)
- **Baffle Spacing Code**: 1.5", 2.0", 3.0", 4.0", 6.0", 8.0"
- **Cooling Tube Diamenter**: 4 = 1/4", 6 = 3/8", 10 = 5/8"
- **Tube Side Passes**: SP = 1 pass, TP = 2 pass, FP = 4 pass
- **Tubing**: Blank = Copper; Options: CNT= 90/10 Cu Ni, STS = Stainless Steel
- **End Bonnets**: Blank = Cast Iron; Options: B = Bronze, SB = Stainless Steel
- **Zinc Anode**: Z = 1 Zinc Anode, 2Z = 2 Zinc Anode etc.

STANDARD CONSTRUCTION MATERIALS & RATINGS

Standard Model	AA Series	SAA Series*	STA Series	Standard Unit Ratings
Shell	Brass	Steel	316 Stainless Steel	Operating Pressure Tubes 150 psig Operating Pressure Shell 300 psig Operating Temperature 300 ºF
Tubes	Copper	Copper	316 Stainless Steel	
Baffle	Aluminum / Brass	Aluminum / Brass	316 Stainless Steel	
Integral End Hub	Forged Brass	Forged Brass	316 Stainless Steel	
End Bonnets	Cast Iron	Cast Iron	316 Stainless Steel	
Mounting Brackets	Steel	Steel	Steel	
Gasket	Hypalon Composite	Hypalon Composite	Hypalon Composite	

*Offered in 5" through 8" shell diameter.

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AA & STA Series *selection*

STEP 1: Calculate the heat load

The heat load in BTU/HR or (Q) can be derived by using several methods. To simplify things, we will consider general specifications for hydraulic system oils and other fluids that are commonly used with shell & tube heat exchangers.

Terms

GPM = Gallons Per Minute
CN = Constant Number for a given fluid
T = Temperature differential across the potential
PSI = Pounds per Square Inch (pressure) of the operating side of the system
MHP = Horsepower of the electric motor driving the hydraulic pump
Kw = Kilowatt (watts x 1000)
T_{in} = Hot fluid entering temperature in °F
T_{out} = Hot fluid exiting temperature in °F
t_{in} = Cold fluid temperature entering in °F
t_{out} = Cold fluid temperature exiting in °F
Q = BTU / HR

For example purposes, a hydraulic system has a 125 HP (93Kw) electric motor installed coupled to a pump that produces a flow of 80 GPM @ 2500 PSIG. The temperature differential of the oil entering the pump *vs* exiting the system is about 5.3°F. Even though our return line pressure operates below 100 psi, we must calculate the system heat load potential (Q) based upon the prime movers (pump) capability. We can use one of the following equations to accomplish this:

To derive the required heat load (Q) to be removed by the heat exchanger, apply ONE of the following. Note: The calculated heat loads may differ slightly from one formula to the next. This is due to assumptions made when estimating heat removal requirements. The factor *(v)* represents the percentage of the overall input energy to be rejected by the heat exchanger. The *(v)* factor is generally about 30% for most hydraulic systems, however it can range from 20%-70% depending upon the installed system components and heat being generated (ie. servo valves, proportional valves, etc…will increase the percentage required).

Formula	Example
a) Q = GPM x CN x actual △T	a) Q =80 x 210 x 5.3°F = 89,040 BTU/HR
b) Q = [(PSI x GPM) / 1714] x (*v*) x 2545	b) Q =[(2500x80)/1714] x .30 x 2545 = 89,090 BTU/HR
c) Q = MHP x (*v*) x 2545	c) Q =125 x .30 x 2545 = 95,347 BTU/HR
d) Q = Kw to be removed x 3415	d) Q =28 x 3415 = 95,620 BTU/HR
e) Q = HP to be removed x 2545	e) Q =37.5 x 2545 = 95,437 BTU/HR

Constant for a given fluid (CN)

1)Oil ..... CN = 210
2)Water..... CN = 500
3)50% E. Glycol..... CN = 450

STEP 2: Calculate the Mean Temperature Difference

When calculating the MTD you will be required to choose a liquid flow rate to derive the Cold Side △T. If your water flow is unknown you may need to assume a number based on what is available. As a normal rule of thumb, for oil to water cooling a 2:1 oil to water ratio is used. For applications of water to water or 50 % Ethylene Glycol to water, a 1:1 ratio is common.

Formula	Example
HOT FLUID △T Oil = $\frac{Q}{CN \times GPM}$	△T = $\frac{89{,}090 \text{ BTU/hr (from step 1,item B)}}{210 \text{ CN} \times 80\text{GPM}}$ = 5.3°F = △T Rejected
COLD FLUID △ t Water = $\frac{BTU / hr}{CN \times GPM}$	△t = $\frac{89{,}090 \text{ BTU/hr}}{500 \text{ CN} \times 40\text{GPM (for a 2:1 ratio)}}$ = 4.45°F = △T Absorbed

T_{in} = Hot Fluid entering temperature in degrees F
T_{out} = Hot Fluid exiting temperature in degrees F
t_{in} = Cold Fluid entering temperature in degrees F
t_{out} = Cold Fluid exiting temperature in degrees F

T_{in} = 125.3 °F
T_{out} = 120.0 °F
t_{in} = 700 °F
t_{out} = 74.5 °F

$$\frac{T_{out} - t_{in}}{T_{in} - t_{out}} = \frac{S\text{[smaller temperature difference]}}{L\text{ [larger temperature difference]}} = \left(\frac{S}{L}\right)$$

$$\frac{120.0°F - 70.0°F = 50.0°F}{125.3°F - 74.5°F = 50.8°F} = \frac{50.0°F}{50.8°F} = .984$$

STEP 3: Calculate Log Mean Temperature Difference (LMTD)

To calculate the LMTD please use the following method;

L = Larger temperature difference from step 2.
M = S/L number (LOCATED IN TABLE A).

$LMTD_i$ = L x M

$LMTD_i$ = 50.8 x .992 (FROM TABLE A) = 50.39

To correct the $LMTD_i$ for a multipass heat exchangers calculate **R** & **K** as follows:

Formula	Example
R = $\frac{T_{in} - T_{out}}{t_{out} - t_{in}}$	**R** = $\frac{125.3°F - 120°F}{74.5°F - 70°F}$ = $\frac{5.3°F}{4.5°F}$ = **{1.17=R}**
K = $\frac{t_{out} - t_{in}}{T_{in} - t_{in}}$	**K** = $\frac{74.5°F - 70°F}{124.5°F - 70°F}$ = $\frac{4.5°F}{55.4°F}$ = **{0.081=K}**

Locate the correction factor CF_B (FROM TABLE B)
$LMTD_c = LMTD_i \times CF_B$
$LMTD_c$ = 50.39 x 1 = **50.39**

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STEP 4: Calculate the area required

Required Area sq.ft. = $\frac{\text{Q (BTU / HR)}}{\text{LMTD}_c \text{ x U (FROM TABLE C)}}$ $\frac{89{,}090}{50.39 \text{ x } 100}$ = **17.68 sq.ft.**

STEP 5: Selection

a) From TABLE E choose the correct series size, baffle spacing, and number of passes that best fits your flow rates for both shell and tube side. Note that the tables suggest minimum and maximum information. Try to stay within the 20-80 percent range of the indicated numbers.

Example

Oil Flow Rate = 80 GPM = Series Required from Table E = **1200 Series**
Baffle Spacing from Table E = **4**
Water Flow Rate = 40 GPM = Passes required in 1200 series = **4 (FP)**

b) From TABLE D choose the heat exchanger model size based upon the sq.ft. or surface area in the series size that will accommodate your flow rate.

Example

Required Area = 17.68sq.ft Closest model required based upon sq.ft. & series = **AA-1224-4-6-FP**

If you require a computer generated data sheet for the application, or if the information that you are trying to apply does not match the corresponding information, please contact our engineering services department for further assistance.

TABLE A- FACTOR M/LMTD = L x M

S/L	M	S/L	M	S/L	M	S/L	M
		.25	.541	.50	.721	.75	.870
.01	.215	.26	.549	.51	.728	.76	.874
.02	.251	.27	.558	.52	.734	.77	.879
.03	.277	.28	.566	.53	.740	.78	.886
.04	.298	.29	.574	.54	.746	.79	.890
.05	.317	.30	.582	.55	.753	.80	.896
.06	.334	.31	.589	.56	.759	.81	.902
.07	.350	.32	.597	.57	.765	.82	.907
.08	.364	.33	.604	.58	.771	.83	.913
.09	.378	.34	.612	.59	.777	.84	.918
.10	.391	.35	.619	.60	.783	.85	.923
.11	.403	.36	.626	.61	.789	.86	.928
.12	.415	.37	.634	.62	.795	.87	.934
.13	.427	.38	.641	.63	.801	.88	.939
.14	.438	.39	.648	.64	.806	.89	.944
.15	.448	.40	.655	.65	.813	.90	.949
.16	.458	.41	.662	.66	.818	.91	.955
.17	.469	.42	.669	.67	.823	.92	.959
.18	.478	.43	.675	.68	.829	.93	.964
.19	.488	.44	.682	.69	.836	.94	.970
.20	.497	.45	.689	.70	.840	.95	.975
.21	.506	.46	.695	.71	.848	.96	.979
.22	.515	.47	.702	.72	.852	.97	.986
.23	.524	.48	.709	.73	.858	.98	.991
.24	.533	.49	.715	.74	.864	.99	.995

TABLE B- LMTD correction factor for Multipass Exchangers

R \ K	.05	.1	.15	.2	.25	.3	.35	.4	.45	.5	.6	.7	.8	.9	1.0
.2	1	1	1	1	1	1	1	.999	.993	.984	.972	.942	.908	.845	.71
.4	1	1	1	1	1	1	.994	.983	.971	.959	.922	.855	.70		
.6	1	1	1	1	1	.992	.980	.965	.948	.923	.840				
.8	1	1	1	1	.995	.981	.965	.945	.916	.872					
1.0	1	1	1	1	.988	.970	.949	.918	.867	.770					
2.0	1	1	.977	.973	.940	.845	.740								
3.0	1	1	.997	.933	.835										
4.0	1	.993	.950	.850											
5.0	1	.982	.917												
6.0	1	.968	.885												
8.0	1	.930													
10.0	.996	.880													
12.0	.985	.720													
14.0	.972														
16.0	.958														
18.0	.940														
20.0	.915														

TABLE D- Surface Area

Model Number	Surface Area in Sq.ft.			Model Number	Surface Area in Sq.ft.		
	1/4" O.D Tubing	3/8" O.D Tubing	5/8 O.D Tubing		1/4" O.D Tubing	3/8" O.D Tubing	5/8 O.D Tubing
AA-408	1.35	–	–	AA-1224	33.76	23.55	11.78
				AA-1236	50.63	35.33	17.66
AA-608	2.62	–	–	AA-1248	67.51	47.10	23.55
AA-614	4.58	–	–	AA-1260	87.39	58.88	29.44
AA-624	7.85	–	–	AA-1272	101.27	70.65	35.33
AA-636	11.78	–	–	AA-1284	118.14	82.43	41.21
				AA-1296	135.02	94.20	47.10
AA-814	8.55	–	–				
AA-824	14.65	–	–	AA-1624	58.61	41.21	23.55
AA-836	21.2	–	–	AA-1636	87.92	61.82	35.33
AA-848	28.3	–	–	AA-1648	117.23	82.43	47.10
				AA-1660	146.53	103.03	58.88
AA-1014	13.74	9.16	4.58	AA-1672	175.84	123.64	70.65
AA-1024	23.55	15.70	7.85	AA-1684	205.15	144.24	82.43
AA-1036	35.33	23.55	11.78	AA-1696	234.45	164.85	94.20
AA-1048	47.10	31.40	15.70	AA-16108	263.76	185.46	105.98
AA-1060	58.88	39.25	19.63	AA-16120	293.07	206.06	117.75

TABLE E- Flow Rate for Shell & Tube

Shell dia . Code	Max. liquid Flow - Shell Side Baffle Spacing					Liquid Flow - Tube Side SP		TP		FP	
	1.5	2	3	4	6	Min.	Max.	Min.	Max.	Min.	Max.
400	10	19	–	–	–	3.5	20	–	–	–	–
600	15	20	25	30	–	7.5	48	3.5	24	2	12
800	20	35	45	60	–	10	70	4.5	38	3	21
1000	24	35	60	70	–	20	120	10	70	5.0	37
1200	35	45	70	100	120	30	220	15	112	7.5	56
1600	38	70	150	200	220	57	300	29	180	14	90

TABLE C

U	TUBE FLUID	SHELL FLUID
400	Water	Water
350	Water	50% E. Glycol
100	Water	Oil
300	50% E. Glycol	50% E. Glycol
90	50% E. Glycol	Oil

note: AIHTI reserves the right to make reasonable design changes without notice.

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AA & STA Series *performance*

Instructions

The selection chart provided contains an array of popular sizes for quick sizing. It does not provide curves for all models available. Refer to page 24 & 25 for detailed calculation information.

Computer selection data sheets for standard or special models are available through the engineering department of American Industrial. To use the followings graphs correctly, refer to the instruction notes "1-5".

1) HP Curves are based upon a 40°F approach temperature; for example: oil leaving a cooler at 125°F, using 85°F cooling water (125°F – 85°F = 40°F).

2) The oil to water ratio of 1:1 or 2:1 means that for every 1 gallon of oil circulated, a minimum of 1 or 1/2 gallon (respectively) of 85°F water must be circulated to match the curve results.

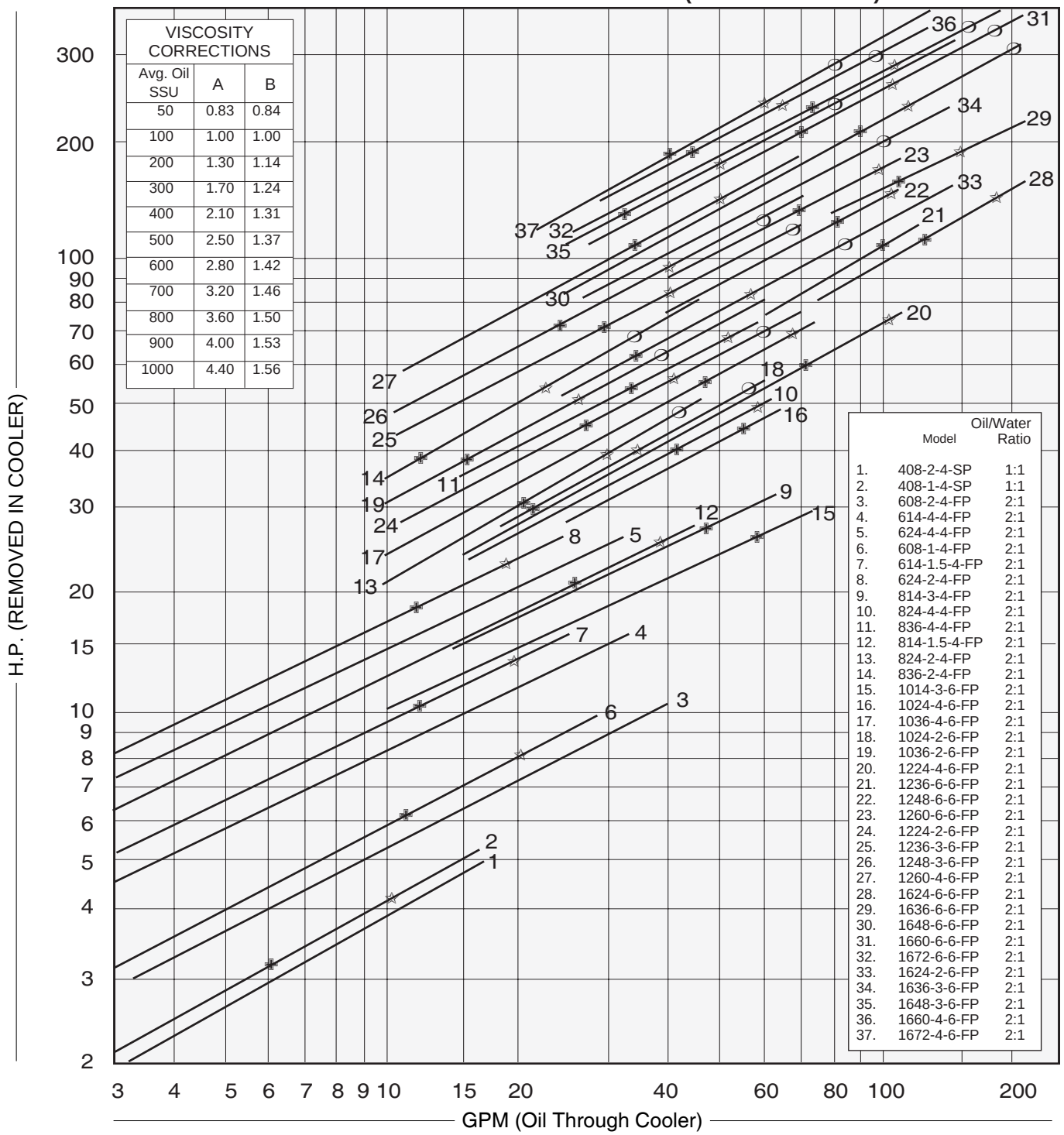
3) OIL PRESSURE DROP CODING: ✙ = 5 psi; ☆= 10 psi; ❍ = 20 psi; △ = 50psi. Curves that have no pressure drop code symbols indicate that the oil pressure drop is less than 5 psi for the flow rate shown.

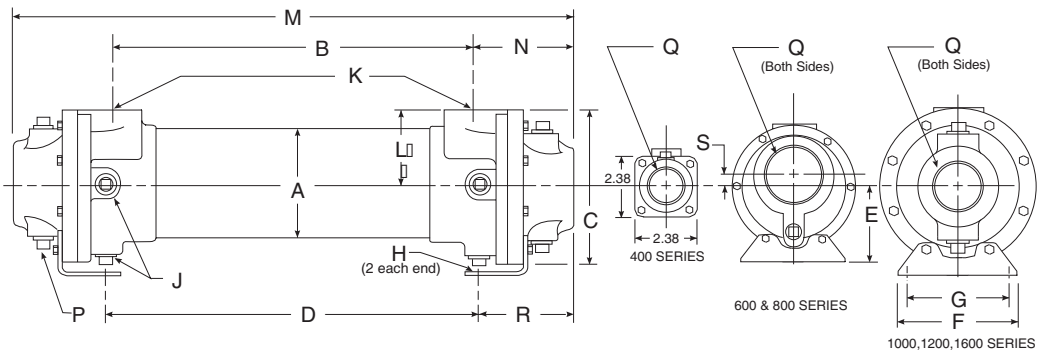
4) Pressure Drop is based upon oil with an average viscosity of 100 SSU. If the average oil viscosity is other than 100 SSU, then multiply the indicated Pressure Drop by the corresponding value from corrections table A.

5) Corrections for approach temperature and oil viscosity are as follows:

$$H.P._{(\text{Removed In Cooler})} = H.P._{(\text{Actual Heat Load})} \times \left(\frac{40}{\text{Actual Approach}}\right) \times B.$$

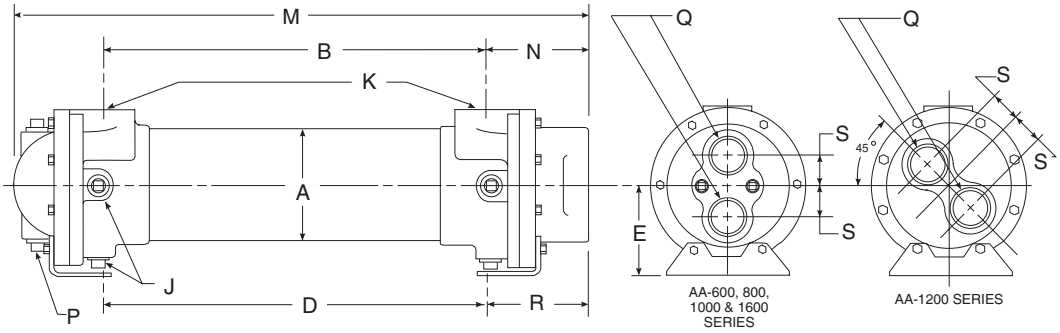
HEAT ENERGY DISSIPATION RATES (Basic Stock Model)





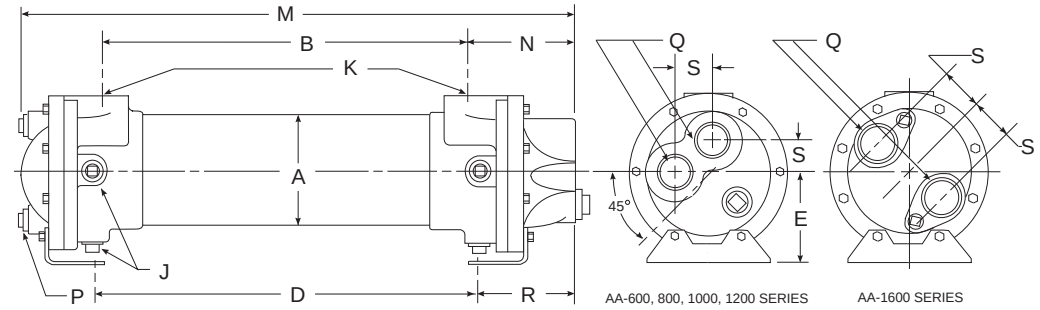
Single Pass (SP)

Model	M	N	P NPT	Q NPT	R	S
AA-408	11.00	2.38	-	1.00	-	-
AA-608	11.25					
AA-614	17.25	2.56	(2) .38	1.50	3.06	0.38
AA-624	27.25					
AA-814	18.00					
AA-824	28.00	3.44	(2) .38	2.00	2.56	0.50
AA-836	40.00					
AA-1014	18.50					
AA-1024	28.50	3.69	(4) .38	2.50	3.38	-
AA-1036	40.50					
AA-1224	29.25					
AA-1236	41.25					
AA-1248	53.25	4.25	(4) .38	3.00	3.75	-
AA-1260	65.25					
AA-1272	77.25					
AA-1624	31.25					
AA-1636	43.25					
AA-1648	55.25					
AA-1660	67.25	6.52	(4) .50	4.00	5.25	-
AA-1672	79.25					
AA-1684	91.25					



Two Pass (TP)

Model	M	N	P NPT	Q NPT	R	S
AA-608	10.75					
AA-614	16.75	2.44	(2) .38	1.00	2.94	1.00
AA-624	26.75					
AA-814	17.62					
AA-824	27.62	3.44	(2) .38	1.25	2.56	1.19
AA-836	39.62					
AA-1014	18.50					
AA-1024	28.50	3.69	(2) .38	1.50	3.50	1.50
AA-1036	40.50					
AA-1224	28.75					
AA-1236	40.75					
AA-1248	52.75	4.25	(2) .38	2.00	3.75	1.56
AA-1260	64.75					
AA-1272	76.75					
AA-1624	30.50					
AA-1636	42.50					
AA-1648	54.50					
AA-1660	66.50	6.00	(2) .50	2.50	5.25	2.25
AA-1672	78.50					
AA-1684	90.50					



Four Pass (FP)

Model	M	N	P NPT	Q NPT	R	S
AA-608	10.88					
AA-614	16.88	2.44	(2) .38	.75	2.81	1.00
AA-624	26.88					
AA-814	17.62					
AA-824	27.62	3.44	(2) .38	.75	2.56	1.06
AA-836	39.62					
AA-1014	18.50					
AA-1024	28.50	3.80	(3) .38	1.00	3.25	1.69
AA-1036	40.50					
AA-1224	29.50					
AA-1236	41.50					
AA-1248	53.50	4.56	(3) .50	1.50	3.75	2.00
AA-1260	65.50					
AA-1272	77.50					
AA-1624	30.75					
AA-1636	42.75					
AA-1648	54.75					
AA-1660	66.75	6.08	(4) .50	2.00	5.25	2.62
AA-1672	78.75					
AA-1684	90.75					

COMMON DIMENSIONS & WEIGHTS

Model	A	B	C	D	E	F	G	H	J NPT	K NPT	L	Approx. Weight	Model
AA-408	2.125	6.25	-	-	-	-	-	-	-	.50	1.69	7	AA-408
AA-608		6.12		5.12								12	AA-608
AA-614	3.125	12.12	4.19	11.12	2.44	3.50	2.50	.38øx.88	(2) .25	1.00	2.44	16	AA-614
AA-624		22.12		21.12								20	AA-624
AA-814		11.12		12.88								37	AA-814
AA-824	4.125	21.12	5.88	22.88	3.50	4.75	3.50	.50øx1.62	(6) .38	1.50	3.12	47	AA-824
AA-836		33.12		34.88								67	AA-836
AA-1014		11.12		11.75								45	AA-1014
AA-1024	5.125	21.12	6.50	21.75	3.75	5.00	4.00	.50øx.88	(6) .38	1.50	3.62	60	AA-1024
AA-1036		33.12		33.75								82	AA-1036
AA-1224		20.50		21.50								90	AA-1224
AA-1236		32.50		33.50								110	AA-1236
AA-1248	6.125	44.50	7.50	45.50	4.12	6.00	5.00	.50øx.88	(6) .38	2.00	4.25	130	AA-1248
AA-1260		56.50		57.50								150	AA-1260
AA-1272		68.50		69.50								180	AA-1272
AA-1624		19.00		20.50								160	AA-1624
AA-1636		31.00		32.50								185	AA-1636
AA-1648		43.00		44.50								205	AA-1648
AA-1660	8.00	55.00	9.75	56.50	5.38	8.25	7.00	.62øx1.12	(6) .38	3.00	5.62	235	AA-1660
AA-1672		67.00		68.50								280	AA-1672
AA-1684		79.00		80.50								320	AA-1684

note: AIHTI reserves the right to make reasonable design changes without notice.

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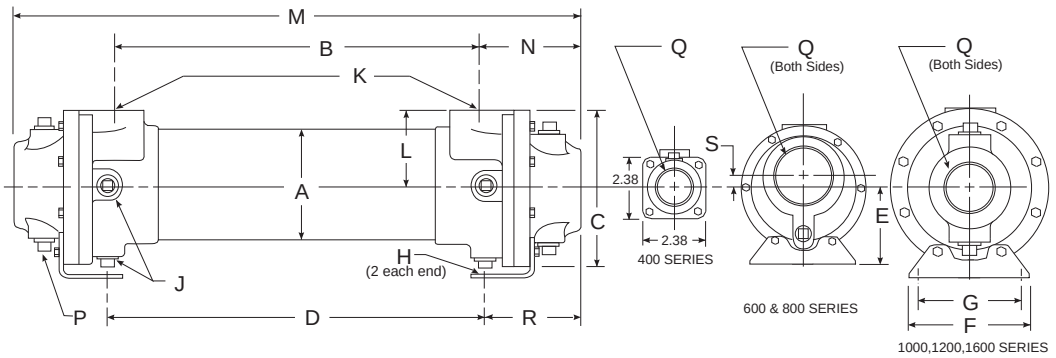
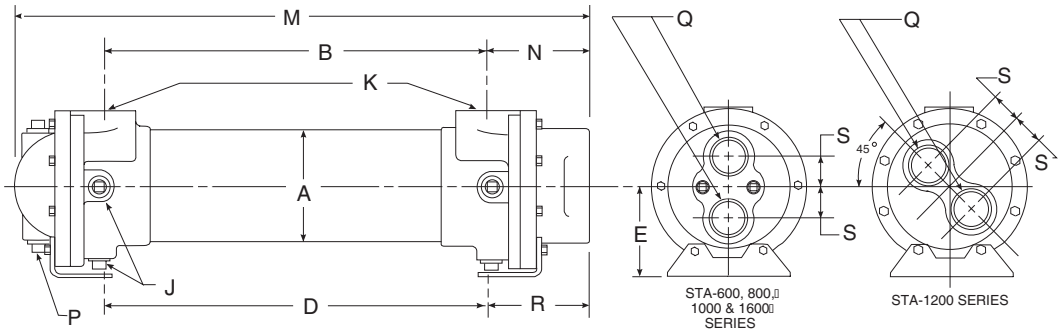
STA Series



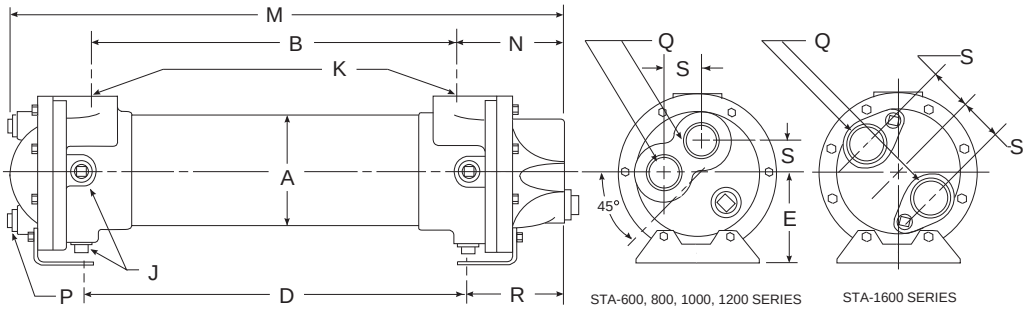
Single Pass (SP)

Model	M	N	P NPT	Q NPT	R	S
STA-408	11.00	2.38	-	1.00	-	-
STA-608	11.25					
STA-614	17.25	2.56	(2) .38	1.50	3.06	0.38
STA-624	27.25					
STA-814	18.00					
STA-824	28.00	3.44	(2) .38	2.00	2.56	0.50
STA-836	40.00					
STA-1014	18.50					
STA-1024	28.50	3.69	(4) .38	2.50	3.38	-
STA-1036	40.50					
STA-1224	29.25					
STA-1236	41.25					
STA-1248	53.25	4.25	(4) .38	3.00	3.75	-
STA-1260	65.25					
STA-1272	77.25					
STA-1624	31.25					
STA-1636	43.25					
STA-1648	55.25					
STA-1660	67.25	6.52	(4) .50	4.00	5.25	-
STA-1672	79.25					
STA-1684	91.25					



Two Pass (TP)

Model	M	N	P NPT	Q NPT	R	S
STA-608	10.75					
STA-614	16.75	2.44	(2) .38	1.00	2.94	1.00
STA-624	26.75					
STA-814	17.62					
STA-824	27.62	3.44	(2) .38	1.25	2.56	1.19
STA-836	39.62					
STA-1014	18.50					
STA-1024	28.50	3.69	(2) .38	1.50	3.50	1.50
STA-1036	40.50					
STA-1224	28.75					
STA-1236	40.75					
STA-1248	52.75	4.25	(2) .38	2.00	3.75	1.56
STA-1260	64.75					
STA-1272	76.75					
STA-1624	30.50					
STA-1636	42.50					
STA-1648	54.50					
STA-1660	66.50	6.00	(2) .50	2.50	5.25	2.25
STA-1672	78.50					
STA-1684	90.50					



FOUR PASS (FP)

Model	M	N	P NPT	Q NPT	R	S
STA-608	10.88					
STA-614	16.88	2.44	(2) .38	.75	2.81	1.00
STA-624	26.88					
STA-814	17.62					
STA-824	27.62	3.44	(2) .38	.75	2.56	1.06
STA-836	39.62					
STA-1014	18.50					
STA-1024	28.50	3.80	(3) .38	1.00	3.25	1.69
STA-1036	40.50					
STA-1224	29.50					
STA-1236	41.50					
STA-1248	53.50	4.56	(3) .50	1.50	3.75	2.00
STA-1260	65.50					
STA-1272	77.50					
STA-1624	30.75					
STA-1636	42.75					
STA-1648	54.75					
STA-1660	66.75	6.08	(4) .50	2.00	5.25	2.62
STA-1672	78.75					
STA-1684	90.75					

COMMON DIMENSIONS & WEIGHTS

Model	A	B	C	D	E	F	G	H	J NPT	K	L	Approx. Weight	Model
STA-408	2.125	6.25	-	-	-	-	-	-	-	.50	1.69	7	STA-408
STA-608		6.12		5.12								12	STA-608
STA-614	3.125	12.12	4.19	11.12	2.44	3.50	2.50	.38øx.88	(2) .25	1.00	2.44	16	STA-614
STA-624		22.12		21.12								20	STA-624
STA-814		11.12		12.88								37	STA-814
STA-824	4.125	21.12	5.88	22.88	3.50	4.75	3.50	.50øx1.62	(6) .38	1.50	3.12	47	STA-824
STA-836		33.12		34.88								67	STA-836
STA-1014		11.12		11.75								45	STA-1014
STA-1024	5.125	21.12	6.50	21.75	3.75	5.00	4.00	.50øx.88	(6) .38	1.50	3.62	60	STA-1024
STA-1036		33.12		33.75								82	STA-1036
STA-1224		20.50		21.50								90	STA-1224
STA-1236		32.50		33.50								110	STA-1236
STA-1248	6.125	44.50	7.50	45.50	4.12	6.00	5.00	.50øx.88	(6) .38	2.00	4.25	130	STA-1248
STA-1260		56.50		57.50								150	STA-1260
STA-1272		68.50		69.50								180	STA-1272
STA-1624		19.00		20.50								160	STA-1624
STA-1636		31.00		32.50								185	STA-1636
STA-1648		43.00		44.50								205	STA-1648
STA-1660	8.00	55.00	9.75	56.50	5.38	8.25	7.00	.62øx1.12	(6) .38	3.00	5.62	235	STA-1660
STA-1672		67.00		68.50								280	STA-1672
STA-1684		79.00		80.50								320	STA-1684

note: AIHTI reserves the right to make reasonable design changes without notice.

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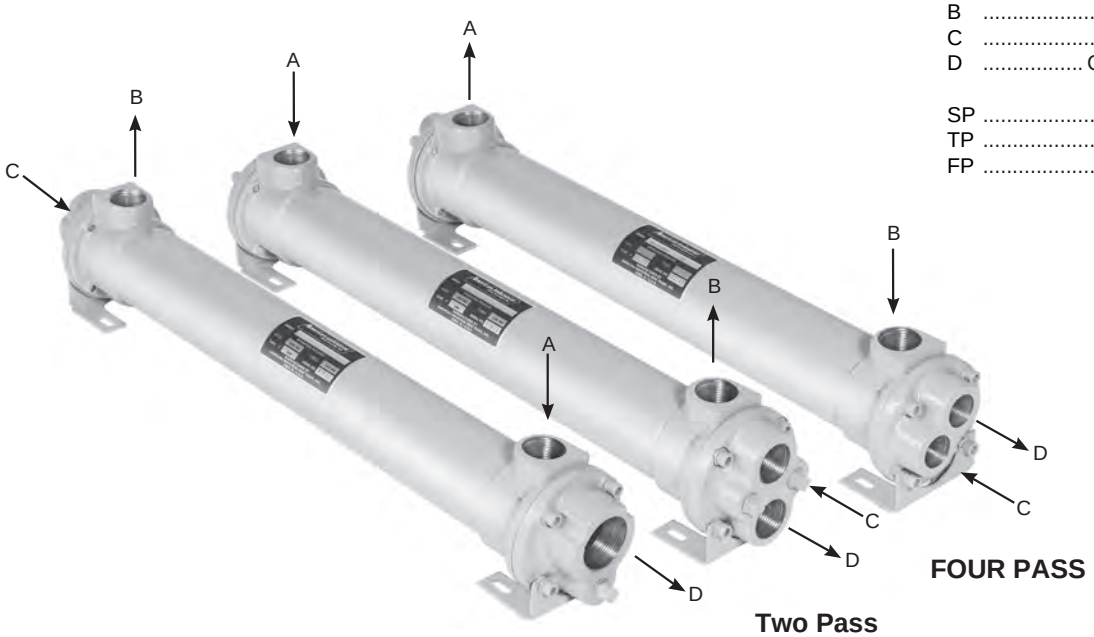
PIPING HOOK-UP

A ..... Hot fluid to be cooled
B ..... Cooled fluid
C ..... Cooling water in
D ..... Cooling water out

SP ..... Single Pass
TP ..... Two Pass
FP .....Four Pass



Receiving / Installation

a) Inspect unit for any shipping damage before uncrating. Indicate all damages to the trucking firms' delivery person, and mark it on the receiving bill before accepting the freight. Make sure that there is no visible damage to the outside surface of the heat exchanger. The published weight information located in this brochure is approximate. True shipment weights are determined at the time of shipping and may vary. Approximate weight information published herein is for engineering approximation purposes and should not be used for exact shipping weight. Since the warranty is based upon the unit date code located on the model identification tags, removal or manipulation of the identification tags will void the manufacturers warranty.

b) When handling the shell & tube heat exchanger, special care should be taken to avoid dropping the unit since mishandling could cause the heat exchanger to crack and leak externally. Mishandling of the unit is not covered under the manufacturers warranty. All units are shipped with partial wood/corrugated cardboard containers for safe handling.

c) Storage: American Industrial heat exchangers are protected against the elements during shipment. If the heat exchanger cannot be installed and put into operation immediately upon receipt, certain precautions are required to prevent deterioration during storage. The responsibility for integrity of the heat exchanger(s) is assumed by the user. American Industrial will not be responsible for damage, corrosion, or other deterioration of the heat exchanger during transit or storage.
Proper storage practices are important when considering the high costs of repair or replacement, and the possible delays for items which require long lead times for manufacture. The following listed practices are provided solely as a convenience to the user, who shall make their own decision on whether to use all or any of them.

1) Heat exchangers not to be placed in immediate service, require precautionary measures to prevent corrosion or contamination.
2) Heat exchangers made of ferrous materials, may be pressure-tested using compressed air at the factory. Residual oil coating on the inside surfaces of the heat exchanger(s) as a result of flushing does not discount the possibility of internal corrosion. Upon receipt, fill the heat exchanger(s) with the appropriate grade of oil or apply a corrosion preventing inhibitor for storage.
3) Corrosion protection compounds for interior surfaces for long term storage or other applications are applied solely at the request of customers. Upon request, American Industrial can provide a customer approved corrosion preventative if available when included in the original purchase order specifications.
4) Remove all dirt, water, ice, or snow and wipe dry before moving heat exchanger(s) into storage. Heat exchangers are generally shipped empty, open drain plugs to remove any accumulated condensation moisture, then reseal. Accumulation of moisture usually indicates corrosion has already started and remedial action should be taken.
5) Store in a covered, environmentally stable area. The ideal storage environment for heat exchangers is in a dry, low-humidity atmosphere which is sealed to prevent the entry of blowing dust, rain, or snow. Maintain in atmospheric temperatures between 70°F and 105°F (Large temperature swings may cause condensation and moisture to form on steel components, threads, shell, etc...) Use thermometers and humidity indicators and maintain the atmosphere at 40% relative humidity, or lower.

d) Standard Enamel Coating: American Industrial provides its standard products with a normal base coat of oil base air cure enamel paint. The enamel paint is applied as a temporary protective and esthetic coating prior to shipment. While the standard enamel coating is durable, American Industrial does not warranty it as a long-term finish coating. It is strongly suggested that a more durable final coating be applied after installation or prior to long-term storage in a corrosive environment to cover any accidental scratches, enhance esthetics, and further prevent corrosion. It is the responsibility of the customer to provide regular maintenance against chips, scratches, etc... and regular touch up maintenance must be provided for long-term benefits and corrosion prevention.

e) Special Coatings: American Industrial offers as customer options, Air-Dry Epoxy, and Heresite (Air-Dry Phenolic) coatings at additional cost. American Industrial offers special coatings upon request, however American Industrial does not warranty coatings to be a permanent solution for any equipment against corrosion. It is the responsibility of the customer to provide regular maintenance against chips, scratches, etc... and regular touch up maintenance must be provided for long-term benefits and corrosion prevention.

f) American Industrial recommends that the equipment supplied should be installed by qualified personnel who have solid understanding of system design, pressure and temperature ratings, and piping assembly. Verify the service conditions of the system prior to applying any shell & tube heat exchanger. If the system pressure or temperature does not fall within the parameters on model rating tag located on the heat exchanger, contact our factory prior to installation or operation.

g) Plan the installation to meet the requirements indicated on the piping installation diagram as illustrated above. It is recommended to put the hot fluid to be cooled through the shell side and the cold fluid through the tube side. The indicated port assembly sequence in the diagram maximizes the performance, and minimizes the possibility of thermal shock. In instances where the fluids are required to be reversed, *hot fluid in the tubes and cold fluid in the shell* the heat exchanger will work with reduced performance. Installation may be vertical or horizontal or a combination thereof. However, the installation must allow for complete draining of the heat exchanger regardless of Single Pass, Two Pass, or four pass construction. Complete drainage is important to prevent the heat exchanger from freezing, over-heating of a fluid, or mineral deposit buildup.
For fixed bundle heat exchangers, provide sufficient clearance at one end to allow for the removal or replacement of tubes. On the opposite end, provide enough space to allow removal of the complete bonnet to provide sufficient clearance to permit tube rolling and cleaning. Allow accessible room for scheduled cleaning as needed. Include thermometer wells and pressure gauge pipe ports in piping to and from the heat exchanger located as close to the heat exchanger as possible. For more information please contact American Industrial.

h) It is recommended to use flexible hose wherever possible to reduce vibration and allow slight movement. However, hoses are not required. Hydraulic carrying lines should be sized to handle the appropriate flow and to meet system pressure drop requirements based upon the systems parameters, and not based upon the units supply and return connection size. We recommend that a low cracking pressure direct acting relief valve be installed at the heat exchanger inlet to protect it from pressure spikes by bypassing oil in the event the system experiences a high flow surge. If preventative filtration is used it should be located ahead of the cooler on both shell and tube side to catch any scale or sludge from the system before it enters the cooler. Failure to install filters ahead of the heat exchanger could lead to possible heat exchanger failure due to high pressure if the system filters plug.

i) Standard shell & tube coolers are built with a rolled tube-sheet construction. However, the differential operating temperature between the entering shell side fluid and the entering tube side fluid should not exceed 150°F. If this condition exists, a severe thermal shock could occur leading to product failure and mixing of the fluids. For applications with a differential temperatures of 150°F or more, we recommend using a series with a floating tube-sheet, u-tube, or expansion joint to reduce the potential for the effects of thermal shock.

j) Water requirements vary from location to location. If the source of cooling water is from other than a municipal water supply, it is recommended that a water strainer be installed ahead of the heat exchanger to prevent dirt and debris from entering and clogging the flow passages. If a water modulating valve is used it is recommended to be installed at the inlet to the cooler to regulate the water flow.

k) For steam service, or other related applications, please consult our engineering department for additional information.

Maintenance
a) Inspect the heat exchanger for loosened bolts, connections, rust spots, corrosion, and for internal or external fluid leakage. Any corroded surfaces should be cleaned and recoated with paint.

b) Shell side: In many cases with clean hydraulic system oils it will not be necessary to flush the interior of the shell side of the cooler. In circumstances where the quality of hydraulic fluid is in question, the shell side should be disconnected and flushed on a yearly basis with a clean flushing oil/solvent to remove any sludge that has been deposited. For severe cases where the unit is plugged and cannot be flushed clean with solvent, the heat exchanger should be replaced to maintain the proper cooling performance.

c) Tube side: In many cases it will be necessary to clean the tube side of the heat exchanger due to poor fluid quality, debris, calcium deposits, corrosion, mud, sludge, seaweed, etc.... To clean the tube side, flush with clean water or any good quality commercial cleaner that does not attack the particular material of construction. With straight tube heat exchangers you can use a rod to carefully push any debris out of the tubes.

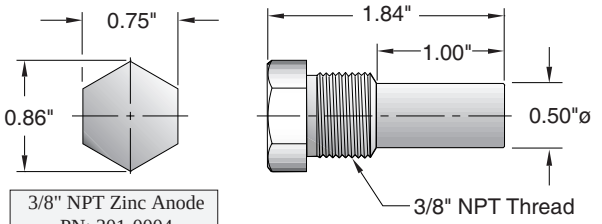
d) Zinc anodes are normally used to reduce the risk of failure due to electrolysis. Zinc anodes are a sacrificial component designed to wear and dissolve through normal use. Normally, zinc anodes are applied to the water supply side of the heat exchanger. Depending upon the amount of corrosive action, one, two, three, or more anodes can be applied to help further reduce the risk of failure. American Industrial Heat Transfer, Inc. offers zinc anodes as an option, to be specified and installed at the request our customers. It is the responsibility of the customer to periodically check and verify the condition of the zinc anode and replace it as needed.

Applications vary due to water chemical makeup and quality, material differences, temperature, flow rate, piping arrangements, and machine grounding. For those reasons, zinc anodes do not follow any scheduled factory predetermined maintenance plan moreover they must be checked routinely by the customer, and a maintenance plan developed based upon the actual wear rate.

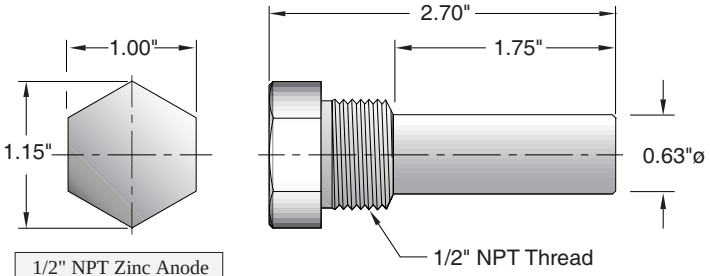
If substantial wear occurs or zinc dissolves without replacement, premature failure or permanent damage may occur to the heat exchanger. American Industrial does not warranty customer applications. It is the responsibility of the customer to verify and apply the proper system materials of construction and overall system requirements. Failures resulting from properly applied or misapplied use of zinc anode(s) into non-specified or specified applications will be the sole responsibility of the customer.

e) A routine maintenance schedule should be developed and adjusted to meet your systems requirements based upon water quality, etc….Failure to regularly maintain and clean your heat exchanger can result in a reduction in operational performance and life expectancy.

Note: *Since applications can vary substantially, the installation and maintenance information contained in this catalog should be used as a basic guideline. The safe installation, maintenance, and use of any American Industrial Heat Transfer, Inc. heat exchanger are solely the responsibility of the user.*



3/8" NPT Zinc Anode PN: 301-0004
AB-400 thru AB-1000 AA-400 thru AA-1000 CS-600 thru CS-1000



1/2" NPT Zinc Anode PN: 301-0003
AB-1200 thru AB-2000 AA-1200 thru AA-1600 CS-1200 thru CS-1700

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website : www.aihti.com
general email : sales@aihti.com
technical email : engineering@aihti.com

Notes:

American Industrial Heat Transfer Inc.
Manufacturer of Quality Heat Exchangers

website : www.aihti.com
general email : sales@aihti.com
technical email : engineering@aihti.com

Shell & Tube Application Request: *(For liquid to liquid heat exchangers)*

Please fill out form as completely as possible.

Email form to: sales@aihti.com or engineering@aihti.com or fax to 434-757-1810

Contact Name _____ Telephone _____ Date _____

Company Name _____ Email _____

Address: _____ Fax _____

_____

Hot Side

Fluid Type _____

If available:

Density _____ lb/ft3
Viscosity _____ cP
Conductivity _____ Btu/hr.ft.°F
Specific Heat _____ Btu/lb.°F

1. Flow Rate _____
2. Temperature In _____
3. Desired Temperature Out _____
4. Heat Load _____

Cold Side

Fluid Type _____

If available:

Density _____ lb/ft3
Viscosity _____ cP
Conductivity _____ Btu/hr.ft.°F
Specific Heat _____ Btu/lb.°F

1. Flow Rate _____
2. Temperature In _____

Maximum Allowable Pressure Drop:

Hot Side _____ Cold Side _____

To properly size the heat exchanger we need 3 of the 4 perameter on the Hot Side and 2 on the Cold Side.

Shell Material Construction:

Brass ☐ Steel ☐ Stainless Steel ☐

Tube Material Construction:

Copper ☐ 90/10 Copper Nickel ☐ Stainless Steel ☐

ASME Code and Certified Yes ☐ No ☐

Require All Stainless Steel Heat Exchanger Yes ☐ No ☐

Comment: _____

_____

_____

FBF SERIES

FOUR
PASS

Fixed Tube Bundle Liquid Cooled

HEAT EXCHANGERS

with code 61 four bolt flange

- Computer generated data sheet available for any application
- Available in single, two, and four pass.
- Operating pressure for tubes 150 PSI.
- Operating pressure for shell 300 PSI.
- Operating temperature 300 °F.
- Can be customized to fit any applications.
- Cools: Fluid power systems, rock crushers, presses, shears, lubrication equipment for paper machinery, gear drives, marine transmissions, etc.

note: AIHTI reserves the right to make reasonable design changes without notice.

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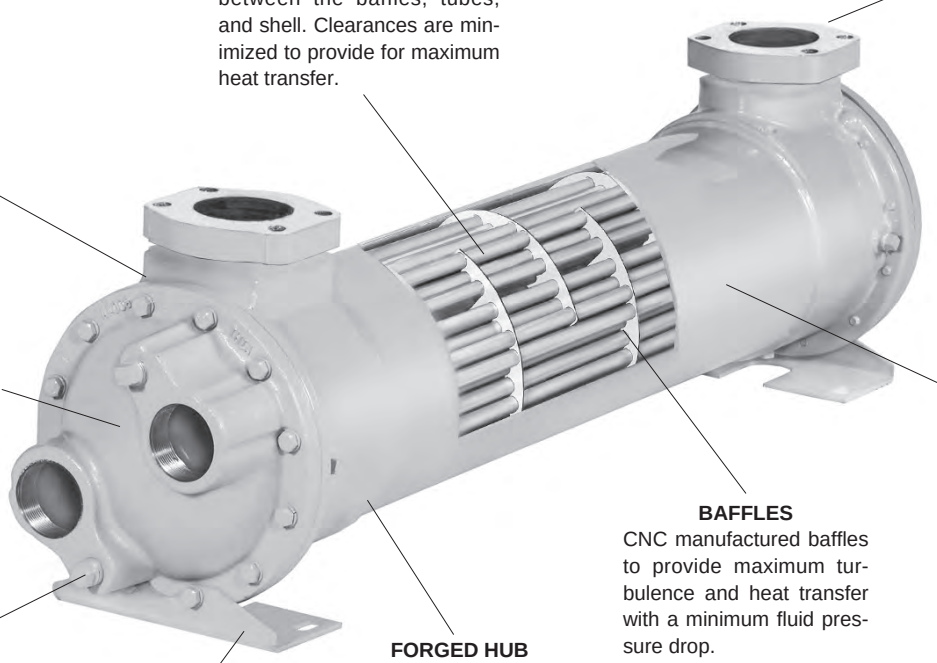
FBF Series *construction*



BUNDLE ASSEMBLY
CNC precision manufactured parts to guarantee a close fit between the baffles, tubes, and shell. Clearances are minimized to provide for maximum heat transfer.

FOUR BOLT FLANGE
SAE Code 61 four bolt flange.

TUBE JOINT
Roller expanded tube joint to integral forged hub.

CAST BONNET
Provides fluid into tubes with minimum restriction. One, two, or four pass interchangeability.

FINISH
Gray semigloss enamel. Can be used as a base for additional coats.

BAFFLES
CNC manufactured baffles to provide maximum turbulence and heat transfer with a minimum fluid pressure drop.

FORGED HUB
Premium quality forging with full opening designed for minimum pressure drop.

DRAIN PORT
Drain ports allow for easy draining of tube side. Optional zinc anode can be inserted in place of plug.

MOUNTING BRACKET
Heavy gauge steel mounting brackets are adjustable in orientations to 360 degrees.

UNIT CODING

Example Model

Options

FBF - 1224 - 4 - 6 - TP - CNT - B - Z

- **Model**: FBF
- **Shell Diameter**: 1000 = 5.13", 1200 = 6.13", 1600 = 8.00"
- **Effective Tube Length** (12" increments)
- **Baffle Spacing Code**: 1.5", 2.0", 3.0", 4.0", 6.0", 8.0"
- **Cooling Tube Diamenter**: 6 = 3/8", 10 = 5/8"
- **Tube Side Passes**: SP = 1 pass, TP = 2 pass, FP = 4 pass
- **Tubing**: Blank = Copper; *Options*: CNT= 90/10 Cu Ni, STS = Stainless Steel
- **End Bonnets**: Blank = Cast Iron; *Options*: B = Bronze, SB = Stainless Steel
- **Zinc Anode**: Z = 1 Zinc Anode, 2Z = 2 Zinc Anode etc.

STANDARD CONSTRUCTION MATERIALS & RATINGS

Standard Model	FBF Series	SFBF Series★	
Shell	Brass	Steel	Operating Pressure Tubes 150 psig Operating Pressure Shell 300 psig Operating Temperature 300 °F
Tubes	Copper	Copper	
Baffle	Brass	Steel	
Integral End Hub	Forged Brass	Forged Brass	
Flanges	Code 61 Steel	Code 61 Steel	
End Bonnets	Cast Iron	Cast Iron	
Mounting Brackets	Steel	Steel	
Gasket	Hypalon Composite	Hypalon Composite	

★Offered in 5" through 8" shell diameter.

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STEP 1: Calculate the heat load

The heat load in BTU/HR or (Q) can be derived by using several methods. To simplify things, we will consider general specifications for hydraulic system oils and other fluids that are commonly used with shell & tube heat exchangers.

Terms

GPM = Gallons Per Minute
CN = Constant Number for a given fluid
△T = Temperature differential across the potential
PSI = Pounds per Square Inch (pressure) of the operating side of the system
MHP = Horsepower of the electric motor driving the hydraulic pump
Kw = Kilowatt (watts x 1000)
T_{in} = Hot fluid entering temperature in °F
T_{out} = Hot fluid exiting temperature in °F
t_{in} = Cold fluid temperature entering in °F
t_{out} = Cold fluid temperature exiting in °F
Q = BTU / HR

For example purposes, a hydraulic system has a 125 HP (93Kw) electric motor installed coupled to a pump that produces a flow of 80 GPM @ 2500 PSIG. The temperature differential of the oil entering the pump *vs* exiting the system is about 5.3°F. Even though our return line pressure operates below 100 psi, we must calculate the system heat load potential (Q) based upon the prime movers (pump) capability. We can use one of the following equations to accomplish this:

To derive the required heat load (Q) to be removed by the heat exchanger, apply ONE of the following. Note: The calculated heat loads may differ slightly from one formula to the next. This is due to assumptions made when estimating heat removal requirements. The factor *(v)* represents the percentage of the overall input energy to be rejected by the heat exchanger. The *(v)* factor is generally about 30% for most hydraulic systems, however it can range from 20%-70% depending upon the installed system components and heat being generated (ie. servo valves, proportional valves, etc…will increase the percentage required).

Formula	Example
A) Q = GPM x CN x actual △T	A) Q =80 x 210 x 5.3°F = 89,040 BTU/HR
B) Q = [(PSI x GPM) / 1714] x (*v*) x 2545	B) Q =[(2500x80)/1714] x .30 x 2545 = 89,090 BTU/HR
	C) Q =125 x .30 x 2545 = 95,347 BTU/HR
C) Q = MHP x (*v*) x 2545	D) Q =28 x 3415 = 95,620 BTU/HR
D) Q = Kw to be removed x 3415	E) Q =37.5 x 2545 = 95,437 BTU/HR
E) Q = HP to be removed x 2545	

Constant for a given fluid (CN)

1) Oil ..... CN = 210
2) Water..... CN = 500
3) 50% E. Glycol..... CN = 450

STEP 2: Calculate the Mean Temperature Difference

When calculating the MTD you will be required to choose a liquid flow rate to derive the Cold Side △T. If your water flow is unknown you may need to assume a number based on what is available. As a normal rule of thumb, for oil to water cooling a 2:1 oil to water ratio is used. For applications of water to water or 50 % Ethylene Glycol to water, a 1:1 ratio is common.

Formula

$$\textbf{HOT FLUID (Oil)}\ \triangle T = \frac{Q}{CN \times GPM}$$

$$\textbf{COLD FLUID (Water)}\ \triangle t = \frac{BTU / hr}{CN \times GPM}$$

Example

$$\triangle T = \frac{89{,}090\ BTU/hr\ \text{(from step 1,item B)}}{210\ CN \times 80GPM} = 5.3°F = \triangle T\ Rejected$$

$$\triangle t = \frac{89{,}090\ BTU/hr}{500\ CN \times 40GPM\ \text{(for a 2:1 ratio)}} = 4.45°F = \triangle T\ Absorbed$$

T_{in} = Hot Fluid entering temperature in degrees F
T_{out} = Hot Fluid exiting temperature in degrees F
t_{in} = Cold Fluid entering temperature in degrees F
t_{out} = Cold Fluid exiting temperature in degrees F

T_{in} = 125.3 °F
T_{out} = 120.0 °F
t_{in} = 700 °F
t_{out} = 74.5 °F

$$\frac{T_{out} - t_{in}}{T_{in} - t_{out}} = \frac{S\text{[smaller temperature difference]}}{L\text{ [larger temperature difference]}} = \left(\frac{S}{L}\right)$$

$$\frac{120.0°F - 70.0°F = 50.0°F}{125.3°F - 74.5°F = 50.8°F} = \frac{50.0°F}{50.8°F} = .984$$

STEP 3: Calculate Log Mean Temperature Difference (LMTD)

To calculate the LMTD please use the following method;

L = Larger temperature difference from step 2.
M = S/L number (LOCATED IN TABLE A).
$LMTD_i$ = L x M
$LMTD_i$ = 50.8 x .992 (FROM TABLE A) = 50.39

To correct the $LMTD_i$ for a multipass heat exchangers calculate **R** & **K** as follows:

Formula

$$\textbf{R} = \frac{T_{in} - T_{out}}{t_{out} - t_{in}}$$

$$\textbf{K} = \frac{t_{out} - t_{in}}{T_{in} - t_{in}}$$

Example

$$\textbf{R} = \frac{125.3°F - 120°F}{74.5°F - 70°F} = \frac{5.3°F}{4.5°F} = \textbf{\{1.17=R\}}$$

$$\textbf{K} = \frac{74.5°F - 70°F}{124.5°F - 70°F} = \frac{4.5°F}{55.4°F} = \textbf{\{0.081=K\}}$$

Locate the correction factor CF_B (FROM TABLE B)
$LMTD_c = LMTD_i \times CF_B$
$LMTD_c$ = 50.39 x 1 = **50.39**

FBF Series *selection*

STEP 4: Calculate the area required

Required Area sq.ft. = $\dfrac{\text{Q (BTU / HR)}}{\text{LMTD}_c \text{ x U (FROM TABLE C)}}$ $\dfrac{89{,}090}{50.39 \text{ x } 100}$ = **17.68 sq.ft.**

STEP 5: Selection

a) From TABLE E choose the correct series size, baffle spacing, and number of passes that best fits your flow rates for both shell and tube side. Note that the tables suggest minimum and maximum information. Try to stay within the 20-80 percent range of the indicated numbers.

Example

Oil Flow Rate = 80 GPM = Series Required from Table E = **1200 Series**
Baffle Spacing from Table E = **4**
Water Flow Rate = 40 GPM = Passes required in 1200 series = **4 (FP)**

b) From TABLE D choose the heat exchanger model size based upon the sq.ft. or surface area in the series size that will accommodate your flow rate.

Example

Required Area = 17.68sq.ft Closest model required based upon sq.ft. & series = **FBF-1224-4-6-FP**

If you require a computer generated data sheet for the application, or if the information that you are trying to apply does not match the corresponding information, please contact our engineering services department for further assistance.

TABLE A- FACTOR M/LMTD = L x M

S/L	M	S/L	M	S/L	M	S/L	M
		.25	.541	.50	.721	.75	.870
.01	.215	.26	.549	.51	.728	.76	.874
.02	.251	.27	.558	.52	.734	.77	.879
.03	.277	.28	.566	.53	.740	.78	.886
.04	.298	.29	.574	.54	.746	.79	.890
.05	.317	.30	.582	.55	.753	.80	.896
.06	.334	.31	.589	.56	.759	.81	.902
.07	.350	.32	.597	.57	.765	.82	.907
.08	.364	.33	.604	.58	.771	.83	.913
.09	.378	.34	.612	.59	.777	.84	.918
.10	.391	.35	.619	.60	.783	.85	.923
.11	.403	.36	.626	.61	.789	.86	.928
.12	.415	.37	.634	.62	.795	.87	.934
.13	.427	.38	.641	.63	.801	.88	.939
.14	.438	.39	.648	.64	.806	.89	.944
.15	.448	.40	.655	.65	.813	.90	.949
.16	.458	.41	.662	.66	.818	.91	.955
.17	.469	.42	.669	.67	.823	.92	.959
.18	.478	.43	.675	.68	.829	.93	.964
.19	.488	.44	.682	.69	.836	.94	.970
.20	.497	.45	.689	.70	.840	.95	.975
.21	.506	.46	.695	.71	.848	.96	.979
.22	.515	.47	.702	.72	.852	.97	.986
.23	.524	.48	.709	.73	.858	.98	.991
.24	.533	.49	.715	.74	.864	.99	.995

TABLE B- LMTD correction factor for Multipass Exchangers

R \ K	.05	.1	.15	.2	.25	.3	.35	.4	.45	.5	.6	.7	.8	.9	1.0
.2	1	1	1	1	1	1	1	.999	.993	.984	.972	.942	.908	.845	.71
.4	1	1	1	1	1	1	.994	.983	.971	.959	.922	.855	.70		
.6	1	1	1	1	1	.992	.980	.965	.948	.923	.840				
.8	1	1	1	1	.995	.981	.965	.945	.916	.872					
1.0	1	1	1	1	.988	.970	.949	.918	.867	.770					
2.0	1	1	.977	.973	.940	.845	.740								
3.0	1	1	.997	.933	.835										
4.0	1	.993	.950	.850											
5.0	1	.982	.917												
6.0	1	.968	.885												
8.0	1	.930													
10.0	.996	.880													
12.0	.985	.720													
14.0	.972														
16.0	.958														
18.0	.940														
20.0	.915														

TABLE D- Surface Area

Model Number	Surface Area in Sq. ft.	
	3/8" O.D. Tubing	5/8" O.D. Tubing
FBF-1014	9.1	4.6
FBF-1024	16.0	7.8
FBF-1036	24.0	11.8
FBF-1048	32.0	15.8
FBF-1224	23.6	11.8
FBF-1236	35.3	17.7
FBF-1248	47.1	23.6
FBF-1260	58.9	29.5
FBF-1272	70.6	35.4
FBF-1624	41.0	23.6
FBF-1636	62.0	35.3
FBF-1648	82.0	47.1
FBF-1660	103.0	58.9
FBF-1672	124.0	70.7
FBF-1684	145.0	82.5

TABLE E- Flow Rate for Shell & Tube

Shell dia . Code	Max. liquid Flow - Shell Side Baffle Spacing					Liquid Flow - Tube Side SP		TP		FP	
	1.5	2	3	4	6	Min.	Max.	Min.	Max.	Min.	Max.
1000	24	35	60	70	–	20	120	10	70	5.0	37
1200	35	45	70	100	120	30	220	15	112	7.5	56
1600	38	70	150	200	220	57	300	29	180	14	90

TABLE C

U	TUBE FLUID	SHELL FLUID
400	Water	Water
350	Water	50% E. Glycol
100	Water	Oil
300	50% E. Glycol	50% E. Glycol
90	50% E. Glycol	Oil

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Instructions

The selection chart provided contains an array of popular sizes for quick sizing. It does not provide curves for all models available. Refer to page 34 & 35 for detailed calculation information.

Computer selection data sheets for standard or special models are available through the engineering department of American Industrial. To use the followings graphs correctly, refer to the instruction notes "1-5".

1) HP Curves are based upon a 40°F approach temperature; for example: oil leaving a cooler at 125°F, using 85°F cooling water (125°F – 85°F = 40°F).

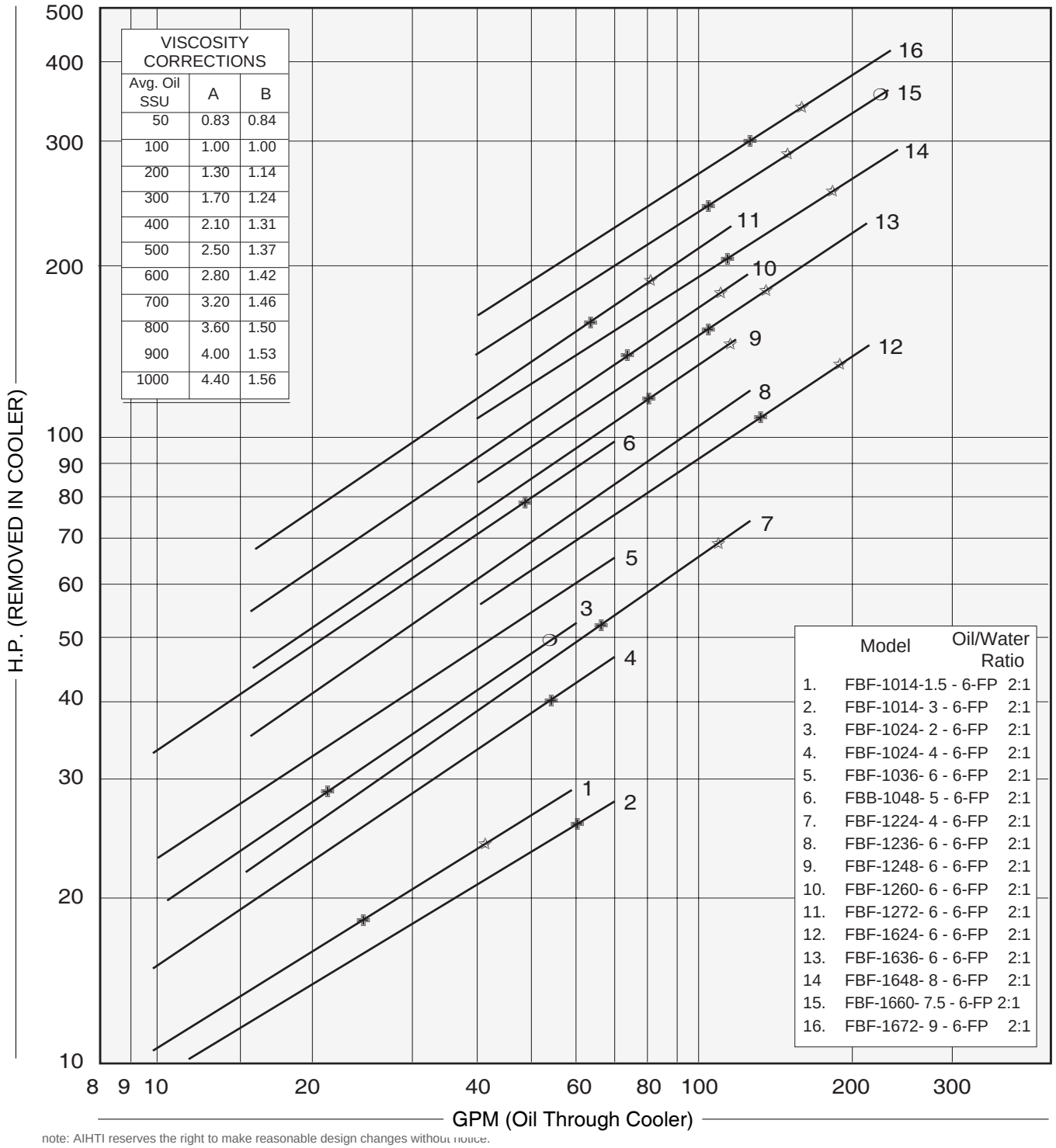
2) The oil to water ratio of 1:1 or 2:1 means that for every 1 gallon of oil circulated, a minimum of 1 or 1/2 gallon (respectively) of 85°F water must be circulated to match the curve results.

3) OIL PRESSURE DROP CODING: ✙ = 5 psi; ☆= 10 psi; ❍ = 20 psi; △ = 50psi. Curves that have no pressure drop code symbols indicate that the oil pressure drop is less than 5 psi for the flow rate shown.

4) Pressure Drop is based upon oil with an average viscosity of 100 SSU. If the average oil viscosity is other than 100 SSU, then multiply the indicated Pressure Drop by the corresponding value from corrections table A.

5) Corrections for approach temperature and oil viscosity are as follows:

$$H.P._{\text{Removed In Cooler}} = H.P._{\text{Actual Heat Load}} \times \left(\frac{40}{\text{Actual Approach}}\right) \times B.$$



note: AIHTI reserves the right to make reasonable design changes without notice.

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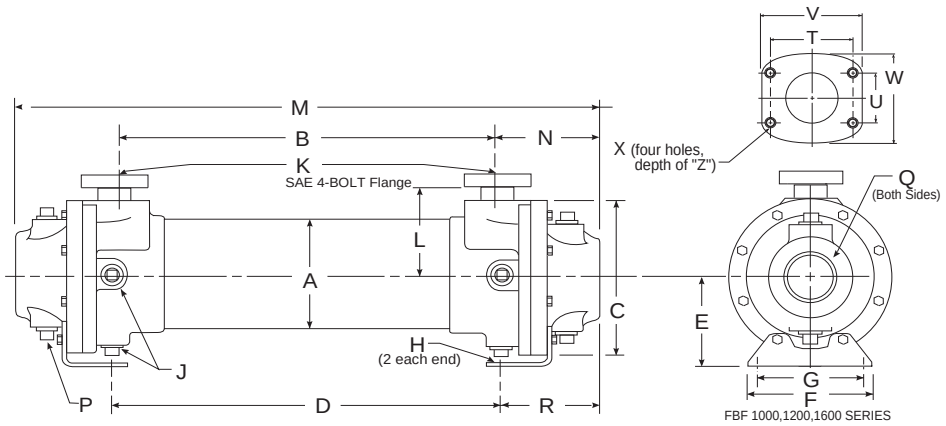
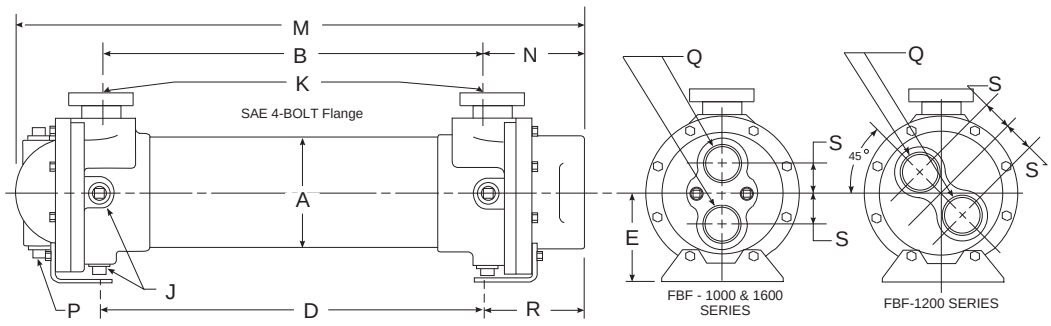
FBF Series *dimensions*

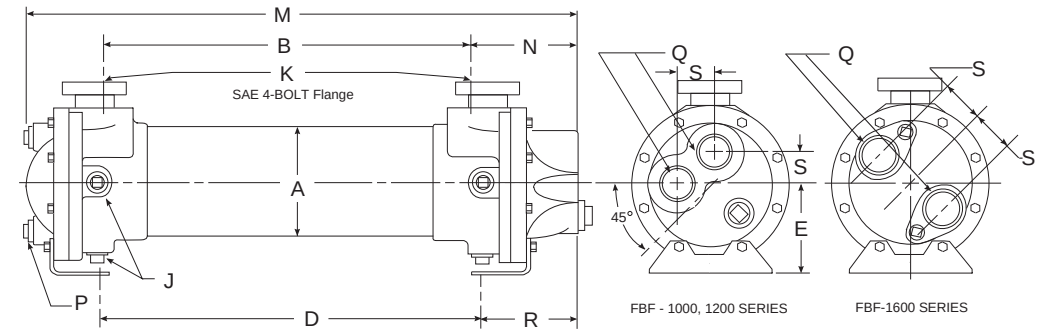


SINGLE PASS (SP)

Model	M	N	P NPT	Q NPT	R	S
1014	18.50	3.69	(4) .38	2.00	3.38	-
1024	28.50					
1036	40.50					
1048	52.50					
1224	29.25	4.25	(4) .38	3.00	3.75	-
1236	41.25					
1248	53.25					
1260	65.25					
1272	77.25					
1624	32.25	6.52	(4) .50	4.00	5.25	-
1636	43.25					
1648	55.25					
1660	67.25					
1672	79.25					
1684	91.25					



Model	M	N	P NPT	Q NPT	R	S
1014	18.50	3.69	(2) .38	1.50	3.50	1.50
1024	28.50					
1036	40.50					
1048	52.50					
1224	28.75	4.25	(2) .38	2.00	3.75	1.56
1236	40.75					
1248	52.75					
1260	64.75					
1272	76.75					
1624	30.50	6.00	(2) .50	2.50	5.25	2.25
1636	42.50					
1648	54.50					
1660	66.50					
1672	78.50					
1684	90.50					



FOUR PASS (FP)

Model	M	N	P NPT	Q NPT	R	S
1014	18.50	3.80	(3) .38	1.00	3.25	1.69
1024	28.50					
1036	40.50					
1048	52.50					
1224	29.50	4.56	(3) .50	1.50	3.75	2.00
1236	41.50					
1248	53.50					
1260	65.50					
1272	77.50					
1624	30.75	6.08	(4) .50	2.00	5.25	2.62
1636	42.75					
1648	54.75					
1660	66.75					
1672	78.75					
1684	90.75					

COMMON DIMENSIONS & WEIGHTS

Model	A	B	C	D	E	F	G	H	J NPT	K SAE	L	T	U	V	W	X	Z	Approx. Weight
FBF-1014	5.13	11.12	6.50	11.75	3.75	5.00	4.00	.50øx.88	(6) .38	1.50 SAE Four Bolt Flange	4.62	2.75	1.41	3.68	2.75	1/2-13	.75	45
FBF-1024		21.12		21.75														60
FBF-1036		33.12		33.75														82
FBF-1048		45.12		45.75														94
FBF-1224	6.13	20.50	7.50	21.50	4.12	6.00	5.00	.50øx.88	(6) .38	2.00 SAE Four Bolt Flange	5.25	3.06	1.69	4.00	3.31	1/2-13	.75	90
FBF-1236		32.50		33.50														110
FBF-1248		44.50		45.50														130
FBF-1260		56.50		57.50														150
FBF-1272		68.50		69.50														170
FBF-1624	8.00	19.00	9.75	20.50	5.38	8.25	7.00	.62øx1.12	(6) .38	3.00 SAE Four Bolt Flange	6.62	4.19	2.44	5.31	4.69	5/8-11	.88	160
FBF-1636		31.00		32.50														185
FBF-1648		43.00		44.50														235
FBF-1660		55.00		56.50														265
FBF-1672		67.00		68.50														296
FBF-1684		79.00		80.50														330

note: AIHTI reserves the right to make reasonable design changes without notice.

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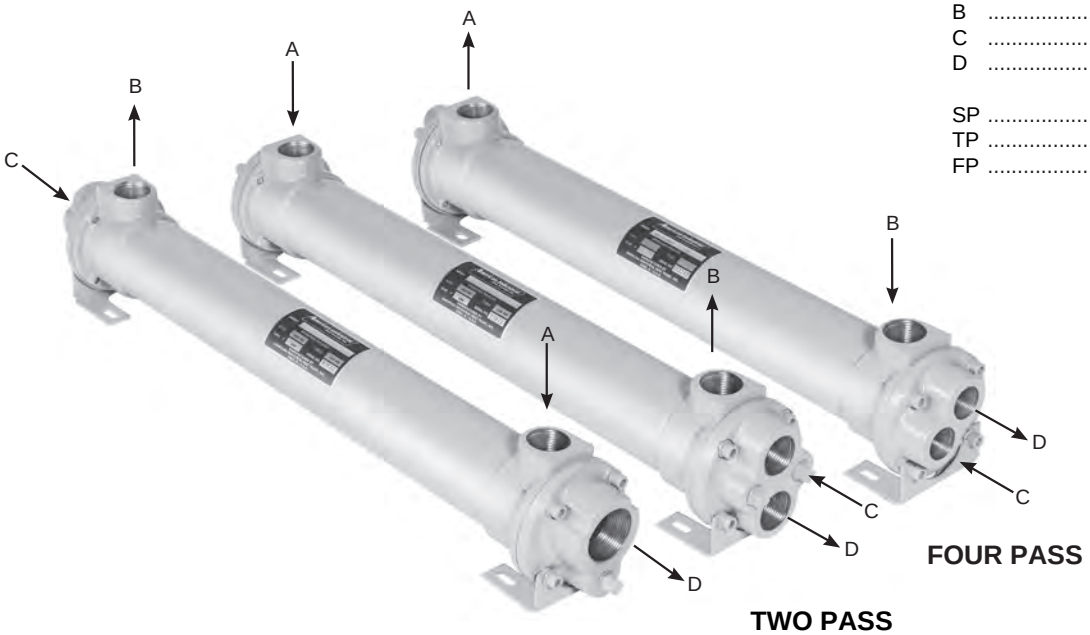
PIPING HOOK-UP

A ..... Hot fluid to be cooled
B ..... Cooled fluid
C ..... Cooling water in
D ..... Cooling water out

SP ..... Single Pass
TP ..... Two Pass
FP .....Four Pass



FOUR PASS

TWO PASS

ONE PASS

Receiving / Installation

a) Inspect unit for any shipping damage before uncrating. Indicate all damages to the trucking firms' delivery person, and mark it on the receiving bill before accepting the freight. Make sure that there is no visible damage to the outside surface of the heat exchanger. The published weight information located in this brochure is approximate. True shipment weights are determined at the time of shipping and may vary. Approximate weight information published herein is for engineering approximation purposes and should not be used for exact shipping weight. Since the warranty is based upon the unit date code located on the model identification tags, removal or manipulation of the identification tags will void the manufacturers warranty.

b) When handling the shell & tube heat exchanger, special care should be taken to avoid dropping the unit since mishandling could cause the heat exchanger to crack and leak externally. Mishandling of the unit is not covered under the manufacturers warranty. All units are shipped with partial wood/corrugated cardboard containers for safe handling.

c) Storage: American Industrial heat exchangers are protected against the elements during shipment. If the heat exchanger cannot be installed and put into operation immediately upon receipt, certain precautions are required to prevent deterioration during storage. The responsibility for integrity of the heat exchanger(s) is assumed by the user. American Industrial will not be responsible for damage, corrosion, or other deterioration of the heat exchanger during transit or storage.
Proper storage practices are important when considering the high costs of repair or replacement, and the possible delays for items which require long lead times for manufacture. The following listed practices are provided solely as a convenience to the user, who shall make their own decision on whether to use all or any of them.

1) Heat exchangers not to be placed in immediate service, require precautionary measures to prevent corrosion or contamination.
2) Heat exchangers made of ferrous materials, may be pressure-tested using compressed air at the factory. Residual oil coating on the inside surfaces of the heat exchanger(s) as a result of flushing does not discount the possibility of internal corrosion. Upon receipt, fill the heat exchanger(s) with the appropriate grade of oil or apply a corrosion preventing inhibitor for storage.
3) Corrosion protection compounds for interior surfaces for long term storage or other applications are applied solely at the request of customers. Upon request, American Industrial can provide a customer approved corrosion preventative if available when included in the original purchase order specifications.
4) Remove all dirt, water, ice, or snow and wipe dry before moving heat exchanger(s) into storage. Heat exchangers are generally shipped empty, open drain plugs to remove any accumulated condensation moisture, then reseal. Accumulation of moisture usually indicates corrosion has already started and remedial action should be taken.
5) Store in a covered, environmentally stable area. The ideal storage environment for heat exchangers is in a dry, low-humidity atmosphere which is sealed to prevent the entry of blowing dust, rain, or snow. Maintain in atmospheric temperatures between 70°F and 105°F (Large temperature swings may cause condensation and moisture to form on steel components, threads, shell, etc...) Use thermometers and humidity indicators and maintain the atmosphere at 40% relative humidity, or lower.

d) Standard Enamel Coating: American Industrial provides its standard products with a normal base coat of oil base air cure enamel paint. The enamel paint is applied as a temporary protective and esthetic coating prior to shipment. While the standard enamel coating is durable, American Industrial does not warranty it as a long-term finish coating. It is strongly suggested that a more durable final coating be applied after installation or prior to long-term storage in a corrosive environment to cover any accidental scratches, enhance esthetics, and further prevent corrosion. It is the responsibility of the customer to provide regular maintenance against chips, scratches, etc... and regular touch up maintenance must be provided for long-term benefits and corrosion prevention.

e) Special Coatings: American Industrial offers as customer options, Air-Dry Epoxy, and Heresite (Air-Dry Phenolic) coatings at additional cost. American Industrial offers special coatings upon request, however American Industrial does not warranty coatings to be a permanent solution for any equipment against corrosion. It is the responsibility of the customer to provide regular maintenance against chips, scratches, etc... and regular touch up maintenance must be provided for long-term benefits and corrosion prevention.

f) American Industrial recommends that the equipment supplied should be installed by qualified personnel who have solid understanding of system design, pressure and temperature ratings, and piping assembly. Verify the service conditions of the system prior to applying any shell & tube heat exchanger. If the system pressure or temperature does not fall within the parameters on model rating tag located on the heat exchanger, contact our factory prior to installation or operation.

g) Plan the installation to meet the requirements indicated on the piping installation diagram as illustrated above. It is recommended to put the

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hot fluid to be cooled through the shell side and the cold fluid through the tube side. The indicated port assembly sequence in the diagram maximizes the performance, and minimizes the possibility of thermal shock. In instances where the fluids are required to be reversed, *hot fluid in the tubes and cold fluid in the shell* the heat exchanger will work with reduced performance. Installation may be vertical or horizontal or a combination thereof. However, the installation must allow for complete draining of the heat exchanger regardless of single pass, two pass, or four pass construction. Complete drainage is important to prevent the heat exchanger from freezing, over-heating of a fluid, or mineral deposit buildup.
For fixed bundle heat exchangers, provide sufficient clearance at one end to allow for the removal or replacement of tubes. On the opposite end, provide enough space to allow removal of the complete bonnet to provide sufficient clearance to permit tube rolling and cleaning. Allow accessible room for scheduled cleaning as needed. Include thermometer wells and pressure gauge pipe ports in piping to and from the heat exchanger located as close to the heat exchanger as possible. For more information please contact American Industrial.

h) It is recommended to use flexible hose wherever possible to reduce vibration and allow slight movement. However, hoses are not required. Hydraulic carrying lines should be sized to handle the appropriate flow and to meet system pressure drop requirements based upon the systems parameters, and not based upon the units supply and return connection size. We recommend that a low cracking pressure direct acting relief valve be installed at the heat exchanger inlet to protect it from pressure spikes by bypassing oil in the event the system experiences a high flow surge. If preventative filtration is used it should be located ahead of the cooler on both shell and tube side to catch any scale or sludge from the system before it enters the cooler. Failure to install filters ahead of the heat exchanger could lead to possible heat exchanger failure due to high pressure if the system filters plug.

i) Standard shell & tube coolers are built with a rolled tube-sheet construction. However, the differential operating temperature between the entering shell side fluid and the entering tube side fluid should not exceed 150°F. If this condition exists, a severe thermal shock could occur leading to product failure and mixing of the fluids. For applications with a differential temperatures of 150°F or more, we recommend using a series with a floating tube-sheet, u-tube, or expansion joint to reduce the potential for the effects of thermal shock.

j) Water requirements vary from location to location. If the source of cooling water is from other than a municipal water supply, it is recommended that a water strainer be installed ahead of the heat exchanger to prevent dirt and debris from entering and clogging the flow passages. If a water modulating valve is used it is recommended to be installed at the inlet to the cooler to regulate the water flow.

k) For steam service, or other related applications, please consult our engineering department for additional information.

Maintenance
a) Inspect the heat exchanger for loosened bolts, connections, rust spots, corrosion, and for internal or external fluid leakage. Any corroded surfaces should be cleaned and recoated with paint.

b) Shell side: In many cases with clean hydraulic system oils it will not be necessary to flush the interior of the shell side of the cooler. In circumstances where the quality of hydraulic fluid is in question, the shell side should be disconnected and flushed on a yearly basis with a clean flushing oil/solvent to remove any sludge that has been deposited. For severe cases where the unit is plugged and cannot be flushed clean with solvent, the heat exchanger should be replaced to maintain the proper cooling performance.

c) Tube side: In many cases it will be necessary to clean the tube side of the heat exchanger due to poor fluid quality, debris, calcium deposits, corrosion, mud, sludge, seaweed, etc.... To clean the tube side, flush with clean water or any good quality commercial cleaner that does not attack the particular material of construction. With straight tube heat exchangers you can use a rod to carefully push any debris out of the tubes.

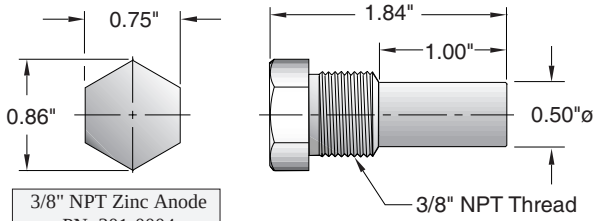
d) Zinc anodes are normally used to reduce the risk of failure due to electrolysis. Zinc anodes are a sacrificial component designed to wear and dissolve through normal use. Normally, zinc anodes are applied to the water supply side of the heat exchanger. Depending upon the amount of corrosive action, one, two, three, or more anodes can be applied to help further reduce the risk of failure. American Industrial Heat Transfer, Inc. offers zinc anodes as an option, to be specified and installed at the request our customers. It is the responsibility of the customer to periodically check and verify the condition of the zinc anode and replace it as needed.

Applications vary due to water chemical makeup and quality, material differences, temperature, flow rate, piping arrangements, and machine grounding. For those reasons, zinc anodes do not follow any scheduled factory predetermined maintenance plan moreover they must be checked routinely by the customer, and a maintenance plan developed based upon the actual wear rate.

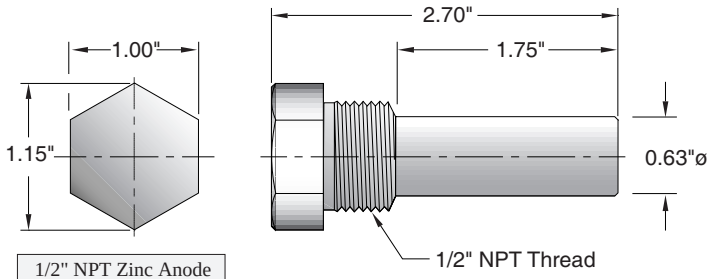
If substantial wear occurs or zinc dissolves without replacement, premature failure or permanent damage may occur to the heat exchanger. American Industrial does not warranty customer applications. It is the responsibility of the customer to verify and apply the proper system materials of construction and overall system requirements. Failures resulting from properly applied or misapplied use of zinc anode(s) into non-specified or specified applications will be the sole responsibility of the customer.

e) A routine maintenance schedule should be developed and adjusted to meet your systems requirements based upon water quality, etc.... Failure to regularly maintain and clean your heat exchanger can result in a reduction in operational performance and life expectancy.

Note: *Since applications can vary substantially, the installation and maintenance information contained in this catalog should be used as a basic guideline. The safe installation, maintenance, and use of any American Industrial Heat Transfer, Inc. heat exchanger are solely the responsibility of the user.*



3/8" NPT Zinc Anode PN: 301-0004
AB-400 thru AB-1000 AA-400 thru AA-1000 CS-600 thru CS-1000



1/2" NPT Zinc Anode PN: 301-0003
AB-1200 thru AB-2000 AA-1200 thru AA-1600 CS-1200 thru CS-1700

website : www.aihti.com
general email : sales@aihti.com
technical email : engineering@aihti.com

Notes:

American Industrial Heat Transfer Inc.
Manufacturer of Quality Heat Exchangers

website : www.aihti.com
general email : sales@aihti.com
technical email : engineering@aihti.com

Shell & Tube Application Request: *(For liquid to liquid heat exchangers)*

Please fill out form as completely as possible.

Email form to: sales@aihti.com or engineering@aihti.com or fax to 434-757-1810

Contact Name _____ Telephone _____ Date _____

Company Name _____ Email _____

Address: _____ Fax _____

_____

Hot Side

Fluid Type _____

If available:

Density _____ lb/ft3
Viscosity _____ cP
Conductivity _____ Btu/hr.ft.°F
Specific Heat _____ Btu/lb.°F

1. Flow Rate _____
2. Temperature In _____
3. Desired Temperature Out _____
4. Heat Load _____

Cold Side

Fluid Type _____

If available:

Density _____ lb/ft3
Viscosity _____ cP
Conductivity _____ Btu/hr.ft.°F
Specific Heat _____ Btu/lb.°F

1. Flow Rate _____
2. Temperature In _____

Maximum Allowable Pressure Drop:

Hot Side _____ Cold Side _____

To properly size the heat exchanger we need 3 of the 4 perameter on the Hot Side and 2 on the Cold Side.

Shell Material Construction:

Brass ☐ Steel ☐ Stainless Steel ☐

Tube Material Construction:

Copper ☐ 90/10 Copper Nickel ☐ Stainless Steel ☐

ASME Code and Certified Yes ☐ No ☐

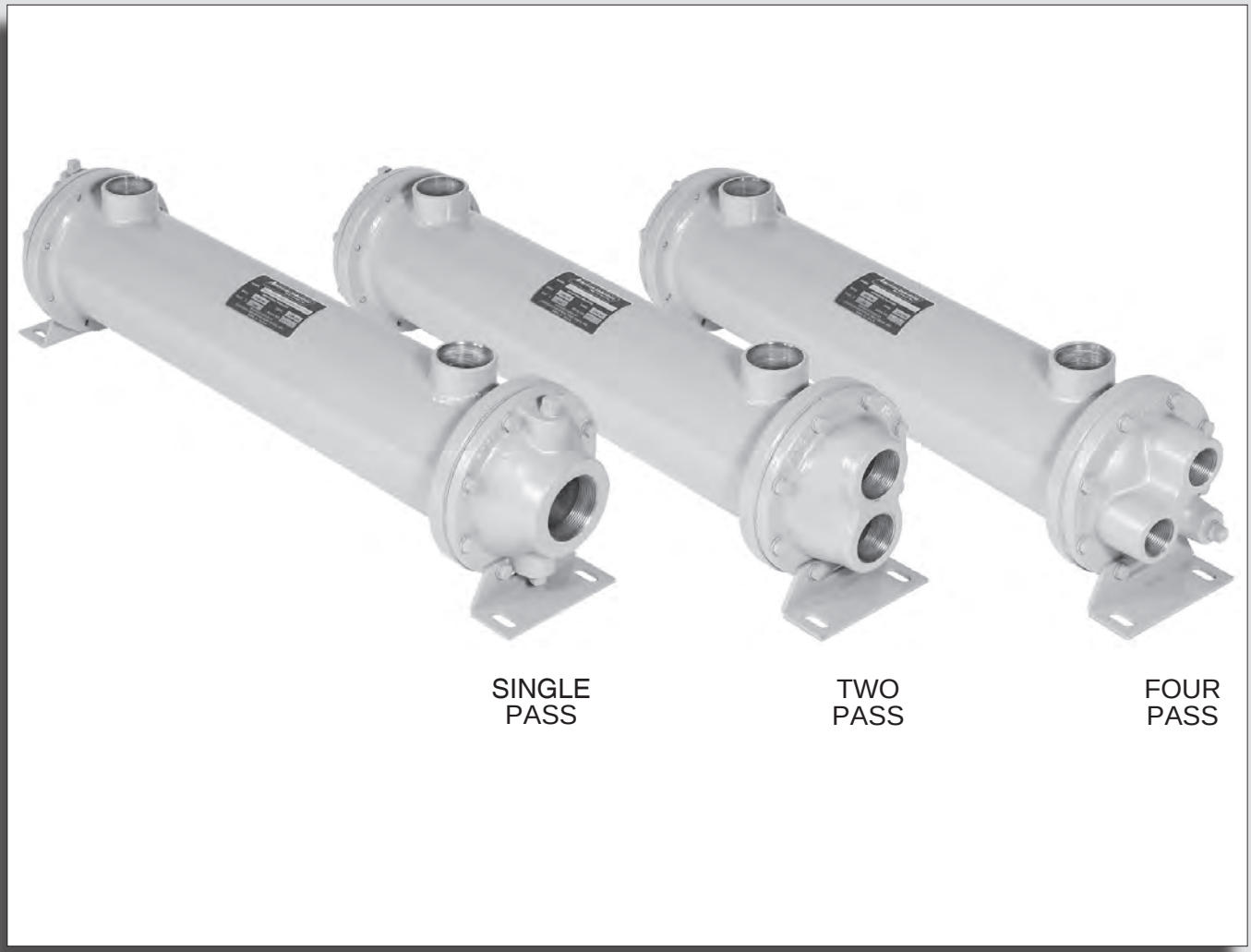
Require All Stainless Steel Heat Exchanger Yes ☐ No ☐

Comment: _____

_____

_____

CS SERIES



SINGLE PASS | TWO PASS | FOUR PASS

Fixed Tube Bundle / Liquid Cooled

HEAT EXCHANGERS

- Computer generated data sheet available for any application
- Steel or stainless steel construction.
- Operating pressure for tubes 150 PSI
- Operating pressure for shell 300 PSI.
- Operating temperature 300 °F.
- Can be customized to fit any applications.
- Cools: Fluid power systems, rock crushers, presses, shears, lubrication equipment for paper machinery, gear drives, marine transmissions, etc.
- As an option, available in ASME code and certified

note: AIHTI reserves the right to make reasonable design changes without notice.

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CS & STC Series *overview*

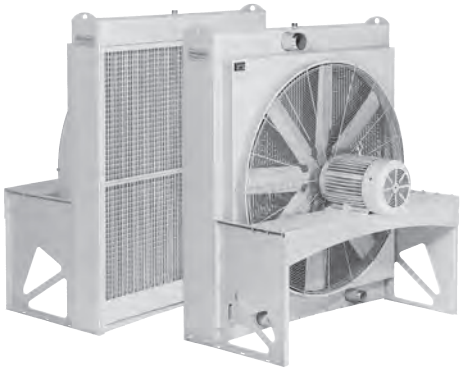
CS SERIES

Fixed tube construction heat exchangers with NPT connections. Made of steel with copper cooling tubes and cast iron end bonnets. Standard sizes from 3" through 8" diameters. Standard one, two, and four pass models are available. Options include 90/10 copper nickel and 316 stainless steel cooling tube, and zinc anodes. Can be customized to fit your requirements.

STC SERIES

Similar in design to CS series with fixed tube construction and NPT connections made of 316 stainless steel. Standard sizes from 3" through 8" diameters. Standard one, two, and four pass models are available. Larger diameter units available upon request. Can be customized to fit your requirements.

AC-ACF-ACHM Series



AOCS Series

ACL Series

EOC - EOCF Series

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CAST BONNET
Provides fluid into tubes with minimum restriction. One, two, or four pass interchangeability.

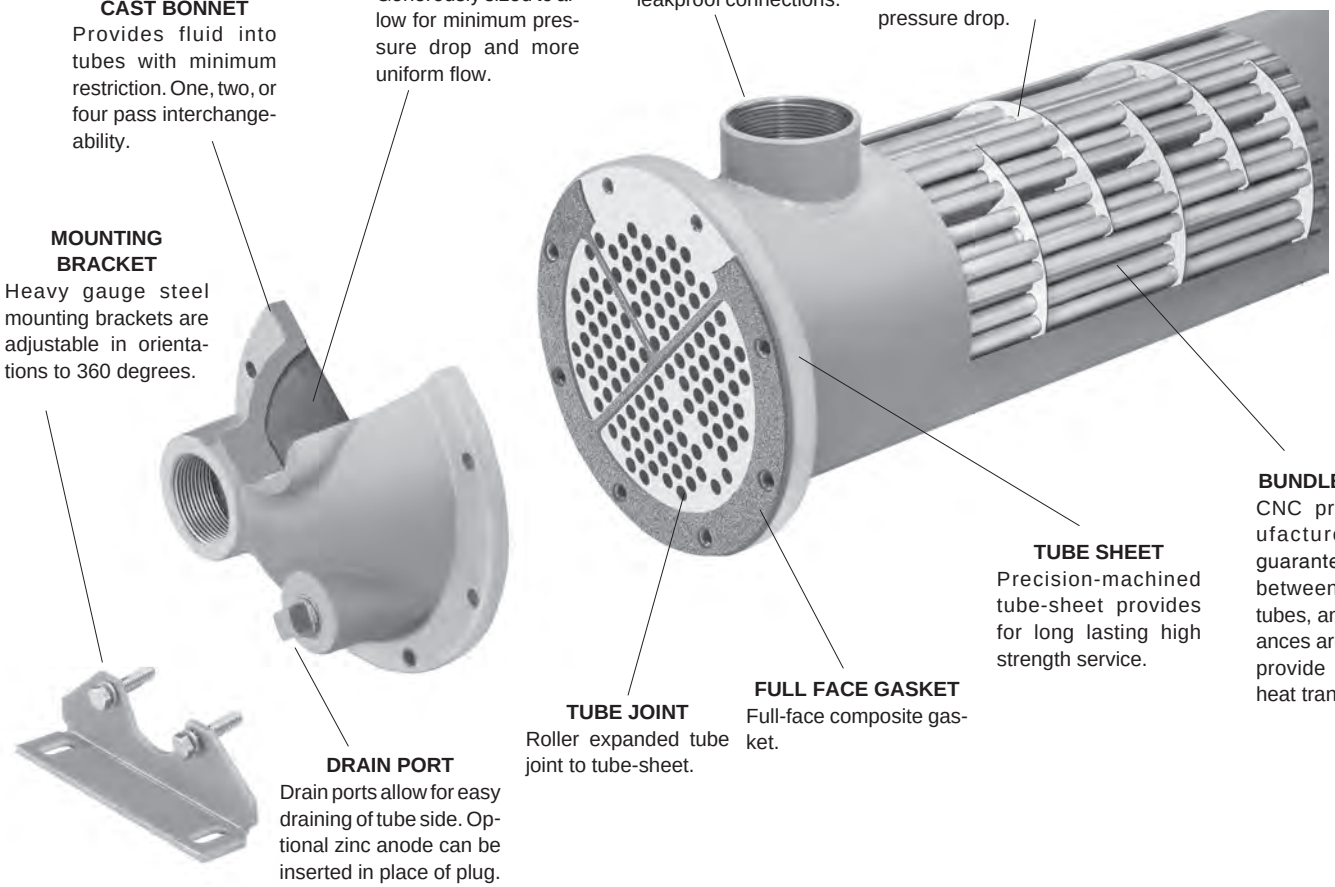
FLOW CAVITY
Generously sized to allow for minimum pressure drop and more uniform flow.

THREAD
CNC precision threading to provide accurate leakproof connections.

BAFFLES
CNC manufactured baffles to provide maximum turbulence and heat transfer with a minimum fluid pressure drop.

FINISH
Gray semi-gloss enamel. Can be used as a base for additional coats.

MOUNTING BRACKET
Heavy gauge steel mounting brackets are adjustable in orientations to 360 degrees.



TUBE SHEET
Precision-machined tube-sheet provides for long lasting high strength service.

BUNDLE ASSEMBLY
CNC precision manufactured parts to guarantee a close fit between the baffles, tubes, and shell. Clearances are minimized to provide for maximum heat transfer.

TUBE JOINT
Roller expanded tube joint to tube-sheet.

FULL FACE GASKET
Full-face composite gasket.

DRAIN PORT
Drain ports allow for easy draining of tube side. Optional zinc anode can be inserted in place of plug.

UNIT CODING

Example Model

Options

CS - 1224 - 4 - 6 - TP - CNT - B - Z

- **Model**: CS, STC
- **Shell Diameter**: 600 = 3.25", 800 = 4.25", 1000 = 5.25", 1200 = 6.25", 1700 = 8.00"
- **Effective Tube Length** (12" increments)
- **Baffle Spacing Code**: 1.5", 2.0", 3.0", 4.0", 6.0", 8.0"
- **Cooling Tube Diamenter**: 6 = 3/8", 10 = 5/8"
- **Tube Side Passes**: SP = 1 pass, TP = 2 pass, FP = 4 pass
- **Tubing**: Blank = Copper; *Options*: CNT= 90/10 Cu Ni, STS = Stainless Steel, C = Carbon Steel
- **End Bonnets**: Blank = Cast Iron; *Options*: B = Bronze
- **Zinc Anode**: Z = 1 Zinc Anode, 2Z = 2 Zinc Anode etc.

Standard Model	CS Series	STC Series	Standard Unit Ratings
Shell	Steel	316 Stainless Steel	Operating Pressure Tubes 150 psig Operating Pressure Shell 300 psig Operating Temperature 300 °F
Tubes	Copper	316 Stainless Steel	
Baffle	Steel	316 Stainless Steel	
Tube Sheet	Steel	316 Stainless Steel	
End Bonnets	Cast Iron	316 Stainless Steel	
Mounting Brackets	Steel	Steel	
Gasket	Hypalon Composite	Hypalon Composite	

note: AIHTI reserves the right to make reasonable design changes without notice.

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STEP 1: Calculate the heat load

The heat load in BTU/HR or (Q) can be derived by using several methods. To simplify things, we will consider general specifications for hydraulic system oils and other fluids that are commonly used with shell & tube heat exchangers.

Terms

GPM = Gallons Per Minute
CN = Constant Number for a given fluid
△T = Temperature differential across the potential
PSI = Pounds per Square Inch (pressure) of the operating side of the system
MHP = Horsepower of the electric motor driving the hydraulic pump
Kw = Kilowatt (watts x 1000)
T_{in} = Hot fluid entering temperature in °F
T_{out} = Hot fluid exiting temperature in °F
t_{in} = Cold fluid temperature entering in °F
t_{out} = Cold fluid temperature exiting in °F
Q = BTU / HR

For example purposes, a hydraulic system has a 125 HP (93Kw) electric motor installed coupled to a pump that produces a flow of 80 GPM @ 2500 PSIG. The temperature differential of the oil entering the pump *vs* exiting the system is about 5.3°F. Even though our return line pressure operates below 100 psi, we must calculate the system heat load potential (Q) based upon the prime movers (pump) capability. We can use one of the following equations to accomplish this:

To derive the required heat load (Q) to be removed by the heat exchanger, apply ONE of the following. Note: The calculated heat loads may differ slightly from one formula to the next. This is due to assumptions made when estimating heat removal requirements. The factor *(v)* represents the percentage of the overall input energy to be rejected by the heat exchanger. The *(v)* factor is generally about 30% for most hydraulic systems, however it can range from 20%-70% depending upon the installed system components and heat being generated (ie. servo valves, proportional valves, etc…will increase the percentage required).

Formula	Example
A) Q = GPM x CN x actual △T	A) Q =80 x 210 x 5.3°F = 89,040 BTU/HR
B) Q = [(PSI x GPM) / 1714] x (*v*) x 2545	B) Q =[(2500x80)/1714] x .30 x 2545 = 89,090 BTU/HR
C) Q = MHP x (*v*) x 2545	C) Q =125 x .30 x 2545 = 95,347 BTU/HR
D) Q = Kw to be removed x 3415	D) Q =28 x 3415 = 95,620 BTU/HR
E) Q = HP to be removed x 2545	

Constant for a given fluid (CN)

1) Oil ..... CN = 210
2) Water..... CN = 500
3) 50% E. Glycol..... CN = 450

STEP 2: Calculate the Mean Temperature Difference

When calculating the MTD you will be required to choose a liquid flow rate to derive the Cold Side △T. If your water flow is unknown you may need to assume a number based on what is available. As a normal rule of thumb, for oil to water cooling a 2:1 oil to water ratio is used. For applications of water to water or 50 % Ethylene Glycol to water, a 1:1 ratio is common.

Formula

$$\textbf{HOT FLUID Oil } \triangle T = \frac{Q}{CN \times GPM}$$

Example

$$\triangle T = \frac{89{,}090 \text{ BTU/hr (from step 1,item B)}}{210 \text{ CN} \times 80\text{GPM}} = 5.3°F = \triangle T \text{ Rejected}$$

$$\textbf{COLD FLUID Water } \triangle t = \frac{\text{BTU / hr}}{CN \times GPM}$$

$$\triangle t = \frac{89{,}090 \text{ BTU/hr}}{500 \text{ CN} \times 40\text{GPM (for a 2:1 ratio)}} = 4.45°F = \triangle T \text{ Absorbed}$$

T_{in} = Hot Fluid entering temperature in degrees F — T_{in} = 125.3 °F
T_{out} = Hot Fluid exiting temperature in degrees F — T_{out} = 120.0 °F
t_{in} = Cold Fluid entering temperature in degrees F — t_{in} = 70.0 °F
t_{out} = Cold Fluid exiting temperature in degrees F — t_{out} = 74.5 °F

$$\frac{T_{out} - t_{in}}{T_{in} - t_{out}} = \frac{\textbf{S}[\text{smaller temperature difference}]}{\textbf{L}\ [\text{larger temperature difference}]} = \left(\frac{S}{L}\right)$$

$$\frac{120.0°F - 70.0°F = 50.0°F}{125.3°F - 74.5°F = 50.8°F} = \frac{50.0°F}{50.8°F} = .984$$

STEP 3: Calculate Log Mean Temperature Difference (LMTD)

To calculate the LMTD please use the following method;

L = Larger temperature difference from step 2.
M = S/L number (LOCATED IN TABLE A).

$LMTD_i$ = L x M

$LMTD_i$ = 50.8 x .992 (FROM TABLE A) = 50.39

To correct the $LMTD_i$ for a multipass heat exchangers calculate **R** & **K** as follows:

Formula

$$\textbf{R} = \frac{T_{in} - T_{out}}{t_{out} - t_{in}}$$

$$\textbf{K} = \frac{t_{out} - t_{in}}{T_{in} - t_{in}}$$

Example

$$\textbf{R} = \frac{125.3°F - 120°F}{74.5°F - 70°F} = \frac{5.3°F}{4.5°F} = \textbf{\{1.17=R\}}$$

$$\textbf{K} = \frac{74.5°F - 70°F}{124.5°F - 70°F} = \frac{4.5°F}{55.4°F} = \textbf{\{0.081=K\}}$$

Locate the correction factor CF_B (FROM TABLE B)
$LMTD_c = LMTD_i \times CF_B$
$LMTD_c$ = 50.39 x 1 = **50.39**

STEP 4: Calculate the area required

Required Area sq.ft. = $\frac{\text{Q (BTU / HR)}}{\text{LMTD}_c \text{ x U (FROM TABLE C)}}$ $\frac{89{,}090}{50.39 \text{ x } 100}$ = **17.68 sq.ft.**

STEP 5: Selection

a) From TABLE E choose the correct series size, baffle spacing, and number of passes that best fits your flow rates for both shell and tube side. Note that the tables suggest minimum and maximum information. Try to stay within the 20-80 percent range of the indicated numbers.

Example

Oil Flow Rate = 80 GPM = Series Required from Table E = **1200 Series**
Baffle Spacing from Table E = **4**
Water Flow Rate = 40 GPM = Passes required in 1200 series = **4 (FP)**

b) From TABLE D choose the heat exchanger model size based upon the sq.ft. or surface area in the series size that will accommodate your flow rate.

Example

Required Area = 17.68sq.ft Closest model required based upon sq.ft. & series = **CS - 1224 - 4 - 6 - FP**

If you require a computer generated data sheet for the application, or if the information that you are trying to apply does not match the corresponding information, please contact our engineering services department for further assistance.

TABLE A- FACTOR M/LMTD = L x M

S/L	M	S/L	M	S/L	M	S/L	M
		.25	.541	.50	.721	.75	.870
.01	.215	.26	.549	.51	.728	.76	.874
.02	.251	.27	.558	.52	.734	.77	.879
.03	.277	.28	.566	.53	.740	.78	.886
.04	.298	.29	.574	.54	.746	.79	.890
.05	.317	.30	.582	.55	.753	.80	.896
.06	.334	.31	.589	.56	.759	.81	.902
.07	.350	.32	.597	.57	.765	.82	.907
.08	.364	.33	.604	.58	.771	.83	.913
.09	.378	.34	.612	.59	.777	.84	.918
.10	.391	.35	.619	.60	.783	.85	.923
.11	.403	.36	.626	.61	.789	.86	.928
.12	.415	.37	.634	.62	.795	.87	.934
.13	.427	.38	.641	.63	.801	.88	.939
.14	.438	.39	.648	.64	.806	.89	.944
.15	.448	.40	.655	.65	.813	.90	.949
.16	.458	.41	.662	.66	.818	.91	.955
.17	.469	.42	.669	.67	.823	.92	.959
.18	.478	.43	.675	.68	.829	.93	.964
.19	.488	.44	.682	.69	.836	.94	.970
.20	.497	.45	.689	.70	.840	.95	.975
.21	.506	.46	.695	.71	.848	.96	.979
.22	.515	.47	.702	.72	.852	.97	.986
.23	.524	.48	.709	.73	.858	.98	.991
.24	.533	.49	.715	.74	.864	.99	.995

TABLE B- LMTD correction factor for Multipass Exchangers

R \ K	.05	.1	.15	.2	.25	.3	.35	.4	.45	.5	.6	.7	.8	.9	1.0
.2	1	1	1	1	1	1	1	.999	.993	.984	.972	.942	.908	.845	.71
.4	1	1	1	1	1	1	.994	.983	.971	.959	.922	.855	.70		
.6	1	1	1	1	1	.992	.980	.965	.948	.923	.840				
.8	1	1	1	1	.995	.981	.965	.945	.916	.872					
1.0	1	1	1	1	.988	.970	.949	.918	.867	.770					
2.0	1	1	.977	.973	.940	.845	.740								
3.0	1	1	.997	.933	.835										
4.0	1	.993	.950	.850											
5.0	1	.982	.917												
6.0	1	.968	.885												
8.0	1	.930													
10.0	.996	.880													
12.0	.985	.720													
14.0	.972														
16.0	.958														
18.0	.940														
20.0	.915														

TABLE D- Surface Area

Model Number	Surface Area in Sq.ft. 1/4" O.D Tubing CODE 4	3/8" O.D Tubing CODE 6	5/8" O.D Tubing CODE 10	Model Number	Surface Area in Sq.ft. 1/4" O.D Tubing CODE 6	3/8" O.D Tubing CODE 6	5/8" O.D Tubing CODE 10
CS-614	4.6	–	–	CS-1236	50.63	35.33	17.66
CS-624	7.9	–	–	CS-1248	67.51	47.10	23.55
CS-636	11.5	–	–	CS-1260	84.39	58.88	29.44
				CS-1272	101.27	70.65	35.33
CS-814	8.3	–	–	CS-1284	118.14	82.43	41.21
CS-824	14.1	–	–	CS-1296	135.02	94.20	47.10
CS-836	21.2	–	–				
CS-848	28.3	–	–	CS-1724	58.61	43.96	23.55
				CS-1736	87.92	65.94	35.33
CS-1014	13.74	9.16	4.58	CS-1748	117.23	87.92	47.10
CS-1024	23.55	15.70	7.85	CS-1760	146.53	109.90	58.88
CS-1036	35.33	23.55	11.78	CS-1772	175.84	131.88	70.65
CS-1048	47.10	31.40	15.70	CS-1784	205.15	153.86	82.43
CS-1060	58.88	39.25	19.63	CS-1796	234.45	175.84	94.20
				CS-17108	263.76	197.82	105.98
CS-1224	33.76	23.55	11.78	CS-17120	293.07	219.80	117.75

TABLE E- Flow Rate for Shell & Tube

Shell dia . Code	Max. Liquid Flow - Shell Side Baffle Spacing 1.5	2	3	4	6	Liquid Flow - Tube Side SP Min.	SP Max.	TP Min.	TP Max.	FP Min.	FP Max.
600	15	20	25	30	–	3.5	20	3.5	24	2	12
800	20	34	45	60	–	7.5	48	4.5	38	3	21
1000	30	36	50	65	–	10	70	10	70	5	37
1200	45	50	70	100	125	20	120	15	112	7.5	56
1700	50	65	100	140	220	30	220	29	180	14	90
2000	60	80	100	160	240	57	300	45	320	25	160

TABLE C

U	TUBE FLUID	SHELL FLUID
400	Water	Water
350	Water	50% E. Glycol
100	Water	Oil
300	50% E. Glycol	50% E. Glycol
90	50% E. Glycol	Oil

CS & STC Series *performance*

The selection chart provided contains an array of popular sizes for quick sizing. It does not provide curves for all models available. Refer to page 44 & 45 for detailed calculation information.

Computer selection data sheets for standard or special models are available through the engineering department of American Industrial. To use the followings graphs correctly, refer to the instruction notes "1-5".

1) HP Curves are based upon a 40°F approach temperature; for example: oil leaving a cooler at 125°F, using 85°F cooling water (125°F – 85°F = 40°F).

2) The oil to water ratio of 1:1 or 2:1 means that for every 1 gallon of oil circulated, a minimum of 1 or 1/2 gallon (respectively) of 85°F water must be circulated to match the curve results.

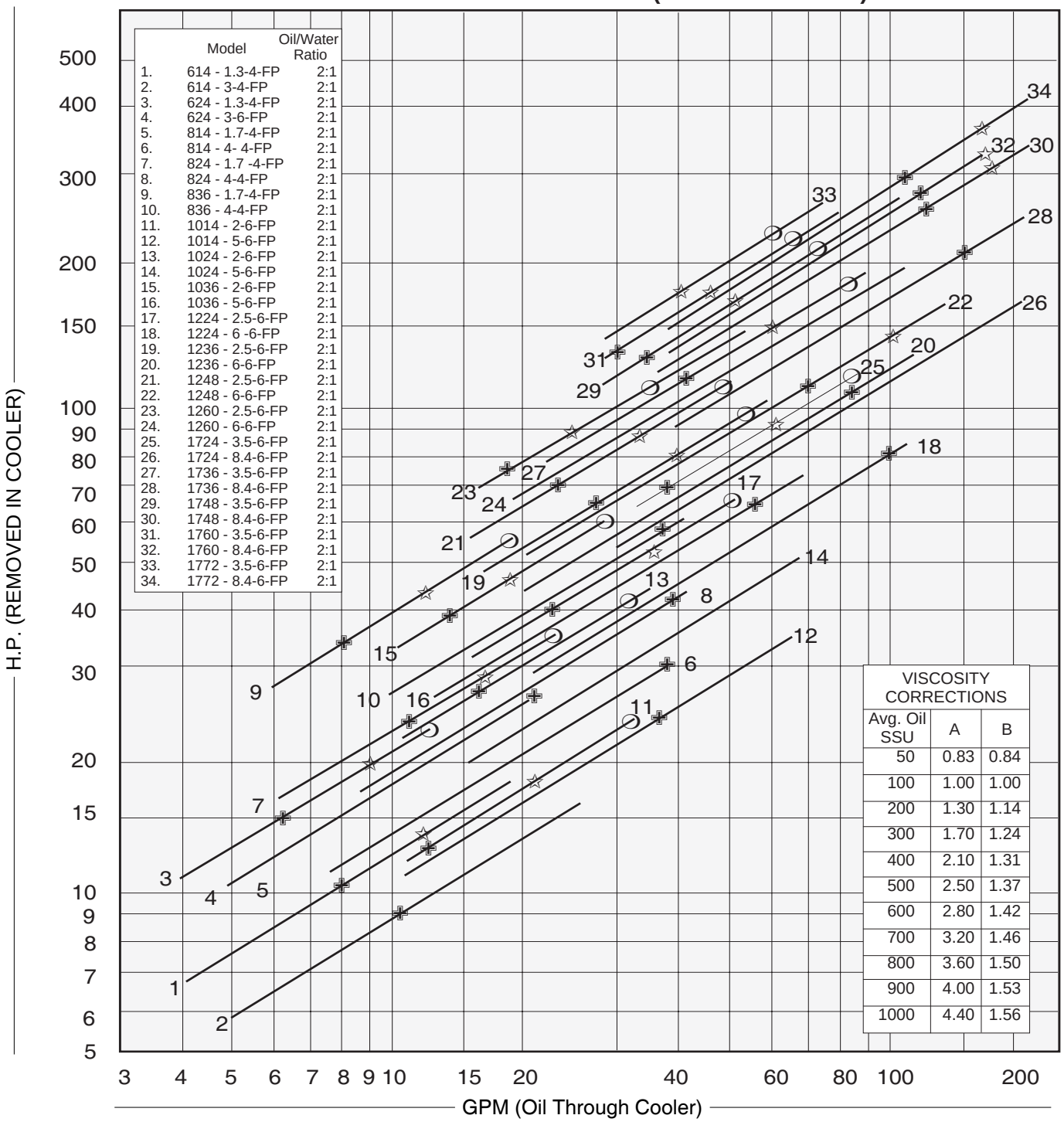
3) OIL PRESSURE DROP CODING: ✙ = 5 psi; ☆= 10 psi; ❍ = 20 psi; △= 50psi. Curves that have no pressure drop code symbols indicate that the oil pressure drop is less than 5 psi for the flow rate shown.

4) Pressure Drop is based upon oil with an average viscosity of 100 SSU. If the average oil viscosity is other than 100 SSU, then multiply the indicated Pressure Drop by the corresponding value from corrections table A.

5) Corrections for approach temperature and oil viscosity are as follows:

$$H.P._{\text{Removed In Cooler}} = H.P._{\text{Actual Heat Load}} \times \left(\frac{40}{\text{Actual Approach}}\right) \times B.$$

HEAT ENERGY DISSIPATION RATES (Basic Stock Model)



	Model	Oil/Water Ratio
1.	614 - 1.3-4-FP	2:1
2.	614 - 3-4-FP	2:1
3.	624 - 1.3-4-FP	2:1
4.	624 - 3-6-FP	2:1
5.	814 - 1.7-4-FP	2:1
6.	814 - 4- 4-FP	2:1
7.	824 - 1.7 -4-FP	2:1
8.	824 - 4-4-FP	2:1
9.	836 - 1.7-4-FP	2:1
10.	836 - 4-4-FP	2:1
11.	1014 - 2-6-FP	2:1
12.	1014 - 5-6-FP	2:1
13.	1024 - 2-6-FP	2:1
14.	1024 - 5-6-FP	2:1
15.	1036 - 2-6-FP	2:1
16.	1036 - 5-6-FP	2:1
17.	1224 - 2.5-6-FP	2:1
18.	1224 - 6 -6-FP	2:1
19.	1236 - 2.5-6-FP	2:1
20.	1236 - 6-6-FP	2:1
21.	1248 - 2.5-6-FP	2:1
22.	1248 - 6-6-FP	2:1
23.	1260 - 2.5-6-FP	2:1
24.	1260 - 6-6-FP	2:1
25.	1724 - 3.5-6-FP	2:1
26.	1724 - 8.4-6-FP	2:1
27.	1736 - 3.5-6-FP	2:1
28.	1736 - 8.4-6-FP	2:1
29.	1748 - 3.5-6-FP	2:1
30.	1748 - 8.4-6-FP	2:1
31.	1760 - 3.5-6-FP	2:1
32.	1760 - 8.4-6-FP	2:1
33.	1772 - 3.5-6-FP	2:1
34.	1772 - 8.4-6-FP	2:1

VISCOSITY CORRECTIONS		
Avg. Oil SSU	A	B
50	0.83	0.84
100	1.00	1.00
200	1.30	1.14
300	1.70	1.24
400	2.10	1.31
500	2.50	1.37
600	2.80	1.42
700	3.20	1.46
800	3.60	1.50
900	4.00	1.53
1000	4.40	1.56

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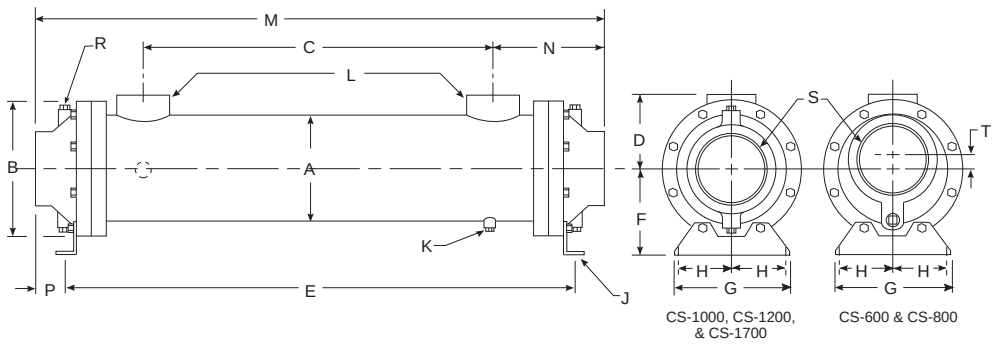
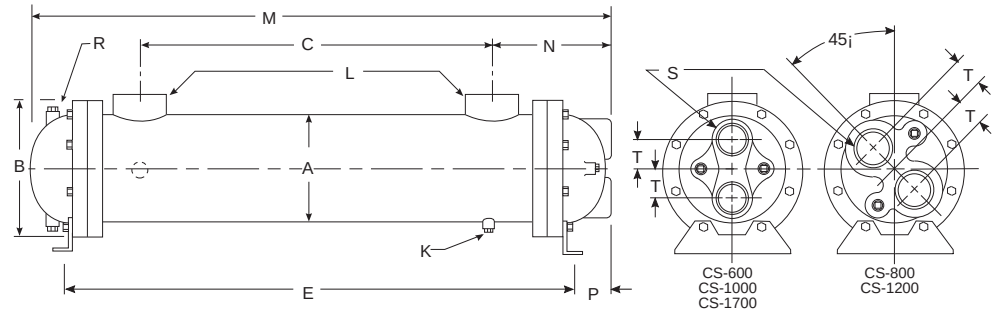


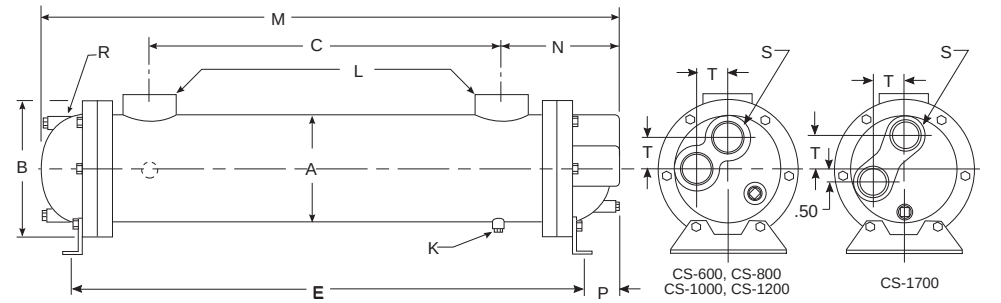
Single Pass (SP)

Model	M	N	P	R NPT	S NPT	T
CS-614	17.18	3.70	.40	(2) .38	1.50	.38
CS-624	27.18					
CS-814	17.88	4.44	.63	(2) .38	2.00	.50
CS-824	27.88					
CS-836	39.88					
CS-1014	19.09	5.05	.92	(4) .38	2.00	-
CS-1024	29.09					
CS-1036	41.09					
CS-1224	30.00	5.88	1.43	(4) .50	3.00	-
CS-1236	42.00					
CS-1248	54.00					
CS-1260	66.00					
CS-1272	78.00					
CS-1724	31.47	7.23	1.99	(4) .50	4.00	-
CS-1736	43.47					
CS-1748	55.47					
CS-1760	67.47					
CS-1772	79.47					
CS-1784	91.47					



Two Pass (TP)

Model	M	N	P	R NPT	S NPT	T
CS-614	17.12	3.70	.38	(2) .38	1.00	1.00
CS-624	27.12					
CS-814	17.88	4.44	.63	(2) .38	1.25	1.06
CS-824	27.88					
CS-836	39.88					
CS-1014	18.62	5.00	.94	(2) .38	1.50	1.19
CS-1024	28.62					
CS-1036	40.62					
CS-1224	29.03	5.44	1.00	(2) .50	2.00	1.44
CS-1236	41.03					
CS-1248	53.03					
CS-1260	65.03					
CS-1272	77.03					
CS-1724	30.62	7.06	1.81	(2) .50	2.50	1.88
CS-1736	42.62					
CS-1748	54.62					
CS-1760	66.62					
CS-1772	78.62					
CS-1784	90.62					



Four Pass (FP)

Model	M	N	P	R NPT	S NPT	T
CS-614	17.12	3.70	.38	(2) .38	.75	1.00
CS-624	27.12					
CS-814	17.88	4.44	.63	(3) .38	.75	1.25
CS-824	27.88					
CS-836	39.88					
CS-1014	18.81	4.81	.75	(3) .38	1.00	1.69
CS-1024	28.81					
CS-1036	40.81					
CS-1224	29.13	5.44	1.00	(3) .50	1.50	2.00
CS-1236	41.13					
CS-1248	53.13					
CS-1260	65.13					
CS-1272	77.13					
CS-1724	29.86	7.06	1.81	(3) .50	2.00	2.50
CS-1736	41.86					
CS-1748	53.86					
CS-1760	65.86					
CS-1772	77.86					
CS-1784	89.86					

COMMON DIMENSIONS & WEIGHTS

Model	A	B	C	D	E	F	G	H	J	K NPT	L NPT	Approx. Weight	Model
CS-614	3.25	4.50	10.00	2.31	17.00	2.75	4.18	1.62	.38ϕx0.88	(2) .25	1.00	17	CS-614
CS-624			20.00		27.00							24	CS-624
CS-814	4.25	6.00	9.00	3.12	16.62	3.50	4.25	1.75	.44ϕx1.00	(2) .25	1.50	32	CS-814
CS-824			19.00		26.62							41	CS-824
CS-836			31.00		38.62							53	CS-836
CS-1014	5.25	6.75	9.00	3.62	17.12	4.00	5.25	2.00	.44ϕx1.00	(2) .25	1.50	43	CS-1014
CS-1024			19.00		27.12							57	CS-1024
CS-1036			31.00		39.12							72	CS-1036
CS-1224	6.25	7.75	18.25	4.16	27.13	4.50	6.25	2.50	.44ϕx1.00	(2) .38	2.00	85	CS-1224
CS-1236			30.25		39.13							110	CS-1236
CS-1248			42.25		51.13							135	CS-1248
CS-1260			54.25		63.13							160	CS-1260
CS-1272			66.25		75.13							185	CS-1272
CS-1724	8.13	10.12	17.00	5.62	27.50	5.75	8.25	3.50	.44ϕx1.00	(2) .38	3.00	140	CS-1724
CS-1736			29.00		39.50							180	CS-1736
CS-1748			41.00		51.50							220	CS-1748
CS-1760			53.00		63.50							260	CS-1760
CS-1772			65.00		75.50							300	CS-1772
CS-1784			77.00		87.50							340	CS-1784

note: AIHTI reserves the right to make reasonable design changes without notice.

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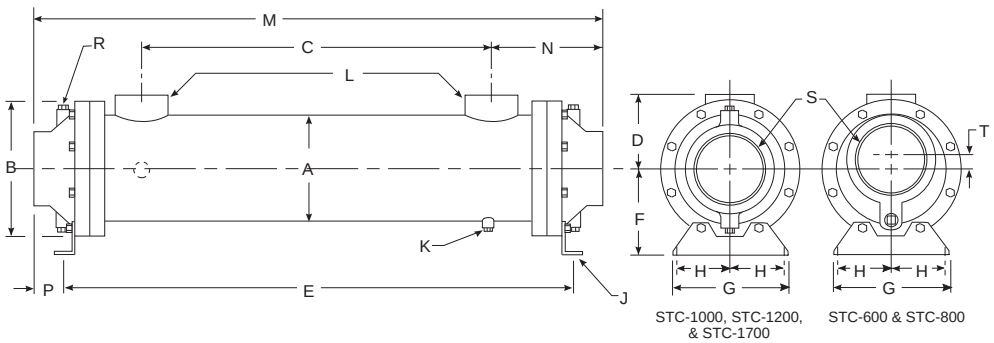
STC Series *dimensions*

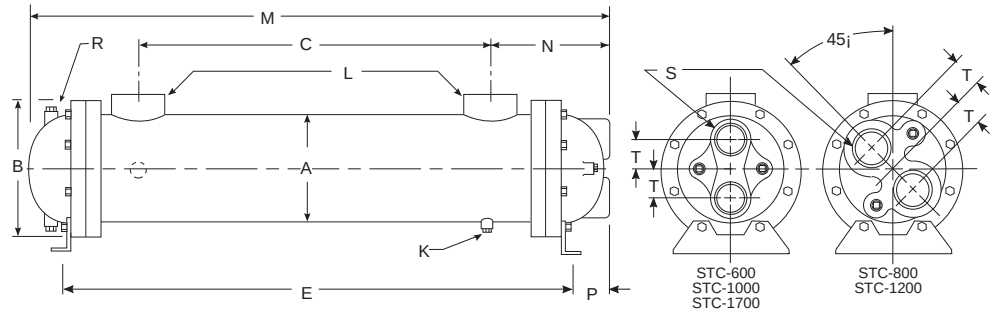


STC-1000, STC-1200, & STC-1700

STC-600 & STC-800

Single Pass (SP)

Model	M	N	P	R NPT	S NPT	T
STC-614	17.18	3.70	.40	(2) .38	1.50	.38
STC-624	27.18					
STC-814	17.88	4.44	.63	(2) .38	2.00	.50
STC-824	27.88					
STC-836	39.88					
STC-1014	19.09	5.05	.92	(4) .38	2.00	-
STC-1024	29.09					
STC-1036	41.09					
STC-1224	30.00	5.88	1.43	(4) .50	3.00	-
STC-1236	42.00					
STC-1248	54.00					
STC-1260	66.00					
STC-1272	78.00					
STC-1724	31.47	7.23	1.99	(4) .50	4.00	-
STC-1736	43.47					
STC-1748	55.47					
STC-1760	67.47					
STC-1772	79.47					
STC-1784	91.47					

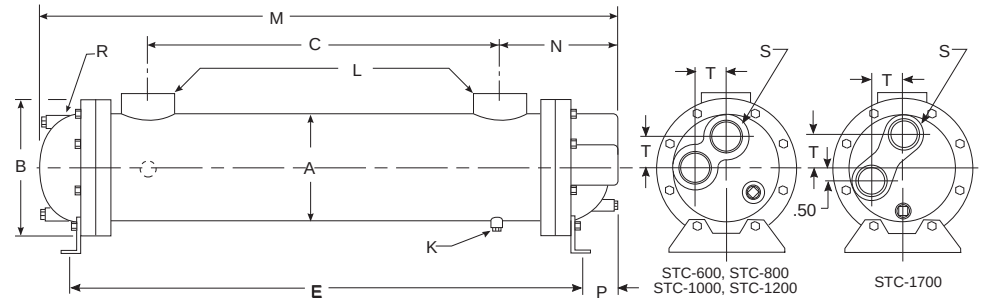


STC-600
STC-1000
STC-1700

STC-800
STC-1200

Two Pass (TP)

Model	M	N	P	R NPT	S NPT	T
STC-614	17.12	3.70	.38	(2) .38	1.00	1.00
STC-624	27.12					
STC-814	17.88	4.44	.63	(2) .38	1.25	1.06
STC-824	27.88					
STC-836	39.88					
STC-1014	18.62	5.00	.94	(2) .38	1.50	1.19
STC-1024	28.62					
STC-1036	40.62					
STC-1224	29.03	5.44	1.00	(2) .50	2.00	1.44
STC-1236	41.03					
STC-1248	53.03					
STC-1260	65.03					
STC-1272	77.03					
STC-1724	30.62	7.06	1.81	(2) .50	2.50	1.88
STC-1736	42.62					
STC-1748	54.62					
STC-1760	66.62					
STC-1772	78.62					
STC-1784	90.62					



STC-600, STC-800
STC-1000, STC-1200

STC-1700

Four Pass (FP)

Model	M	N	P	R NPT	S NPT	T
STC-614	17.12	3.70	.38	(2) .38	.75	1.00
STC-624	27.12					
STC-814	17.88	4.44	.63	(3) .38	.75	1.25
STC-824	27.88					
STC-836	39.88					
STC-1014	18.81	4.81	.75	(3) .38	1.00	1.69
STC-1024	28.81					
STC-1036	40.81					
STC-1224	29.13	5.44	1.00	(3) .50	1.50	2.00
STC-1236	41.13					
STC-1248	53.13					
STC-1260	65.13					
STC-1272	77.13					
STC-1724	29.86	7.06	1.81	(3) .50	2.00	2.50
STC-1736	41.86					
STC-1748	53.86					
STC-1760	65.86					
STC-1772	77.86					
STC-1784	89.86					

COMMON DIMENSIONS & WEIGHTS

Model	A	B	C	D	E	F	G	H	J	K NPT	L NPT	Approx. Weight	Model
STC-614	3.13	4.50	10.00	2.31	17.00	2.75	4.18	1.62	.38ϕx0.88	(2) .25	1.00	17	STC-614
STC-624			20.00		27.00							24	STC-624
STC-814	4.25	6.00	9.00	3.12	16.62	3.50	4.25	1.75	.44ϕx1.00	(2) .25	1.50	32	STC-814
STC-824			19.00		26.62							41	STC-824
STC-836			31.00		38.62							53	STC-836
STC-1014	5.25	6.75	9.00	3.62	17.12	4.00	5.25	2.00	.44ϕx1.00	(2) .25	1.50	43	STC-1014
STC-1024			19.00		27.12							57	STC-1024
STC-1036			31.00		39.12							72	STC-1036
STC-1224	6.25	7.75	18.25	4.16	27.13	4.50	6.25	2.50	.44ϕx1.00	(2) .38	2.00	85	STC-1224
STC-1236			30.25		39.13							110	STC-1236
STC-1248			42.25		51.13							135	STC-1248
STC-1260			54.25		63.13							160	STC-1260
STC-1272			66.25		75.13							185	STC-1272
STC-1724	8.00	10.12	17.00	5.62	27.50	5.75	8.25	3.50	.44ϕx1.00	(2) .38	3.00	140	STC-1724
STC-1736			29.00		39.50							180	STC-1736
STC-1748			41.00		51.50							220	STC-1748
STC-1760			53.00		63.50							260	STC-1760
STC-1772			65.00		75.50							300	STC-1772
STC-1784			77.00		87.50							340	STC-1784

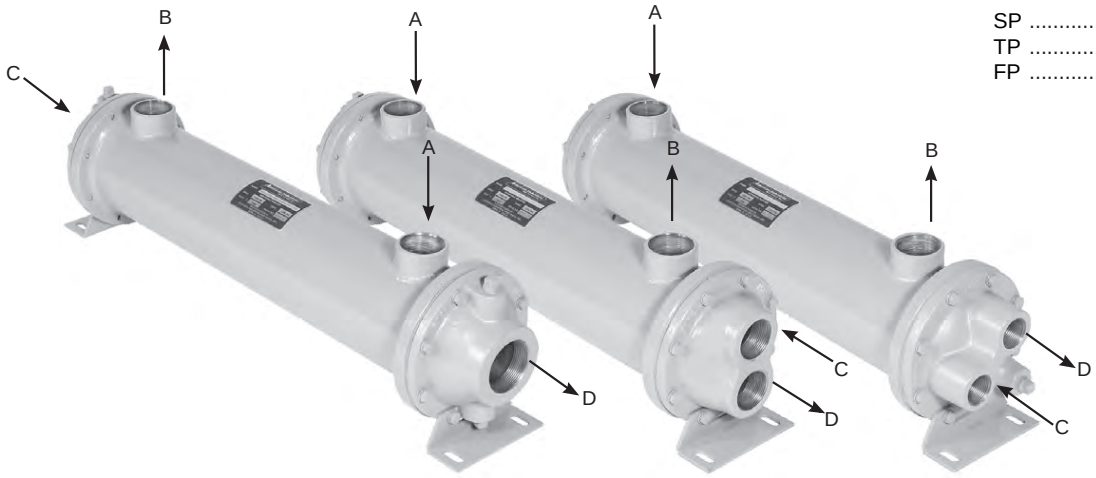
note: AIHTI reserves the right to make reasonable design changes without notice.

355 American Industrial Drive LaCrosse, VA 23950 tel: 434-757-1800 fax: 434-757-1810 email: sales@aihti.com

PIPING HOOK-UP

A ..... Hot fluid to be cooled
B ..... Cooled fluid
C ..... Cooling water in
D ..... Cooling water out

SP ..... Single Pass
TP ..... Two Pass
FP .....Four Pass



ONE PASS **TWO PASS** **FOUR PASS**

Receiving / Installation

a) Inspect unit for any shipping damage before uncrating. Indicate all damages to the trucking firms' delivery person, and mark it on the receiving bill before accepting the freight. Make sure that there is no visible damage to the outside surface of the heat exchanger. The published weight information located in this brochure is approximate. True shipment weights are determined at the time of shipping and may vary. Approximate weight information published herein is for engineering approximation purposes and should not be used for exact shipping weight. Since the warranty is based upon the unit date code located on the model identification tags, removal or manipulation of the identification tags will void the manufacturers warranty.

b) When handling the shell & tube heat exchanger, special care should be taken to avoid dropping the unit since mishandling could cause the heat exchanger to crack and leak externally. Mishandling of the unit is not covered under the manufacturers warranty. All units are shipped with partial wood/corrugated cardboard containers for safe handling.

c) Storage: American Industrial heat exchangers are protected against the elements during shipment. If the heat exchanger cannot be installed and put into operation immediately upon receipt, certain precautions are required to prevent deterioration during storage. The responsibility for integrity of the heat exchanger(s) is assumed by the user. American Industrial will not be responsible for damage, corrosion, or other deterioration of the heat exchanger during transit or storage.
Proper storage practices are important when considering the high costs of repair or replacement, and the possible delays for items which require long lead times for manufacture. The following listed practices are provided solely as a convenience to the user, who shall make their own decision on whether to use all or any of them.

1) Heat exchangers not to be placed in immediate service, require precautionary measures to prevent corrosion or contamination.
2) Heat exchangers made of ferrous materials, may be pressure-tested using compressed air at the factory. Residual oil coating on the inside surfaces of the heat exchanger(s) as a result of flushing does not discount the possibility of internal corrosion. Upon receipt, fill the heat exchanger(s) with the appropriate grade of oil or apply a corrosion preventing inhibitor for storage.
3) Corrosion protection compounds for interior surfaces for long term storage or other applications are applied solely at the request of customers. Upon request, American Industrial can provide a customer approved corrosion preventative if available when included in the original purchase order specifications.
4) Remove all dirt, water, ice, or snow and wipe dry before moving heat exchanger(s) into storage. Heat exchangers are generally shipped empty, open drain plugs to remove any accumulated condensation moisture, then reseal. Accumulation of moisture usually indicates corrosion has already started and remedial action should be taken.
5) Store in a covered, environmentally stable area. The ideal storage environment for heat exchangers is in a dry, low-humidity atmosphere which is sealed to prevent the entry of blowing dust, rain, or snow. Maintain in atmospheric temperatures between 70ºF and 105ºF (Large temperature swings may cause condensation and moisture to form on steel components, threads, shell, etc...) Use thermometers and humidity indicators and maintain the atmosphere at 40% relative humidity, or lower.

d) Standard Enamel Coating: American Industrial provides its standard products with a normal base coat of oil base air cure enamel paint. The enamel paint is applied as a temporary protective and esthetic coating prior to shipment. While the standard enamel coating is durable, American Industrial does not warranty it as a long-term finish coating. It is strongly suggested that a more durable final coating be applied after installation or prior to long-term storage in a corrosive environment to cover any accidental scratches, enhance esthetics, and further prevent corrosion. It is the responsibility of the customer to provide regular maintenance against chips, scratches, etc... and regular touch up maintenance must be provided for long-term benefits and corrosion prevention.

e) Special Coatings: American Industrial offers as customer options, Air-Dry Epoxy, and Heresite (Air-Dry Phenolic) coatings at additional cost. American Industrial offers special coatings upon request, however American Industrial does not warranty coatings to be a permanent solution for any equipment against corrosion. It is the responsibility of the customer to provide regular maintenance against chips, scratches, etc... and regular touch up maintenance must be provided for long-term benefits and corrosion prevention.

f) American Industrial recommends that the equipment supplied should be installed by qualified personnel who have solid understanding of system design, pressure and temperature ratings, and piping assembly. Verify the service conditions of the system prior to applying any shell & tube heat exchanger. If the system pressure or temperature does not fall within the parameters on model rating tag located on the heat exchanger, contact our factory prior to installation or operation.

g) Plan the installation to meet the requirements indicated on the piping installation diagram as illustrated above. It is recommended to put the hot fluid to be cooled through the shell side and the cold fluid through the tube side. The indicated port assembly sequence in the diagram maximizes the performance, and minimizes the possibility of thermal shock. In instances where the fluids are required to be reversed, *hot fluid in the tubes and cold fluid in the shell* the heat exchanger will work with reduced performance. Installation may be vertical or horizontal or a combination thereof. However, the installation must allow for complete draining of the heat exchanger regardless of Single Pass, Two Pass, or four pass construction. Complete drainage is important to prevent the heat exchanger from freezing, over-heating of a fluid, or mineral deposit buildup.
For fixed bundle heat exchangers, provide sufficient clearance at one end to allow for the removal or replacement of tubes. On the opposite end, provide enough space to allow removal of the complete bonnet to provide sufficient clearance to permit tube rolling and cleaning. Allow accessible room for scheduled cleaning as needed. Include thermometer wells and pressure gauge pipe ports in piping to and from the heat exchanger located as close to the heat exchanger as possible. For more information please contact American Industrial.

h) It is recommended to use flexible hose wherever possible to reduce vibration and allow slight movement. However, hoses are not required. Hydraulic carrying lines should be sized to handle the appropriate flow and to meet system pressure drop requirements based upon the systems parameters, and not based upon the units supply and return connection size. We recommend that a low cracking pressure direct acting relief valve be installed at the heat exchanger inlet to protect it from pressure spikes by bypassing oil in the event the system experiences a high flow surge. If preventative filtration is used it should be located ahead of the cooler on both shell and tube side to catch any scale or sludge from the system before it enters the cooler. Failure to install filters ahead of the heat exchanger could lead to possible heat exchanger failure due to high pressure if the system filters plug.

i) Standard shell & tube coolers are built with a rolled tube-sheet construction. However, the differential operating temperature between the entering shell side fluid and the entering tube side fluid should not exceed 150°F. If this condition exists, a severe thermal shock could occur leading to product failure and mixing of the fluids. For applications with a differential temperatures of 150°F or more, we recommend using a series with a floating tube-sheet, u-tube, or expansion joint to reduce the potential for the effects of thermal shock.

j) Water requirements vary from location to location. If the source of cooling water is from other than a municipal water supply, it is recommended that a water strainer be installed ahead of the heat exchanger to prevent dirt and debris from entering and clogging the flow passages. If a water modulating valve is used it is recommended to be installed at the inlet to the cooler to regulate the water flow.

k) For steam service, or other related applications, please consult our engineering department for additional information.

Maintenance
a) Inspect the heat exchanger for loosened bolts, connections, rust spots, corrosion, and for internal or external fluid leakage. Any corroded surfaces should be cleaned and recoated with paint.

b) Shell side: In many cases with clean hydraulic system oils it will not be necessary to flush the interior of the shell side of the cooler. In circumstances where the quality of hydraulic fluid is in question, the shell side should be disconnected and flushed on a yearly basis with a clean flushing oil/solvent to remove any sludge that has been deposited. For severe cases where the unit is plugged and cannot be flushed clean with solvent, the heat exchanger should be replaced to maintain the proper cooling performance.

c) Tube side: In many cases it will be necessary to clean the tube side of the heat exchanger due to poor fluid quality, debris, calcium deposits, corrosion, mud, sludge, seaweed, etc.... To clean the tube side, flush with clean water or any good quality commercial cleaner that does not attack the particular material of construction. With straight tube heat exchangers you can use a rod to carefully push any debris out of the tubes.

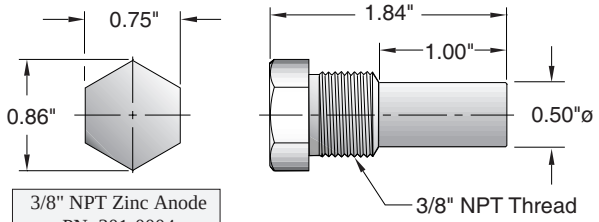
d) Zinc anodes are normally used to reduce the risk of failure due to electrolysis. Zinc anodes are a sacrificial component designed to wear and dissolve through normal use. Normally, zinc anodes are applied to the water supply side of the heat exchanger. Depending upon the amount of corrosive action, one, two, three, or more anodes can be applied to help further reduce the risk of failure. American Industrial Heat Transfer, Inc. offers zinc anodes as an option, to be specified and installed at the request our customers. It is the responsibility of the customer to periodically check and verify the condition of the zinc anode and replace it as needed.

Applications vary due to water chemical makeup and quality, material differences, temperature, flow rate, piping arrangements, and machine grounding. For those reasons, zinc anodes do not follow any scheduled factory predetermined maintenance plan moreover they must be checked routinely by the customer, and a maintenance plan developed based upon the actual wear rate.

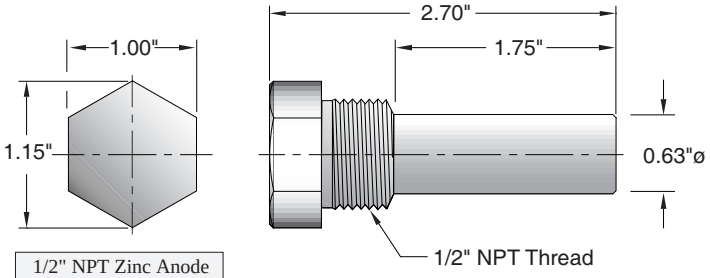
If substantial wear occurs or zinc dissolves without replacement, premature failure or permanent damage may occur to the heat exchanger. American Industrial does not warranty customer applications. It is the responsibility of the customer to verify and apply the proper system materials of construction and overall system requirements. Failures resulting from properly applied or misapplied use of zinc anode(s) into non-specified or specified applications will be the sole responsibility of the customer.

e) A routine maintenance schedule should be developed and adjusted to meet your systems requirements based upon water quality, etc….Failure to regularly maintain and clean your heat exchanger can result in a reduction in operational performance and life expectancy.

Note: *Since applications can vary substantially, the installation and maintenance information contained in this catalog should be used as a basic guideline. The safe installation, maintenance, and use of any American Industrial Heat Transfer, Inc. heat exchanger are solely the responsibility of the user.*



3/8" NPT Zinc Anode PN: 301-0004
AB-400 thru AB-1000 AA-400 thru AA-1000 CS-600 thru CS-1000



1/2" NPT Zinc Anode PN: 301-0003
AB-1200 thru AB-2000 AA-1200 thru AA-1600 CS-1200 thru CS-1700

website : www.aihti.com
general email : sales@aihti.com
technical email : engineering@aihti.com

Notes:

American Industrial Heat Transfer Inc.
Manufacturer of Quality Heat Exchangers

website : www.aihti.com
general email : sales@aihti.com
technical email : engineering@aihti.com

Shell & Tube Application Request: *(For liquid to liquid heat exchangers)*

For CS2000 Series

Email form to: sales@aihti.com or engineering@aihti.com or fax to 434-757-1810

Contact Name _____ Telephone _____ Date _____

Company Name _____ Email _____

Address: _____ Fax _____

_____

Hot Side

Fluid Type _____

If available:

Density _____ lb/ft3
Viscosity _____ cP
Conductivity _____ Btu/hr.ft.°F
Specific Heat _____ Btu/lb.°F

1. Flow Rate _____
2. Temperature In _____
3. Desired Temperature Out _____
4. Heat Load _____

Cold Side

Fluid Type _____

If available:

Density _____ lb/ft3
Viscosity _____ cP
Conductivity _____ Btu/hr.ft.°F
Specific Heat _____ Btu/lb.°F

1. Flow Rate _____
2. Temperature In _____

Maximum Allowable Pressure Drop:

Hot Side _____ Cold Side _____

To properly size the heat exchanger we need 3 of the 4 perameter on the Hot Side and 2 on the Cold Side.

Shell Material Construction:

Steel ☐ Stainless Steel ☐

Tube Material Construction:

Copper ☐ 90/10 Copper Nickel ☐ Stainless Steel ☐

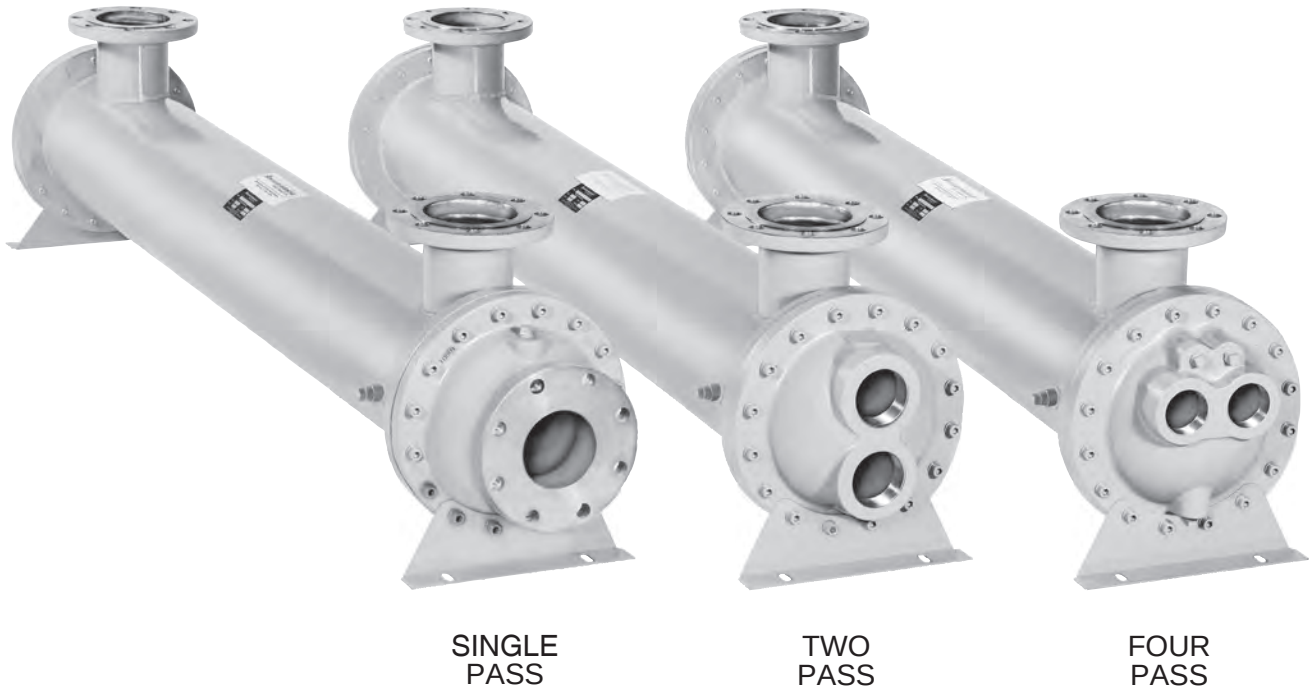
ASME Code and Certified Yes ☐ No ☐

Require All Stainless Steel Heat Exchanger Yes ☐ No ☐

Comment: _____

_____

CS 2000 SERIES



Fixed Tube Bundle / Liquid Cooled

HEAT EXCHANGERS

- High thermal capacity.
- Large flow capacity.
- Operating pressure for tubes 150 PSI.
- Operating pressure for shell 300 PSI.
- Operating temperature 300 °F.
- Computer generated data sheet available for any application
- As an option, available in ASME code and certified
- Can be customized to fit any applications.

CS 2000 Series *selection*

STEP 1: Calculate the heat load

The heat load in BTU/HR or (Q) can be derived by using several methods. To simplify things, we will consider general specifications for hydraulic system oils and other fluids that are commonly used with shell & tube heat exchangers.

Terms

GPM = Gallons Per Minute
CN = Constant Number for a given fluid
△T = Temperature differential across the potential
PSI = Pounds per Square Inch (pressure) of the operating side of the system
MHP = Horsepower of the electric motor driving the hydraulic pump
Kw = Kilowatt (watts x 1000)
T_{in} = Hot fluid entering temperature in °F
T_{out} = Hot fluid exiting temperature in °F
t_{in} = Cold fluid temperature entering in °F
t_{out} = Cold fluid temperature exiting in °F
Q = BTU / HR

For example purposes, a hydraulic system has a 250 HP (186Kw) electric motor installed coupled to a pump that produces a flow of 200 GPM @ 2000 PSIG. The temperature differential of the oil entering the pump *vs* exiting the system is about 4.3°F. Even though the return line pressure operates below 100 psi, calculate the system heat load potential (Q) based upon the prime movers (pump) capability.

To derive the required heat load (Q) to be removed by the heat exchanger, apply ONE of the following. Note: The calculated heat loads may differ slightly from one formula to the next. This is due to assumptions made when estimating heat removal requirements. The factor *(v)* represents the percentage of the overall input energy to be rejected by the heat exchanger. The *(v)* factor is generally about 30% for most hydraulic systems, however it can range from 20%-70% depending upon the installed system components and heat being generated (ie. servo valves, proportional valves, etc…will increase the percentage required).

Formula	Example
A) Q = GPM x CN x actual △T	A) Q =200 x 210 x 4 .3°F = 180,600 BTU/HR
B) Q = [(PSI x GPM) / 1714] x (*v*) x 2545	B) Q =[(2000x200)/1714] x .30 x 2545 = 178,179 BTU/HR
C) Q = MHP x (*v*) x 2545	C) Q =250 x .30 x 2545 = 190,875 BTU/HR
D) Q = Kw to be removed x 3415	D) Q =186 x .30 x 3415 = 190,557 BTU/HR
E) Q = HP to be removed x 2545	

Constant for a given fluid (CN)

1) Oil ..... CN = 210
2) Water..... CN = 500
3) 50% E. Glycol..... CN = 450

STEP 2: Calculate the Mean Temperature Difference

When calculating the MTD you will be required to choose a liquid flow rate to derive the Cold Side △T. If your water flow is unknown you may need to assume a number based on what is available. As a normal rule of thumb, for oil to water cooling a 2:1 oil to water ratio is used. For applications of water to water or 50 % Ethylene Glycol to water, a 1:1 ratio is common.

Formula

HOT FLUID △T = Oil $\quad \dfrac{Q}{CN \times GPM}$

COLD FLUID △ t = Water $\quad \dfrac{BTU / hr}{CN \times GPM}$

Example

$$\triangle T = \frac{190{,}875 \text{ BTU/hr (from step 1,item C)}}{210 \text{ CN} \times 200 \text{GPM}} = 4.54°F = \triangle T \text{ Rejected}$$

$$\triangle t = \frac{190{,}875 \text{ BTU/hr}}{500 \text{ CN} \times 100 \text{GPM (for a 2:1 ratio)}} = 3.81°F = \triangle t \text{ Absorbed}$$

T_{in} = Hot Fluid entering temperature in degrees F
T_{out} = Hot Fluid exiting temperature in degrees F
t_{in} = Cold Fluid entering temperature in degrees F
t_{out} = Cold Fluid exiting temperature in degrees F

T_{in} = 104.54 °F
T_{out} = 100.0 °F
t_{in} = 90.0 °F
t_{out} = 93.81 °F

$$\frac{T_{out} - t_{in}}{T_{in} - t_{out}} = \frac{S \text{[smaller temperature difference]}}{L \text{ [larger temperature difference]}} = \left(\frac{S}{L}\right)$$

$$\frac{100.0°F - 90.0°F = 10.0°F}{104.54°F - 93.81°F = 10.73°F} = \frac{\overline{10.0°F}}{10.73°F} = .931$$

STEP 3: Calculate Log Mean Temperature Difference (LMTD)

To calculate the LMTD please use the following method;
$LMTD_i$ = L x M (L = Larger temperature difference from step 2) x (M = S/L number (LOCATED IN TABLE A))
$LMTD_i$ = 10.73 x .964 (FROM TABLE A) = 10.34

To correct the $LMTD_i$ for a multipass heat exchangers calculate **R** & **K** as follows:

Formula

$$R = \frac{T_{in} - T_{out}}{t_{out} - t_{in}}$$

$$K = \frac{t_{out} - t_{in}}{T_{in} - t_{in}}$$

Example

$$R = \frac{104.54°F - 100°F}{93.81°F - 90°F} = \frac{4.54°F}{3.81°F} = \{1.191=R\}$$

$$K = \frac{93.81°F - 90°F}{104.54°F - 90°F} = \frac{3.81°F}{14.54°F} = \{0.262=K\}$$

Locate the correction factor CF_B (FROM TABLE B)
$LMTD_c = LMTD_i \times CF_B$
$LMTD_c$ = 10.34 x .98 = **10.13**

TABLE C

U	TUBE FLUID	SHELL FLUID
400	Water	Water
350	Water	50% E. Glycol
100	Water	Oil
300	50% E. Glycol	50% E. Glycol
90	50% E. Glycol	Oil

TABLE E- Flow Rate for Shell & Tube

Shell dia .	Max. Liquid Flow - Shell Side					Liquid Flow - Tube Side					
	Baffle Spacing					SP		TP		FP	
Code	2	4	6	8	12	Min.	Max.	Min.	Max.	Min.	Max.
2000	80	160	240	320	500	90	650	45	320	25	160

note: AIHTI reserves the right to make reasonable design changes without notice.
 355 American Industrial Drive LaCrosse, VA 23950 tel: 434-757-1800 fax: 434-757-1810 email: sales@aihti.com

STEP 4: Calculate the area required

Required Area sq.ft. = $\frac{Q\ (BTU / HR)}{LMTD_c \times U\ (\text{FROM TABLE C})}$ $\frac{190{,}875}{10.13 \times 100}$ = **188.4 sq.ft.**

STEP 5: Selection

a) From TABLE E choose the correct series size, baffle spacing, and number of passes that best fits the flow rates for both shell and tube side. Note that the tables suggest minimum and maximum information. Try to stay within the 20-80 percent range of the indicated numbers.

Example

Oil Flow Rate = 200 GPM = Series Required from Table E = **2000 Series**
Baffle Spacing from Table E = **6"**
Water Flow Rate = 100 GPM = Passes required in 2000 series = **4 (FP)**

b) From TABLE D choose the heat exchanger model size based upon the sq.ft. or surface area in the series size that will accommodate your flow rate.

Example

Required Area = 188.4 sq.ft Closest model required based upon sq.ft. & series = **CS-2072-6-6-FP**

If you require a computer generated data sheet for the application, or if the information that you are trying to apply does not match the corresponding information, please contact our engineering services department for further assistance.

TABLE A- FACTOR M/LMTD = L x M

S/L	M	S/L	M	S/L	M	S/L	M
		.25	.541	.50	.721	.75	.870
.01	.215	.26	.549	.51	.728	.76	.874
.02	.251	.27	.558	.52	.734	.77	.879
.03	.277	.28	.566	.53	.740	.78	.886
.04	.298	.29	.574	.54	.746	.79	.890
.05	.317	.30	.582	.55	.753	.80	.896
.06	.334	.31	.589	.56	.759	.81	.902
.07	.350	.32	.597	.57	.765	.82	.907
.08	.364	.33	.604	.58	.771	.83	.913
.09	.378	.34	.612	.59	.777	.84	.918
.10	.391	.35	.619	.60	.783	.85	.923
.11	.403	.36	.626	.61	.789	.86	.928
.12	.415	.37	.634	.62	.795	.87	.934
.13	.427	.38	.641	.63	.801	.88	.939
.14	.438	.39	.648	.64	.806	.89	.944
.15	.448	.40	.655	.65	.813	.90	.949
.16	.458	.41	.662	.66	.818	.91	.955
.17	.469	.42	.669	.67	.823	.92	.959
.18	.478	.43	.675	.68	.829	.93	.964
.19	.488	.44	.682	.69	.836	.94	.970
.20	.497	.45	.689	.70	.840	.95	.975
.21	.506	.46	.695	.71	.848	.96	.979
.22	.515	.47	.702	.72	.852	.97	.986
.23	.524	.48	.709	.73	.858	.98	.991
.24	.533	.49	.715	.74	.864	.99	.995

R

TABLE B- LMTD correction factor for Multipass Exchangers

	.05	.1	.15	.2	.25	.3	.35	.4	.45	.5	.6	.7	.8	.9	1.0
.2	1	1	1	1	1	1	1	.999	.993	.984	.972	.942	.908	.845	.71
.4	1	1	1	1	1	1	.994	.983	.971	.959	.922	.855	.70		
.6	1	1	1	1	1	.992	.980	.965	.948	.923	.840				
.8	1	1	1	1	.995	.981	.965	.945	.916	.872					
1.0	1	1	1	1	.988	.970	.949	.918	.867	.770					
2.0	1	1	.977	.973	.940	.845	.740								
3.0	1	1	.997	.933	.835										
4.0	1	.993	.950	.850											
5.0	1	.982	.917												
6.0	1	.968	.885												
8.0	1	.930													
10.0	.996	.880													
12.0	.985	.720													
14.0	.972														
16.0	.958														
18.0	.940														
20.0	.915														

K

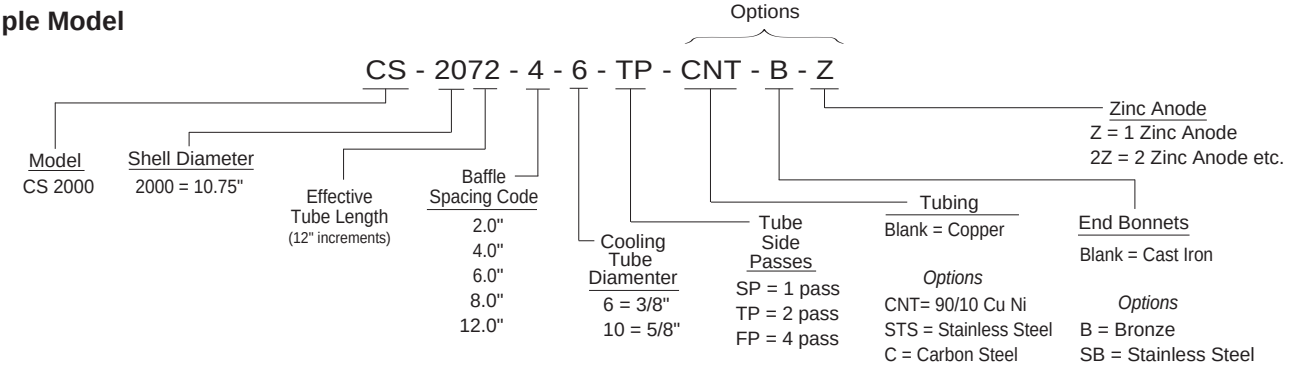
STANDARD CONSTRUCTION MATERIALS & RATINGS

	AB-2000 Series	**Standard Unit Ratings**
Shell	Steel	
Tubes	Copper	Operating Pressure Tubes
Baffle	Steel	150 psig
Tube Sheet	Steel	Operating Pressure Shell
End Bonnets	Cast Iron	225 psig
Mounting Brackets	Steel	Operating Temperature
Gasket	Hypalon Composite	250 °F

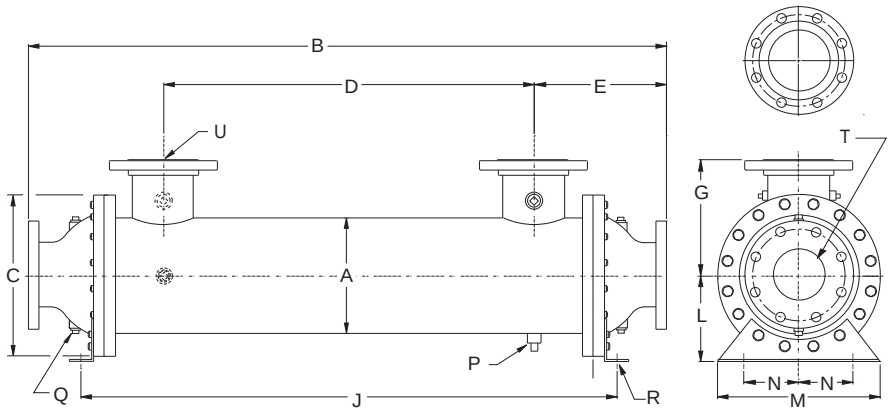
TABLE D- Surface Area

Model Number	Surface Area in Sq.ft.		
	1/4" O.D Tubing	3/8" O.D Tubing	5/8 O.D Tubing
CS-2036	155.43	110.69	60.84
CS-2048	207.24	147.58	81.12
CS-2060	259.05	184.48	101.40
CS-2072	310.86	221.37	121.68
CS-2084	362.67	258.27	141.95
CS-2096	414.48	295.16	162.23
CS-20108	466.29	332.06	182.51
CS-20120	518.10	368.95	202.79
CS-20132	569.91	405.85	223.07
CS-20144	621.72	442.74	243.35

Example Model

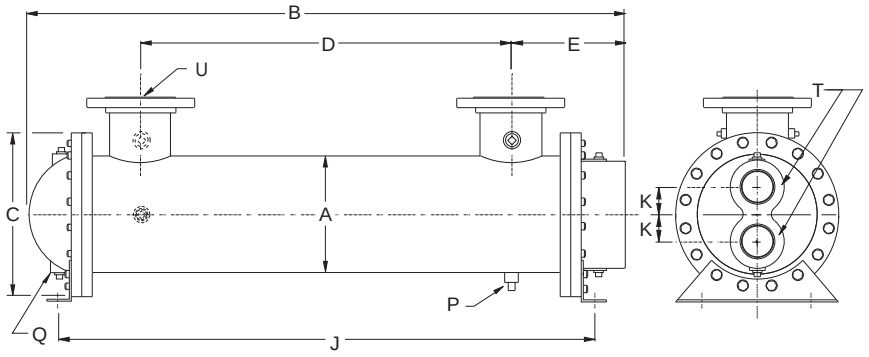


CS 2000 Series *dimensions*



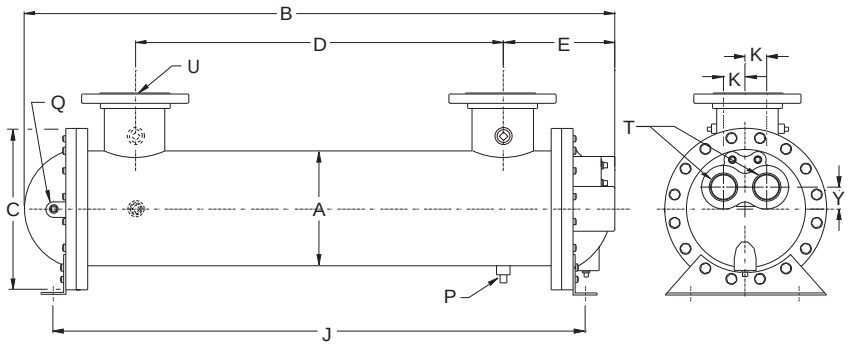
Single Pass (SP)

Model	B	E	Q NPT	T NPT
CS-2036	50.13	12.06	.50 (4x)	5.00" 150# ASME / ANSI Flat Face Flange 8 holes .88 dia. on 8.5 DBC both ends
CS-2048	62.13			
CS-2060	74.13			
CS-2072	86.13			
CS-2084	98.13			
CS-2096	110.13			
CS-20108	122.13			
CS-20120	134.13			
CS-20132	146.13			
CS-20144	158.13			



Two Pass (TP)

Model	B	E	K	Q NPT	T NPT
CS-2036	45.50	9.83	2.50	.50 (4x)	3.00
CS-2048	57.50				
CS-2060	69.50				
CS-2072	81.50				
CS-2084	93.50				
CS-2096	105.50				
CS-20108	117.50				
CS-20120	129.50				
CS-20132	141.50				
CS-20144	153.50				



Four Pass (FP)

Model	B	E	K	Q NPT	Y	T NPT
CS-2036	45.80	9.93	2.00	.50 (5x)	1.75	2.50
CS-2048	57.80					
CS-2060	69.80					
CS-2072	81.80					
CS-2084	93.80					
CS-2096	105.80					
CS-20108	117.80					
CS-20120	129.80					
CS-20132	141.80					
CS-20144	153.80					

COMMON DIMENSIONS & WEIGHTS

Model	A	C	D	G	J	L	M	N	P NPT	R	U	Weight	Model
CS-2036	10.75	15.00	26.00	10.38	42.00	8.00	12.00	5.00	.50 (2x)	.75"Ø x 1.25" Thru Slot	4.00" ANSI Flange 150# RF	690	CS-2036
CS-2048			38.00		54.00							750	CS-2048
CS-2060			50.00		66.00							810	CS-2060
CS-2072			62.00		78.00							870	CS-2072
CS-2084			74.00		90.00							930	CS-2084
CS-2096			86.00		102.00							990	CS-2096
CS-20108			98.00		114.00							1050	CS-20108
CS-20120			110.00		126.00							1110	CS-20120
CS-20132			122.00		138.00							1170	CS-20132
CS-20144			134.00		150.00							1230	CS-20144

note: AIHTI reserves the right to make reasonable design changes without notice.

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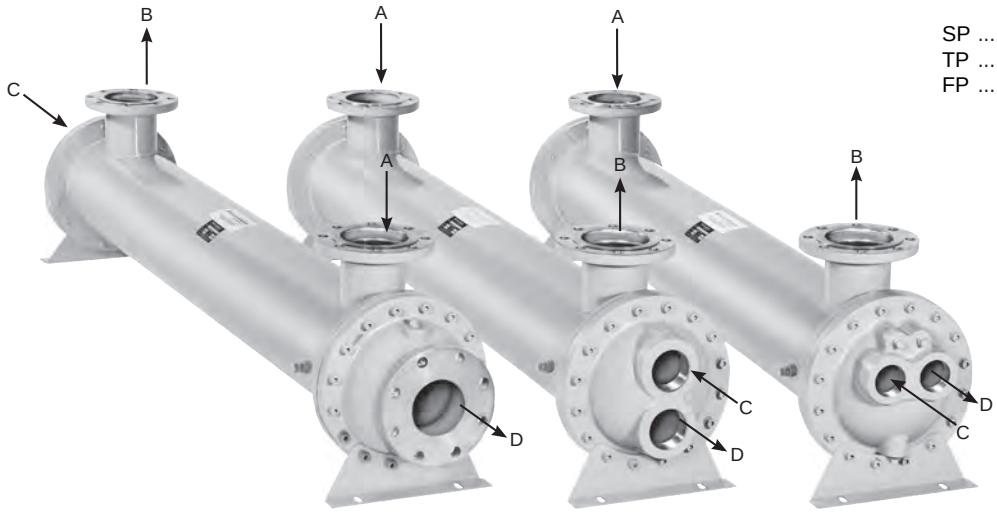
PIPING HOOK-UP

A ..... Hot fluid to be cooled
B ..... Cooled fluid
C ..... Cooling water in
D ..... Cooling water out

SP ..... Single Pass
TP ..... Two Pass
FP .....Four Pass



ONE PASS **TWO PASS** **FOUR PASS**

Receiving / Installation

a) Inspect unit for any shipping damage before uncrating. Indicate all damages to the trucking firms' delivery person, and mark it on the receiving bill before accepting the freight. Make sure that there is no visible damage to the outside surface of the heat exchanger. The published weight information located in this brochure is approximate. True shipment weights are determined at the time of shipping and may vary. Approximate weight information published herein is for engineering approximation purposes and should not be used for exact shipping weight. Since the warranty is based upon the unit date code located on the model identification tags, removal or manipulation of the identification tags will void the manufacturers warranty.

b) When handling the shell & tube heat exchanger, special care should be taken to avoid dropping the unit since mishandling could cause the heat exchanger to crack and leak externally. Mishandling of the unit is not covered under the manufacturers warranty. All units are shipped with partial wood/corrugated cardboard containers for safe handling.

c) Storage: American Industrial heat exchangers are protected against the elements during shipment. If the heat exchanger cannot be installed and put into operation immediately upon receipt, certain precautions are required to prevent deterioration during storage. The responsibility for integrity of the heat exchanger(s) is assumed by the user. American Industrial will not be responsible for damage, corrosion, or other deterioration of the heat exchanger during transit or storage.

Proper storage practices are important when considering the high costs of repair or replacement, and the possible delays for items which require long lead times for manufacture. The following listed practices are provided solely as a convenience to the user, who shall make their own decision on whether to use all or any of them.

1) Heat exchangers not to be placed in immediate service, require precautionary measures to prevent corrosion or contamination.
2) Heat exchangers made of ferrous materials, may be pressure-tested using compressed air at the factory. Residual oil coating on the inside surfaces of the heat exchanger(s) as a result of flushing does not discount the possibility of internal corrosion. Upon receipt, fill the heat exchanger(s) with the appropriate grade of oil or apply a corrosion preventing inhibitor for storage.
3) Corrosion protection compounds for interior surfaces for long term storage or other applications are applied solely at the request of customers. Upon request, American Industrial can provide a customer approved corrosion preventative if available when included in the original purchase order specifications.
4) Remove all dirt, water, ice, or snow and wipe dry before moving heat exchanger(s) into storage. Heat exchangers are generally shipped empty, open drain plugs to remove any accumulated condensation moisture, then reseal. Accumulation of moisture usually indicates corrosion has already started and remedial action should be taken.
5) Store in a covered, environmentally stable area. The ideal storage environment for heat exchangers is in a dry, low-humidity atmosphere which is sealed to prevent the entry of blowing dust, rain, or snow. Maintain in atmospheric temperatures between 70°F and 105°F (Large temperature swings may cause condensation and moisture to form on steel components, threads, shell, etc...) Use thermometers and humidity indicators and maintain the atmosphere at 40% relative humidity, or lower.

d) Standard Enamel Coating: American Industrial provides its standard products with a normal base coat of oil base air cure enamel paint. The enamel paint is applied as a temporary protective and esthetic coating prior to shipment. While the standard enamel coating is durable, American Industrial does not warranty it as a long-term finish coating. It is strongly suggested that a more durable final coating be applied after installation or prior to long-term storage in a corrosive environment to cover any accidental scratches, enhance esthetics, and further prevent corrosion. It is the responsibility of the customer to provide regular maintenance against chips, scratches, etc... and regular touch up maintenance must be provided for long-term benefits and corrosion prevention.

e) Special Coatings: American Industrial offers as customer options, Air-Dry Epoxy, and Heresite (Air-Dry Phenolic) coatings at additional cost. American Industrial offers special coatings upon request, however American Industrial does not warranty coatings to be a permanent solution for any equipment against corrosion. It is the responsibility of the customer to provide regular maintenance against chips, scratches, etc... and regular touch up maintenance must be provided for long-term benefits and corrosion prevention.

f) American Industrial recommends that the equipment supplied should be installed by qualified personnel who have solid understanding of system design, pressure and temperature ratings, and piping assembly. Verify the service conditions of the system prior to applying any shell & tube heat exchanger. If the system pressure or temperature does not fall within the parameters on model rating tag located on the heat exchanger, contact our factory prior to installation or operation.

g) Plan the installation to meet the requirements indicated on the piping installation diagram as illustrated above. It is recommended to put the hot fluid to be cooled through the shell side and the cold fluid through the tube side. The indicated port assembly sequence in the diagram maximizes the

performance, and minimizes the possibility of thermal shock. In instances where the fluids are required to be reversed, *hot fluid in the tubes and cold fluid in the shell* the heat exchanger will work with reduced performance. Installation may be vertical or horizontal or a combination thereof. However, the installation must allow for complete draining of the heat exchanger regardless of Single Pass, Two Pass, or four pass construction. Complete drainage is important to prevent the heat exchanger from freezing, overheating of a fluid, or mineral deposit buildup.
For fixed bundle heat exchangers, provide sufficient clearance at one end to allow for the removal or replacement of tubes. On the opposite end, provide enough space to allow removal of the complete bonnet to provide sufficient clearance to permit tube rolling and cleaning. Allow accessible room for scheduled cleaning as needed. Include thermometer wells and pressure gauge pipe ports in piping to and from the heat exchanger located as close to the heat exchanger as possible. For more information please contact American Industrial.

h) It is recommended to use flexible hose wherever possible to reduce vibration and allow slight movement. However, hoses are not required. Hydraulic carrying lines should be sized to handle the appropriate flow and to meet system pressure drop requirements based upon the systems parameters, and not based upon the units supply and return connection size. We recommend that a low cracking pressure direct acting relief valve be installed at the heat exchanger inlet to protect it from pressure spikes by bypassing oil in the event the system experiences a high flow surge. If preventative filtration is used it should be located ahead of the cooler on both shell and tube side to catch any scale or sludge from the system before it enters the cooler. Failure to install filters ahead of the heat exchanger could lead to possible heat exchanger failure due to high pressure if the system filters plug.

i) Standard shell & tube coolers are built with a rolled tube-sheet construction. However, the differential operating temperature between the entering shell side fluid and the entering tube side fluid should not exceed 150°F. If this condition exists, a severe thermal shock could occur leading to product failure and mixing of the fluids. For applications with a differential temperatures of 150°F or more, we recommend using a series with a floating tube-sheet, u-tube, or expansion joint to reduce the potential for the effects of thermal shock.

j) Water requirements vary from location to location. If the source of cooling water is from other than a municipal water supply, it is recommended that a water strainer be installed ahead of the heat exchanger to prevent dirt and debris from entering and clogging the flow passages. If a water modulating valve is used it is recommended to be installed at the inlet to the cooler to regulate the water flow.

k) For steam service, or other related applications, please consult our engineering department for additional information.

Maintenance
a) Inspect the heat exchanger for loosened bolts, connections, rust spots, corrosion, and for internal or external fluid leakage. Any corroded surfaces should be cleaned and recoated with paint.

b) Shell side: In many cases with clean hydraulic system oils it will not be necessary to flush the interior of the shell side of the cooler. In circumstances where the quality of hydraulic fluid is in question, the shell side should be disconnected and flushed on a yearly basis with a clean flushing oil/solvent to remove any sludge that has been deposited. For severe cases where the unit is plugged and cannot be flushed clean with solvent, the heat exchanger should be replaced to maintain the proper cooling performance.

c) Tube side: In many cases it will be necessary to clean the tube side of the heat exchanger due to poor fluid quality, debris, calcium deposits, corrosion, mud, sludge, seaweed, etc.... To clean the tube side, flush with clean water or any good quality commercial cleaner that does not attack the particular material of construction. With straight tube heat exchangers you can use a rod to carefully push any debris out of the tubes.

d) Zinc anodes are normally used to reduce the risk of failure due to electrolysis. Zinc anodes are a sacrificial component designed to wear and dissolve through normal use. Normally, zinc anodes are applied to the water supply side of the heat exchanger. Depending upon the amount of corrosive action, one, two, three, or more anodes can be applied to help further reduce the risk of failure. American Industrial Heat Transfer, Inc. offers zinc anodes as an option, to be specified and installed at the request our customers. It is the responsibility of the customer to periodically check and verify the condition of the zinc anode and replace it as needed.

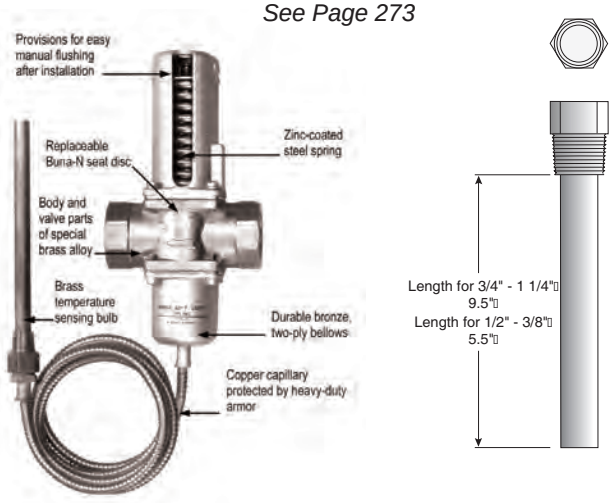
Applications vary due to water chemical makeup and quality, material differences, temperature, flow rate, piping arrangements, and machine grounding. For those reasons, zinc anodes do not follow any scheduled factory predetermined maintenance plan moreover they must be checked routinely by the customer, and a maintenance plan developed based upon the actual wear rate.

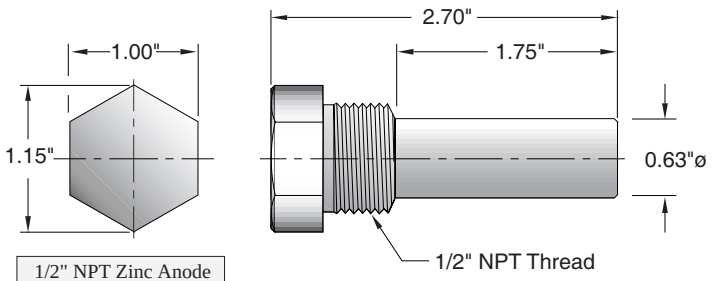
If substantial wear occurs or zinc dissolves without replacement, premature failure or permanent damage may occur to the heat exchanger. American Industrial does not warranty customer applications. It is the responsibility of the customer to verify and apply the proper system materials of construction and overall system requirements. Failures resulting from properly applied or misapplied use of zinc anode(s) into non-specified or specified applications will be the sole responsibility of the customer.

e) A routine maintenance schedule should be developed and adjusted to meet your systems requirements based upon water quality, etc….Failure to regularly maintain and clean your heat exchanger can result in a reduction in operational performance and life expectancy.

Note: *Since applications can vary substantially, the installation and maintenance information contained in this catalog should be used as a basic guideline. The safe installation, maintenance, and use of any American Industrial Heat Transfer, Inc. heat exchanger are solely the responsibility of the user.*

ACCESSORIES: THERMOSTATIC MODULATING WATER VALVE WITH BULB WELL ASSEMBLY
(for Shell & Tube Heat Exchangers And Air/Oil Coolers)
See Page 273





1/2" NPT Zinc Anode PN: 301-0003
AB-1200 thru AB-2000 AA-1200 thru AA-1600 CS-1200 thru CS-1700

website : www.aihti.com
general email : sales@aihti.com
technical email : engineering@aihti.com

Notes:

American Industrial Heat Transfer Inc.
Manufacturer of Quality Heat Exchangers

website : www.aihti.com
general email : sales@aihti.com
technical email : engineering@aihti.com

For ASME Application Computerized Data will be provided

For ASME Certified Units

Email form to: sales@aihti.com or engineering@aihti.com or fax to 434-757-1810

Contact Name _____ Telephone _____ Date _____

Company Name _____ Email _____

Address: _____ Fax _____

_____

Hot Side

Fluid Type _____

If available:

Density _____ lb/ft3
Viscosity _____ cP
Conductivity _____ Btu/hr.ft.°F
Specific Heat _____ Btu/lb.°F

1. Flow Rate _____
2. Temperature In _____
3. Desired Temperature Out _____
4. Heat Load _____

Cold Side

Fluid Type _____

If available:

Density _____ lb/ft3
Viscosity _____ cP
Conductivity _____ Btu/hr.ft.°F
Specific Heat _____ Btu/lb.°F

1. Flow Rate _____
2. Temperature In _____

Maximum Allowable Pressure Drop:

Hot Side _____ Cold Side _____

To properly size the heat exchanger we need 3 of the 4 perameter on the Hot Side and 2 on the Cold Side.

Fixed Tube Bundle ☐ Removable Tube Bundle ☐ U-Tube Fixed Tube Bundle ☐ U-Tube Removable Tube Bundle ☐

Shell Material Construction:

Steel ☐ Stainless Steel ☐

Tube Sheet Material

Steel ☐ Stainless Steel ☐

Brass ☐ (Applies to removable bundle only)

Tube Material Construction:

Copper ☐
90/10 Copper Nickel ☐
Stainless Steel ☐

End Bonnets Material:

Steel ☐
Stainless Steel ☐

Require All Stainless Steel Heat Exchanger Yes ☐ No ☐

Comment: _____

_____

note: AIHTI reserves the right to make reasonable design changes without notice.

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American Industrial
Heat Transfer Inc.

Manufacturer of Quality Heat Exchangers

www.aihti.com

ASME CERTIFIED UNITS

Single Pass

Two Pass

ASME CERTIFIED

HEAT EXCHANGERS

At American Industrial we manufacture various sizes of heat exchangers, from 5 inch to 50 inches diameter and larger if needed. The length can range from 20 inches to 40 feet long. Heat exchangers can be manufactured in a variety of materials to meet customer requirements with ASME code and certified.

Since we manufacture all components in our facility, we can meet the quality and delivery our customers require.

We can duplicate any existing heat exchanger from a drawing, free-hand sketch, or by sending the actual physical unit to our facility. We will guarantee to meet material construction, dimensions, and performance of the unit.

You may contact:

Engineering department: 434-757-1800 • 847-731-1000
engineering@aihti.com • sales@aihti.com

note: AIHTI reserves the right to make reasonable design changes without notice.

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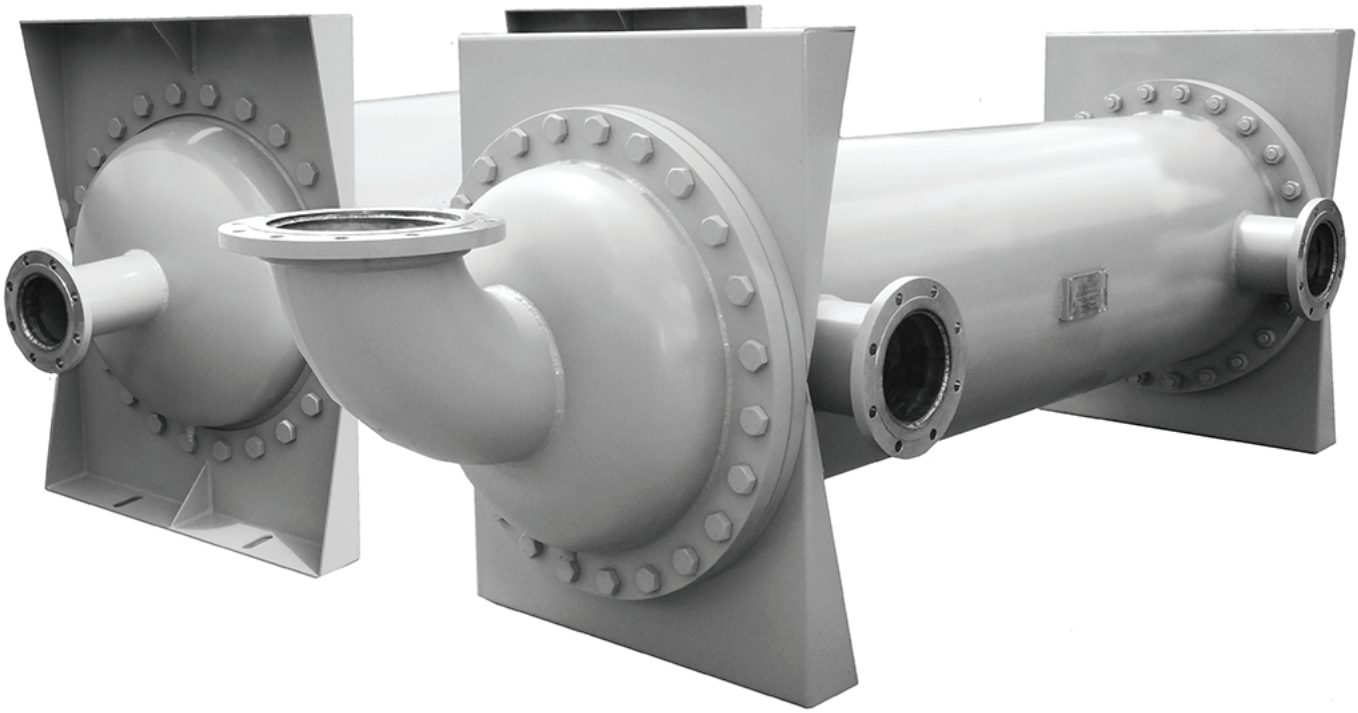


Sample of Shell and Tube

Sample of air and liquid

355 American Industrial Drive LaCrosse, VA 23950 tel: 434-757-1800 fax: 434-757-1810 email: sales@aihti.com

website : www.aihti.com
general email : sales@aihti.com
technical email : engineering@aihti.com

Notes:

American Industrial Heat Transfer Inc.
Manufacturer of Quality Heat Exchangers

website : www.aihti.com
general email : sales@aihti.com
technical email : engineering@aihti.com

Shell & Tube Application Request: *(For liquid to liquid heat exchangers)*

For CS2400 - 4800 Series

Email form to: sales@aihti.com or engineering@aihti.com or fax to 434-757-1810

Contact Name _____ Telephone _____ Date _____

Company Name _____ Email _____

Address: _____ Fax _____

_____

Hot Side

Fluid Type _____

If available:

Density _____ lb/ft3
Viscosity _____ cP
Conductivity _____ Btu/hr.ft.°F
Specific Heat _____ Btu/lb.°F

1. Flow Rate _____
2. Temperature In _____
3. Desired Temperature Out _____
4. Heat Load _____

Cold Side

Fluid Type _____

If available:

Density _____ lb/ft3
Viscosity _____ cP
Conductivity _____ Btu/hr.ft.°F
Specific Heat _____ Btu/lb.°F

1. Flow Rate _____
2. Temperature In _____

Maximum Allowable Pressure Drop:

Hot Side _____ Cold Side _____

To properly size the heat exchanger we need 3 of the 4 perameter on the Hot Side and 2 on the Cold Side.

Fixed Tube Bundle ☐ Removable Tube Bundle ☐ U-Tube Fixed Tube Bundle ☐ U-Tube Removable Tube Bundle ☐

Shell Material Construction:

Steel ☐ Stainless Steel ☐

Tube Sheet Material

Steel ☐ Stainless Steel ☐
Brass ☐ (Applies to removable bundle only)

Tube Material Construction:

Copper ☐
90/10 Copper Nickel ☐
Stainless Steel ☐

End Bonnets Material:

Steel ☐
Stainless Steel ☐

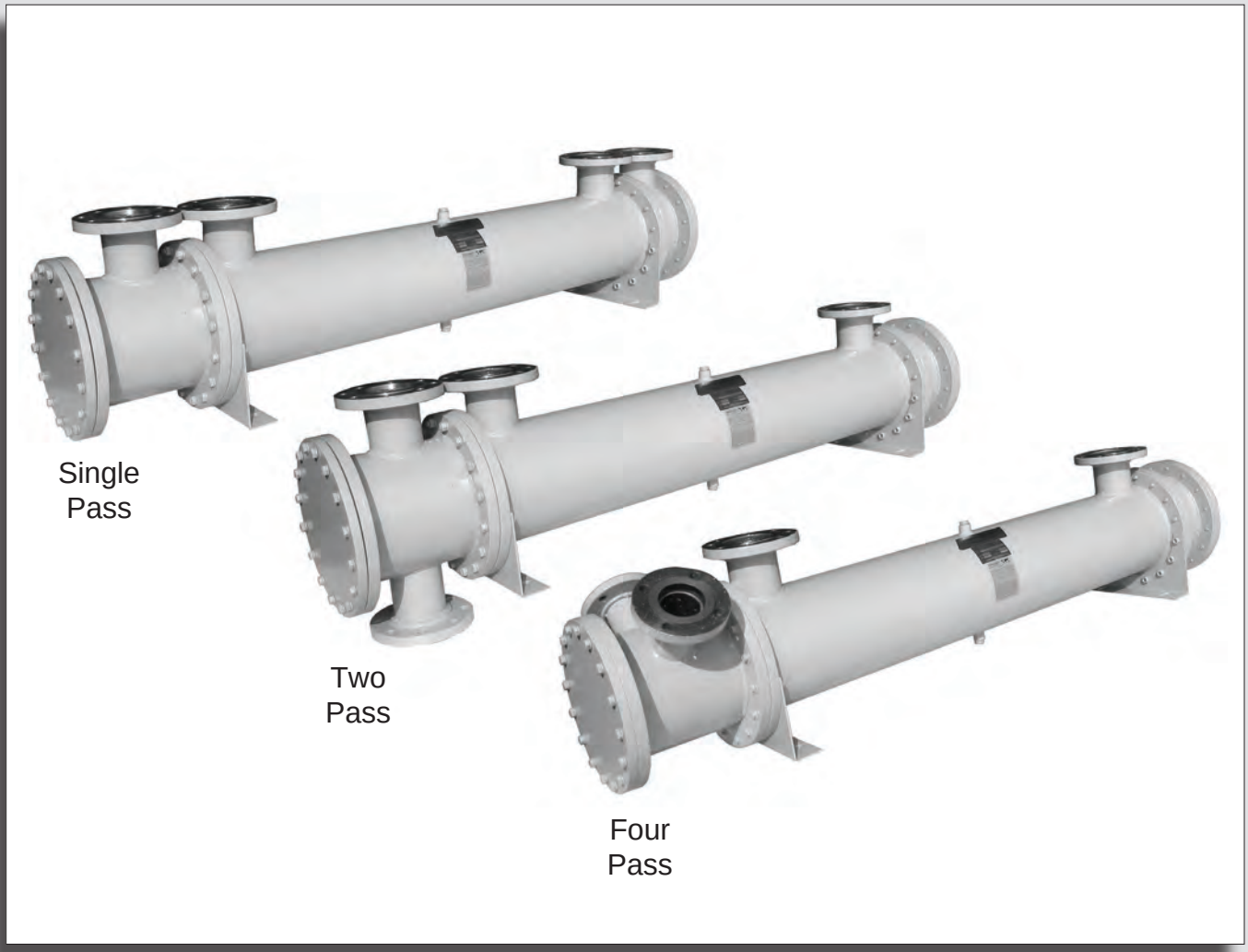
Require All Stainless Steel Heat Exchanger Yes ☐ No ☐

ASME Code and Certified Yes ☐ No ☐

Comment: _____

_____

CS 2400 - 4800 SERIES

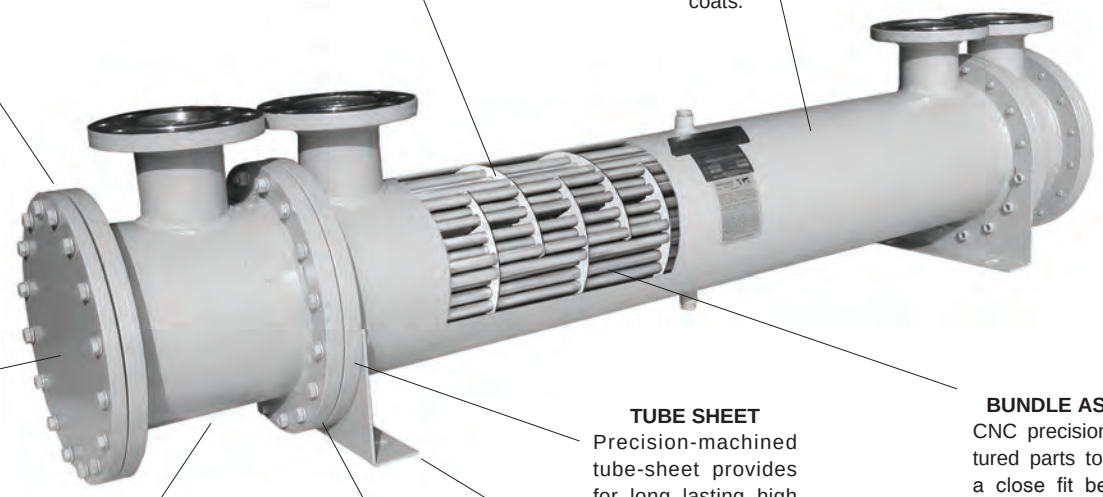


Fixed Tube Bundle / Liquid Cooled

HEAT EXCHANGERS

- High thermal capacity.
- Large flow capacity.
- Operating pressure for tubes 150 PSI.
- Operating pressure for shell 300 PSI.
- Operating temperature 300 °F.
- Computer generated data sheet available for any application
- As an option, available in ASME code and certified
- Can be customized to fit any applications.

CS 2400 - CS 4800 Series *overview*



BAFFLES
CNC manufactured baffles to provide maximum turbulence and heat transfer with a minimum fluid pressure drop.

FINISH
Gray semigloss enamel suitable for outdoor service. Can be used as a base for additional coats.

FULL FACE GASKET
Full-face composite gasket.

REMOVABLE CHANNEL COVER
For easy access to tubes for cleaning without removing the channel.

TUBE SHEET
Precision-machined tube-sheet provides for long lasting high strength service.

BUNDLE ASSEMBLY
CNC precision manufactured parts to guarantee a close fit between the baffles, tubes, and shell. Clearances are minimized to provide for maximum heat transfer.

FABRICATED CHANNEL
Provides fluid into tubes with minimum restriction. One, two, or four pass interchangeability.

TUBE JOINT
Roller expanded tube joint to tube-sheet.

STEEL FOOT BRACKET

UNIT CODING

Example Model

Options

CS - 3648 - 4 - 6 - TP - CNT - SB - Z

Model
CS

Shell Diameter
2400 = 12.75"
2800 = 14.00"
3200 = 16.00"
3600 = 18.00"
4000 = 20.00"
4400 = 22.00"
4800 = 24.00"

Effective Tube Length
(12" increments)

Baffle Spacing Code
4.0"
6.0"
8.0"
12.0"
18.0"
24.0"

Cooling Tube Diamenter
6 = 3/8"
10 = 5/8"

Tube Side Passes
SP = 1 pass
TP = 2 pass
FP = 4 pass

Tubing
Blank = Copper

Options
CNT= 90/10 Cu Ni
STS = Stainless Steel
C = Carbon Steel

End Bonnets
Blank = Fabricated Steel

Options
SB = Stainless Steel

Zinc Anode
Z = 1 Zinc Anode
2Z = 2 Zinc Anode etc.

STANDARD CONSTRUCTION MATERIALS & RATINGS

Standard Model	CS 2400 - 4800	Options	
Shell	Steel	Stainless Steel	Operating Pressure Tubes 150 psig Operating Pressure Shell 300 psig Operating Temperature 300 °F
Tubes	Copper	90/10 Copper Nickel / Stainless Steel	
Baffle	Steel	Brass / Stainless Steel	
Tube Sheet	Steel	Stainless Steel	
End Bonnets	Fabricated Steel	Stainless Steel	
Mounting Brackets	Steel	Steel	
Gasket	Hypalon Composite	O-Ring	

note: AIHTI reserves the right to make reasonable design changes without notice.

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STEP 1: Calculate the heat load

The heat load in BTU/HR or (Q) can be derived by using several methods. To simplify things, we will consider general specifications for hydraulic system oils and other fluids that are commonly used with shell & tube heat exchangers.

Terms					
GPM	=	Gallons Per Minute	Kw	=	Kilowatt (watts x 1000)
CN	=	Constant Number for a given fluid	T_{in}	=	Hot fluid entering temperature in °F
△T	=	Temperature differential across the potential	T_{out}	=	Hot fluid exiting temperature in °F
PSI	=	Pounds per Square Inch (pressure) of the operating side of the system	t_{in}	=	Cold fluid temperature entering in °F
MHP	=	Horsepower of the electric motor driving the hydraulic pump	t_{out}	=	Cold fluid temperature exiting in °F
			Q	=	BTU / HR

For example purposes, a hydraulic system has a total input 1200 HP (894Kw) electric motor installed coupled to a pump that produces a flow of 600 GPM @ 3000 PSIG. The temperature differential of the oil entering the pump *vs* exiting the system is about 6.6°F. Even though the return line pressure operates below 200 psi, calculate the system heat load potential (Q) based upon the prime movers (pump) capability, cooling fluid is water @ 80ºF use one of the following equations to accomplish this:

To derive the required heat load (Q) to be removed by the heat exchanger, apply ONE of the following. Note: The calculated heat loads may differ slightly from one formula to the next. This is due to assumptions made when estimating heat removal requirements. The factor *(v)* represents the percentage of the overall input energy to be rejected by the heat exchanger. The *(v)* factor is generally about 30% for most hydraulic systems, however it can range from 20%-70% depending upon the installed system components and heat being generated (ie. servo valves, proportional valves, etc…will increase the percentage required).

Formula	Example
A) Q = GPM x CN x actual △T	A) Q =600 x 210 x 6.6°F = 831,600 BTU/HR
B) Q = [(PSI x GPM) / 1714] x (*v*) x 2545	B) Q =[(3000x600)/1714] x .30 x 2545 = 801,808 BTU/HR
C) Q = MHP x (*v*) x 2545	C) Q =1200 x .30 x 2545 = 916,200 BTU/HR
D) Q = Kw to be removed x 3415	D) Q =894 x .30 x 3415 = 915,909 BTU/HR
E) Q = HP to be removed x 2545	E) Q =300 x 2545 = 736,500 BTU/HR

Constant for a given fluid (CN)

1) Oil ..... CN = 210
2) Water..... CN = 500
3) 50% E. Glycol..... CN = 450

STEP 2: Calculate the Mean Temperature Difference

When calculating the MTD you will be required to choose a liquid flow rate to derive the Cold Side △T. If the water flow is unknown you may need to assume a number based on what is available. As a normal rule of thumb, for oil to water cooling a 2:1 oil to water ratio is used. For applications of water to water or 50 % Ethylene Glycol to water, a 1:1 ratio is common.

	Formula	Example (from step 1,item C)
HOT FLUID Oil	$\triangle T = \frac{Q}{CN \times GPM}$	$\triangle T = \frac{916{,}200\ BTU/hr}{210\ CN \times 600 GPM} = 7.37°F$ = △T Rejected
COLD FLUID Water	$\triangle t = \frac{BTU\ /\ hr}{CN \times GPM}$	$\triangle t = \frac{916{,}200\ BTU/hr}{500\ CN \times 300 GPM} = 3.81°F$ = △t Absorbed

T_{in}	=	Hot Fluid entering temperature in degrees F	117.3 °F
T_{out}	=	Hot Fluid exiting temperature in degrees F	110.0 °F
t_{in}	=	Cold Fluid entering temperature in degrees F	80.0 °F
t_{out}	=	Cold Fluid exiting temperature in degrees F	86.1 °F

$$\frac{T_{out} - t_{in}}{T_{in} - t_{out}} = \frac{S[\text{smaller temperature difference}]}{L[\text{larger temperature difference}]} = \left(\frac{S}{L}\right) \qquad \frac{110.0°F - 80.0°F}{117.3°F - 86.1°F} = \frac{30.0°F}{31.2°F} = .962$$

STEP 3: Calculate Log Mean Temperature Difference (LMTD)

To calculate the LMTD please use the following method;
L = Larger temperature difference from step 2.
M = S/L number (LOCATED IN TABLE A). .962 = .980
$LMTD_i$ = L x M
$LMTD_i$ = 31.2 x .980 (FROM TABLE A) = 30.6

To correct the $LMTD_i$ for a multipass heat exchangers calculate **R** & **K** as follows:

Formula	Example
$R = \frac{T_{in} - T_{out}}{t_{out} - t_{in}}$	$R = \frac{117.3°F - 100°F}{86.1°F - 90°F} = \frac{17.3°F}{6.1°F} =$ **{2.82=R}**
$K = \frac{t_{out} - t_{in}}{T_{in} - t_{in}}$	$K = \frac{86.1°F - 80°F}{117.3°F - 80°F} = \frac{6.1°F}{37.3°F} =$ **{.163=K}**

Locate the correction factor CF_B (FROM TABLE B)
$LMTD_c = LMTD_i \times CF_B$
$LMTD_c$ = 30.6 x .997 = **30.5**

STEP 4: Calculate the area required

$$\textbf{Required Area sq.ft.} = \frac{Q\ (BTU\ /\ HR)}{LMTD_c \times U\ (\text{FROM TABLE C})} \qquad \frac{916{,}200}{30.5 \times 100} = \textbf{300.4 sq.ft.}$$

CS 2400 - 4800 Series *selection*

STEP 5: Selection

a) From TABLE E choose the correct series size, baffle spacing, and number of passes that best fits your flow rates for both shell and tube side. Note that the tables suggest minimum and maximum information. Try to stay within the 20-80 percent range of the indicated numbers.

Example

Oil Flow Rate = 600 GPM = Series Required from Table E = **2400 Series**
Baffle Spacing from Table E = **18 baffle**
Water Flow Rate = 300 GPM = Passes required in 2000 series = **TP**

b) From TABLE D choose the heat exchanger model size based upon the sq.ft. or surface area in the series size that will accommodate your flow rate.

Example

Required Area = 300.4 sq.ft Closest model required based upon sq.ft. & series = **CS-2472-12-6-TP**

If you require a computer generated data sheet for the application, or if the information that you are trying to apply does not match the corresponding information, please contact our engineering services department for further assistance.

Shell Dia. Code	Max. Liquid Flow - Shell Side						Liquid Flow - Tube Side					
	4	6	8	12	18	24	SP		TP		FP	
							Min.	Max.	Min.	Max.	Min.	Max.
2400	155	235	310	470	700	930	135	1080	70	535	34	265
2800	170	255	345	510	770	1030	166	1320	83	660	42	330
3200	200	295	395	590	890	1175	221	1760	110	880	55	440
3600	225	335	445	665	1000	1330	284	2275	142	1135	71	565
4000	250	375	495	745	1120	1490	355	2845	177	1420	89	710
4400	275	410	550	820	1230	1640	435	3480	218	1740	109	870
4800	300	450	600	895	1345	1790	522	4170	261	2085	130	1040

TABLE C

U	TUBE FLUID	SHELL FLUID
400	Water	Water
350	Water	50% E. Glycol
100	Water	Oil
300	50% E. Glycol	50% E. Glycol
90	50% E. Glycol	Oil

TABLE A- FACTOR M/LMTD = L x M

S/L	M	S/L	M	S/L	M	S/L	M
		.25	.541	.50	.721	.75	.870
.01	.215	.26	.549	.51	.728	.76	.864
.02	.251	.27	.558	.52	.734	.77	.879
.03	.277	.28	.566	.53	.740	.78	.886
.04	.298	.29	.574	.54	.746	.79	.890
.05	.317	.30	.582	.55	.753	.80	.896
.06	.334	.31	.589	.56	.759	.81	.902
.07	.350	.32	.597	.57	.765	.82	.907
.08	.364	.33	.604	.58	.771	.83	.913
.09	.378	.34	.612	.59	.777	.84	.918
.10	.391	.35	.619	.60	.783	.85	.923
.11	.403	.36	.626	.61	.789	.86	.928
.12	.415	.37	.634	.62	.795	.87	.934
.13	.427	.38	.641	.63	.801	.88	.939
.14	.438	.39	.648	.64	.806	.89	.944
.15	.448	.40	.655	.65	.813	.90	.949
.16	.458	.41	.662	.66	.818	.91	.955
.17	.469	.42	.669	.67	.823	.92	.959
.18	.478	.43	.675	.68	.829	.93	.964
.19	.488	.44	.682	.69	.836	.94	.970
.20	.497	.45	.689	.70	.840	.95	.975
.21	.506	.46	.695	.71	.848	.96	.979
.22	.515	.47	.702	.72	.852	.97	.986
.23	.524	.48	.709	.73	.858	.98	.991
.24	.533	.49	.715	.74	.864	.99	.995

TABLE B- LMTD correction factor for Multipass Exchangers

R

	.05	.1	.15	.2	.25	.3	.35	.4	.45	.5	.6	.7	.8	.9	1.0
.2	1	1	1	1	1	1	1	.999	.993	.984	.972	.942	.908	.845	.71
.4	1	1	1	1	1	1	.994	.983	.971	.959	.922	.855	.70		
.6	1	1	1	1	1	.992	.980	.965	.948	.923	.840				
.8	1	1	1	1	.995	.981	.965	.945	.916	.872					
1.0	1	1	1	1	.988	.970	.949	.918	.867	.770					
2.0	1	1	.977	.973	.940	.845	.740								
3.0	1	1	.997	.933	.835										
4.0	1	.993	.950	.850											
5.0	1	.982	.917												
6.0	1	.968	.885												
8.0	1	.930													
10.0	.996	.880													
12.0	.985	.720													
14.0	.972														
16.0	.958														
18.0	.940														
20.0	.915														

K

TABLE D- Surface Area

Model Number	Surface Area in Sq.ft.		Model Number	Surface Area in Sq.ft.		Model Number	Surface Area in Sq.ft.		Model Number	Surface Area in Sq.ft.	
	3/8" O.D Tubing	5/8 O.D Tubing		3/8" O.D Tubing	5/8 O.D Tubing		3/8" O.D Tubing	5/8 O.D Tubing		3/8" O.D Tubing	5/8 O.D Tubing
CS-2436	153.2	82.5	CS-3248	334.6	185.9	CS-4048	540.4	301.1	CS-4848	793.2	442.4
CS-2448	204.2	110.0	CS-3260	418.2	232.3	CS-4060	675.4	376.3	CS-4860	991.6	553.0
CS-2460	255.3	137.4	CS-3272	501.9	278.8	CS-4072	810.5	451.6	CS-4872	1189.9	663.7
CS-2472	306.3	164.9	CS-3284	585.5	325.3	CS-4084	945.6	526.9	CS-4884	1388.2	774.3
CS-2484	357.4	192.4	CS-3296	669.1	371.8	CS-4096	1080.7	602.1	CS-4896	1586.5	884.9
CS-2496	408.4	219.9	CS-32108	752.8	418.2	CS-40108	1215.8	677.4	CS-48108	1784.8	995.5
CS-24108	459.5	247.4	CS-32120	836.4	464.7	CS-40120	1350.9	752.7	CS-48120	1983.1	1106.1
CS-24120	510.5	274.9	CS-32132	920.1	511.2	CS-40132	1486.0	827.9	CS-48132	2181.4	1216.7
CS-2848	251.3	138.8	CS-3648	432.0	240.9	CS-4448	661.3	361.3			
CS-2860	314.2	173.4	CS-3660	540.0	301.1	CS-4460	826.6	451.6			
CS-2872	377.0	208.1	CS-3672	647.9	361.3	CS-4472	991.9	541.9			
CS-2884	439.8	242.8	CS-3684	755.9	421.5	CS-4484	1157.3	632.2			
CS-2896	502.7	277.5	CS-3696	863.9	481.7	CS-4496	1322.6	722.6			
CS-28108	565.5	312.2	CS-36108	971.9	541.9	CS-44108	1487.9	812.9			
CS-28120	628.3	346.9	CS-36120	1079.9	602.1	CS-44120	1653.2	903.2			
CS-28132	691.1	381.6	CS-36132	1187.9	662.4	CS-44132	1818.5	993.5			

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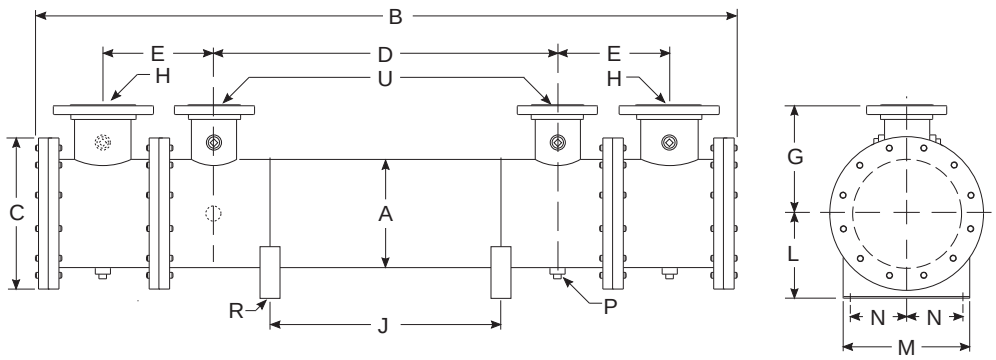
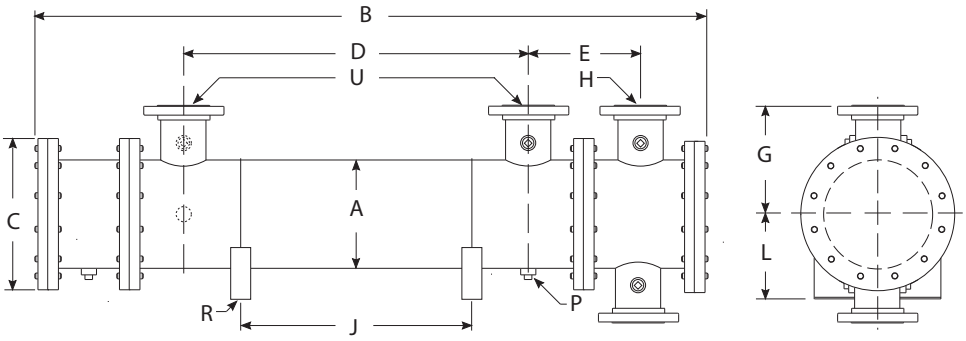


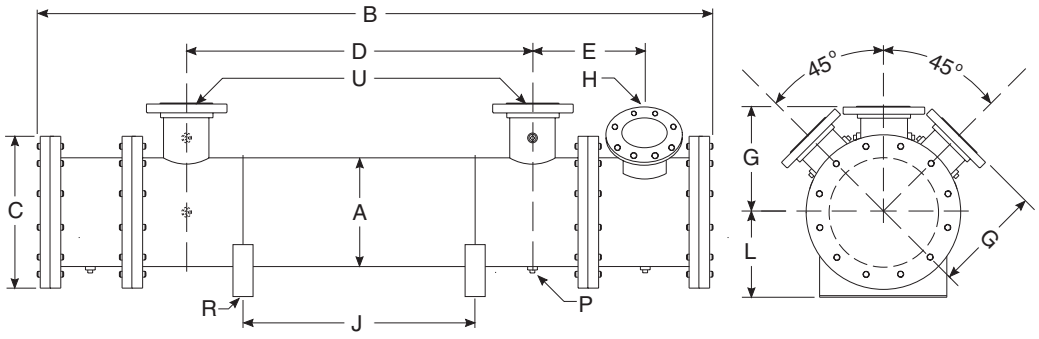
Model	B	E	H
CS-2436	68.00	14.44	8.00" ANSI Flange 150# RF
CS-2448	80.00		
CS-2460	92.00		
CS-2472	104.00		
CS-2484	116.00		
CS-2496	128.00		
CS-24108	140.00		
CS-24120	152.00		

Single Pass (SP)



Model	B	E	H
CS-2436	63.00	14.44	6.00" ANSI Flange 150# RF
CS-2448	75.00		
CS-2460	87.00		
CS-2472	99.00		
CS-2484	111.00		
CS-2496	123.00		
CS-24108	135.00		
CS-24120	147.00		

Two Pass (TP)



Model	B	E	H
CS-2436	63.00	14.44	4.00" ANSI Flange 150# RF
CS-2448	75.00		
CS-2460	87.00		
CS-2472	99.00		
CS-2484	111.00		
CS-2496	123.00		
CS-24108	135.00		
CS-24120	147.00		

Four Pass (FP)

COMMON DIMENSIONS & WEIGHTS

Model	A	C	D	G	J adjustable	L	M	N	P NPT	R	U	Weight	Model
CS-2436	12.75	16.25	24.00	11.38	12.00	12.00	14.75	5.00	(10) .50	.75"Ø x 1.00" Thru Slot	6.00" ANSI Flange 150# RF	1040	CS-2436
CS-2448			36.00		24.00							1130	CS-2448
CS-2460			48.00		36.00							1221	CS-2460
CS-2472			60.00		48.00							1312	CS-2472
CS-2484			72.00		60.00							1402	CS-2484
CS-2496			84.00		72.00							1493	CS-2496
CS-24108			96.00		84.00							1584	CS-24108
CS-24120			108.00		96.00							1675	CS-24120

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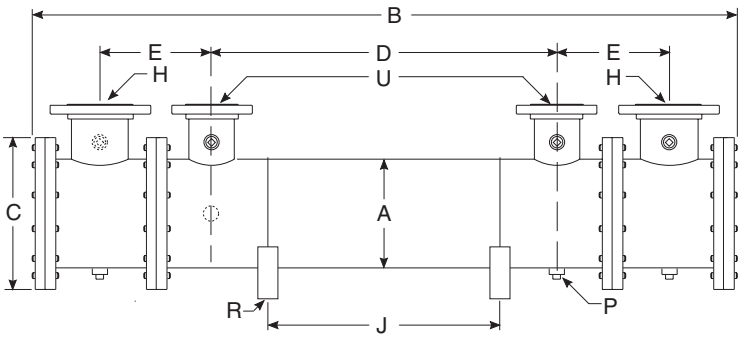
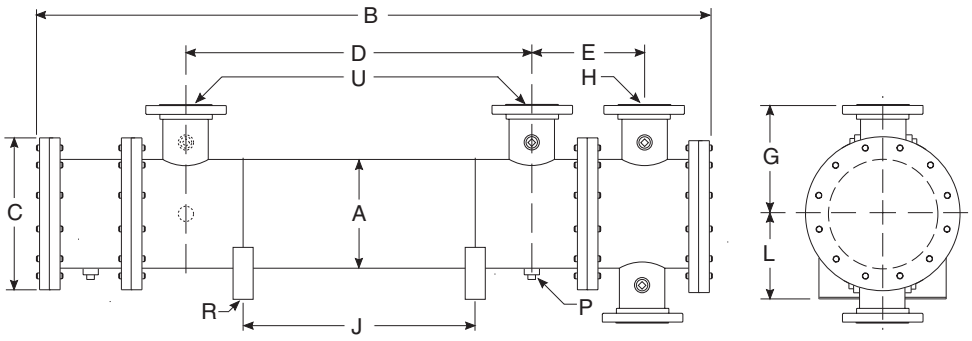
CS-2800 Series *dimensions*



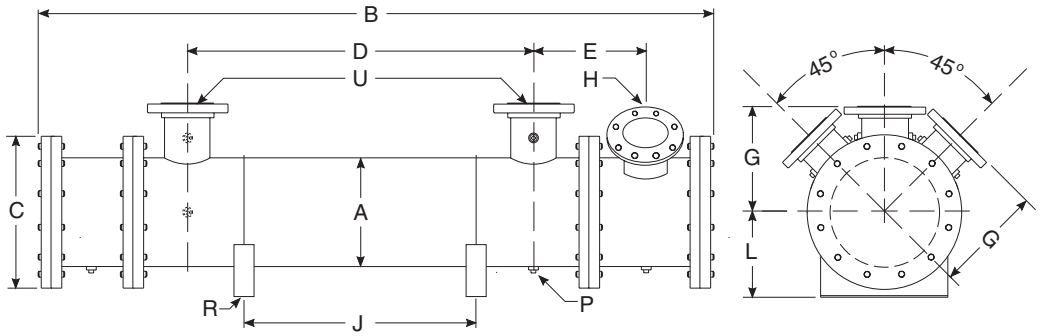
Model	B	E	H
CS-2836	68.00	15.44	8.00" ANSI Flange 150# RF
CS-2848	80.00		
CS-2860	92.00		
CS-2872	104.00		
CS-2884	116.00		
CS-2896	128.00		
CS-28108	140.00		
CS-28120	152.00		
CS-28132	164.00		

Single Pass (SP)



Model	B	E	H
CS-2836	64.00	15.44	6.00" ANSI Flange 150# RF
CS-2848	76.00		
CS-2860	88.00		
CS-2872	100.00		
CS-2884	112.00		
CS-2896	124.00		
CS-28108	136.00		
CS-28120	148.00		
CS-28132	160.00		

Two Pass (TP)



Model	B	E	H
CS-2836	64.00	15.44	4.00" ANSI Flange 150# RF
CS-2848	76.00		
CS-2860	88.00		
CS-2872	100.00		
CS-2884	112.00		
CS-2896	124.00		
CS-28108	136.00		
CS-28120	148.00		
CS-28132	160.00		

Four Pass (FP)

COMMON DIMENSIONS & WEIGHTS

Model	A	C	D	G	J adjustable	L	M	N	P NPT	R	U	Weight	Model
CS-2836	14.00	18.00	22.00	13.00	6.00	13.00	16.00	5.00	(10) .50	.75"Ø x 1.00" Thru Slot	8.00" ANSI Flange 150# RF	1288	CS-2836
CS-2848			34.00		18.00							1400	CS-2848
CS-2860			46.00		30.00							1512	CS-2860
CS-2872			58.00		42.00							1624	CS-2872
CS-2884			70.00		54.00							1736	CS-2884
CS-2896			82.00		66.00							1848	CS-2896
CS-28108			94.00		78.00							1960	CS-28108
CS-28120			106.00		90.00							2072	CS-28120
CS-28132			118.00		102.00							2184	CS-28132

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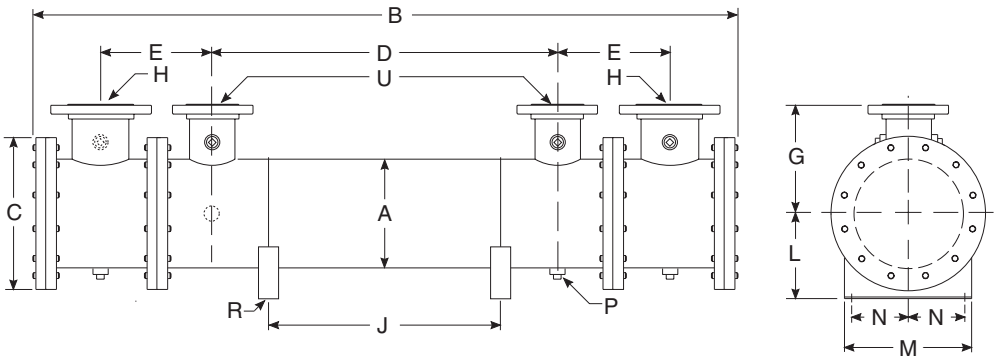
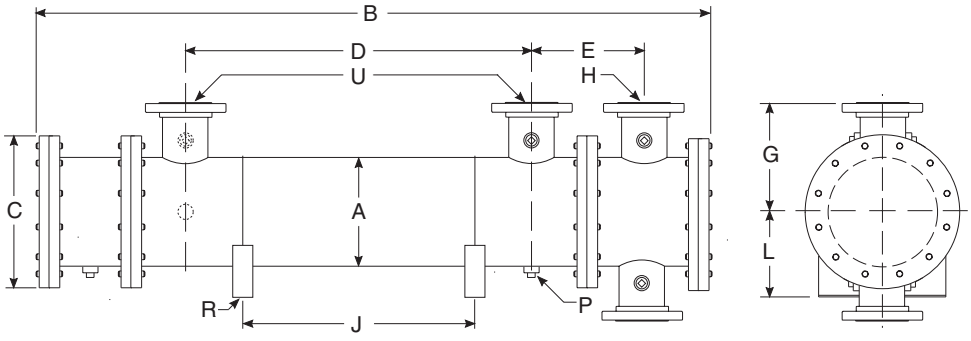


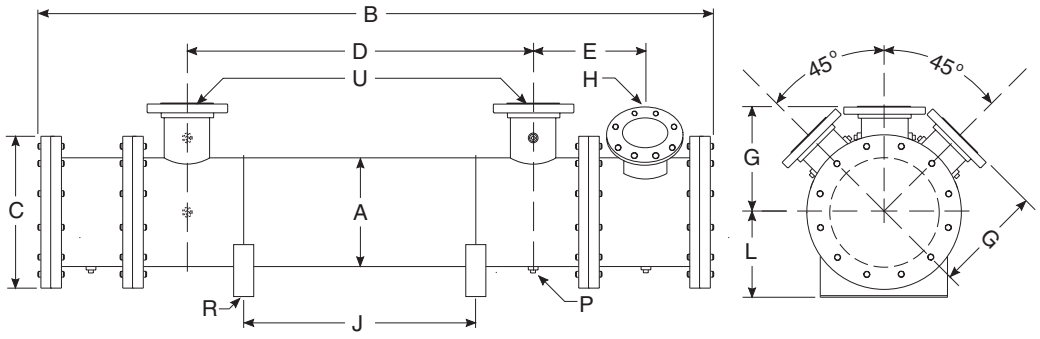
Model	B	E	H
CS-3248	85.00	17.00	10.00" ANSI Flange 150# RF
CS-3260	97.00		
CS-3272	109.00		
CS-3284	121.00		
CS-3296	133.00		
CS-32108	145.00		
CS-32120	157.00		
CS-32132	169.00		

Single Pass (SP)



Model	B	E	H
CS-3248	80.00	17.00	6.00" ANSI Flange 150# RF
CS-3260	92.00		
CS-3272	104.00		
CS-3284	116.00		
CS-3296	128.00		
CS-32108	140.00		
CS-32120	152.00		
CS-32132	164.00		

Two Pass (TP)



Model	B	E	H
CS-3248	80.00	17.00	5.00" ANSI Flange 150# RF
CS-3260	92.00		
CS-3272	104.00		
CS-3284	116.00		
CS-3296	128.00		
CS-32108	140.00		
CS-32120	152.00		
CS-32132	164.00		

Four Pass (FP)

COMMON DIMENSIONS & WEIGHTS

Model	A	C	D	G	J adjustable	L	M	N	P NPT	R	U	Weight	Model
CS-3248	16.00	20.00	34.00	13.00	18.00	14.00	18.00	6.00	(10) .50	.781"Ø x 1.50" Thru Slot	8.00" ANSI Flange 150# RF	2377	CS-3248
CS-3260			46.00		30.00							1975	CS-3260
CS-3272			58.00		42.00							2121	CS-3272
CS-3284			70.00		54.00							2266	CS-3284
CS-3296			82.00		66.00							2412	CS-3296
CS-32108			94.00		78.00							2558	CS-32108
CS-32120			106.00		90.00							2705	CS-32120
CS-32132			118.00		102.00							2852	CS-32132

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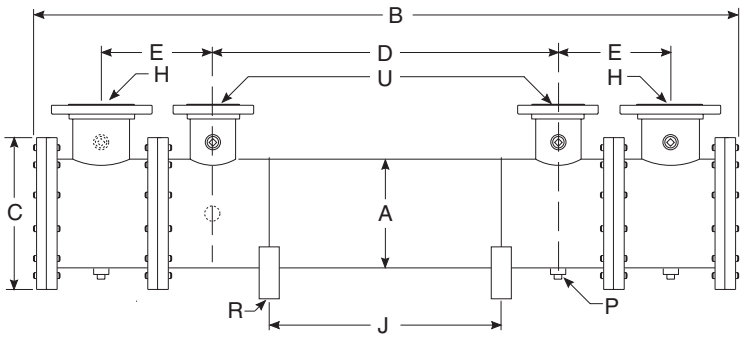
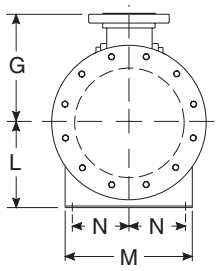
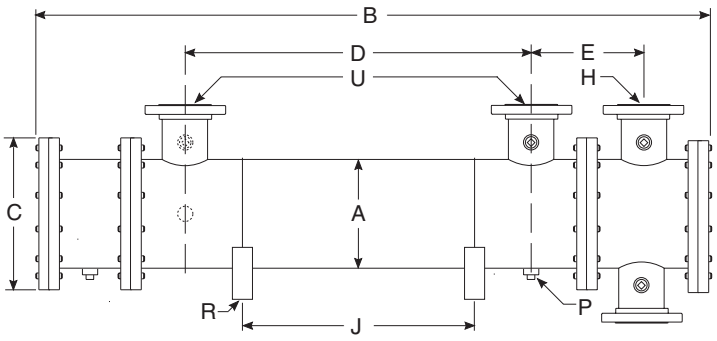
CS-3600 Series *dimensions*

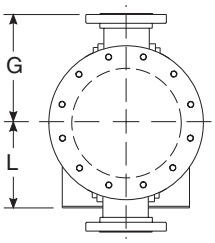




Model	B	E	H
CS-3648	85.00	18.00	10.00" ANSI Flange 150# RF
CS-3660	97.00		
CS-3672	109.00		
CS-3684	121.00		
CS-3696	133.00		
CS-36108	145.00		
CS-36120	157.00		
CS-36132	169.00		

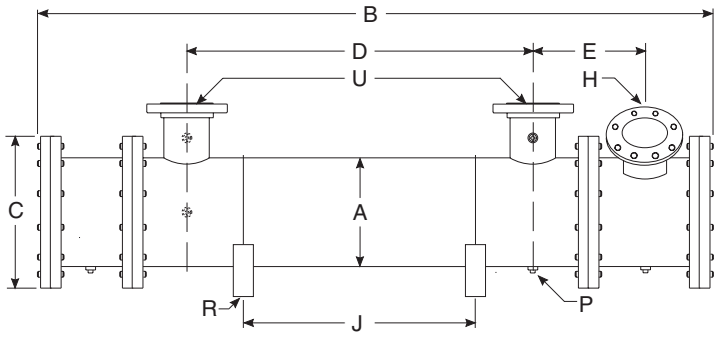
Single Pass (SP)

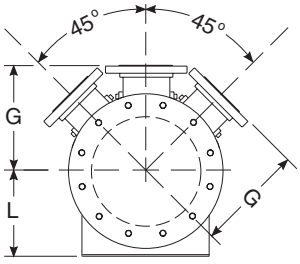




Model	B	E	H
CS-3648	81.50	18.00	8.00" ANSI Flange 150# RF
CS-3660	93.50		
CS-3672	105.50		
CS-3684	117.50		
CS-3696	129.50		
CS-36108	141.50		
CS-36120	153.50		
CS-36132	165.50		

Two Pass (TP)





Model	B	E	H
CS-3648	81.50	18.00	5.00" ANSI Flange 150# RF
CS-3660	93.50		
CS-3672	105.50		
CS-3684	117.50		
CS-3696	129.50		
CS-36108	141.50		
CS-36120	153.50		
CS-36132	165.50		

Four Pass (FP)

COMMON DIMENSIONS & WEIGHTS

Model	A	C	D	G	J adjustable	L	M	N	P NPT	R	U	Weight	Model
CS-3648	18.00	22.00	32.00	13.00	12.00	15.00	20.00	7.00	.50	.781"Ø x 1.50" Thru Slot	10.00" ANSI Flange 150# RF	2314	CS-3648
CS-3660			44.00		24.00							2498	CS-3660
CS-3672			56.00		36.00							2684	CS-3672
CS-3684			68.00		48.00							2869	CS-3684
CS-3696			80.00		60.00							3054	CS-3696
CS-36108			92.00		72.00							3239	CS-36108
CS-36120			104.00		84.00							3424	CS-36120
CS-36132			116.00		96.00							3609	CS-36132

note: AIHTI reserves the right to make reasonable design changes without notice.

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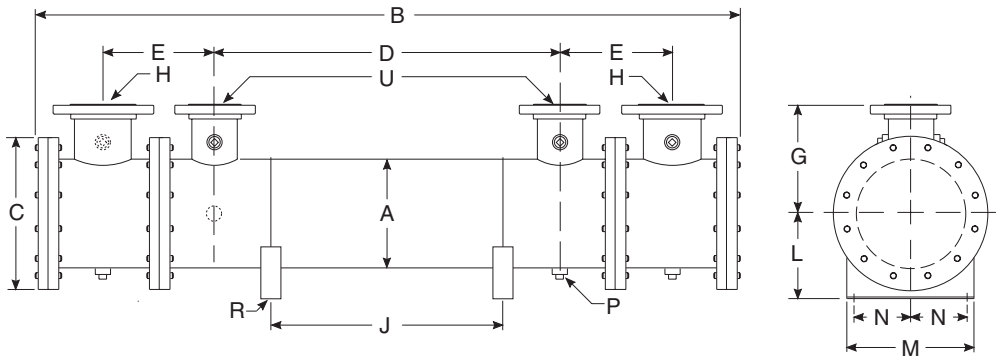
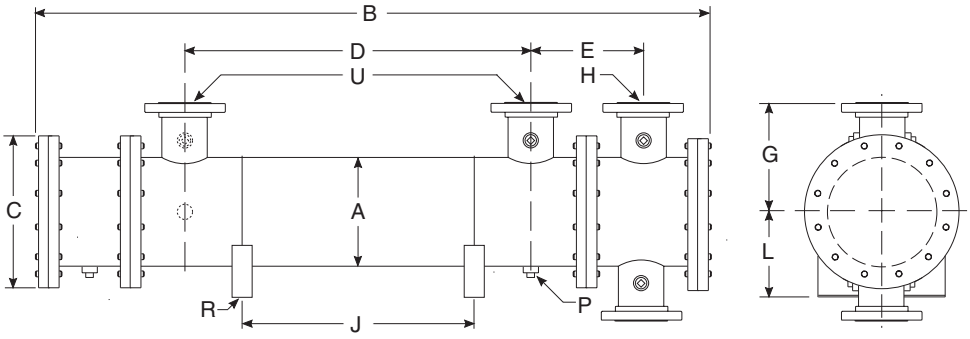


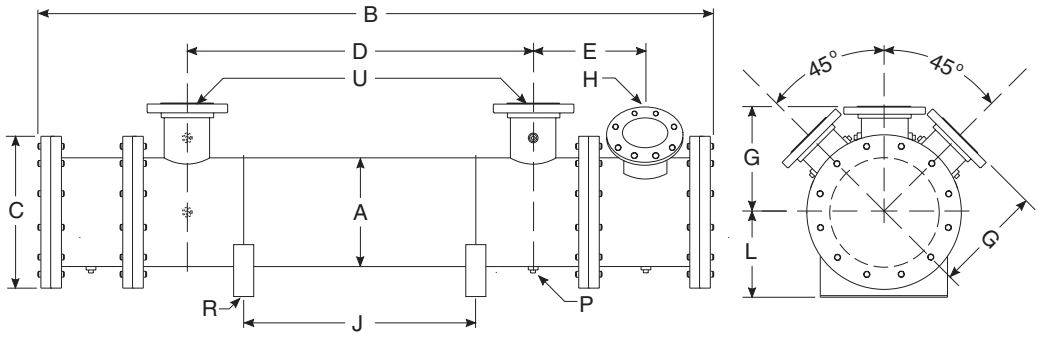
Model	B	E	H
CS-4048	91.00	19.50	12.00" ANSI Flange 150# RF
CS-4060	103.00		
CS-4072	115.00		
CS-4084	127.00		
CS-4096	139.00		
CS-40108	151.00		
CS-40120	163.00		
CS-40132	175.00		

Single Pass (SP)



Model	B	E	H
CS-4048	86.50	19.50	8.00" ANSI Flange 150# RF
CS-4060	98.50		
CS-4072	110.50		
CS-4084	122.50		
CS-4096	134.50		
CS-40108	146.50		
CS-40120	158.50		
CS-40132	170.50		

Two Pass (TP)



Model	B	E	H
CS-4048	86.50	19.50	6.00" ANSI Flange 150# RF
CS-4060	98.50		
CS-4072	110.50		
CS-4084	122.50		
CS-4096	134.50		
CS-40108	146.50		
CS-40120	158.50		
CS-40132	170.50		

Four Pass (FP)

COMMON DIMENSIONS & WEIGHTS

Model	A	C	D	G	J adjustable	L	M	N	P NPT	R	U	Weight	Model
CS-4048	20.00	25.00	32.00	16.00	12.00	17.00	22.00	8.00	.50	.781"Ø x 1.50" Thru Slot	10.00" ANSI Flange 150# RF	2856	CS-4048
CS-4060			44.00		24.00							3085	CS-4060
CS-4072			56.00		36.00							3313	CS-4072
CS-4084			68.00		48.00							3542	CS-4084
CS-4096			80.00		60.00							3770	CS-4096
CS-40108			92.00		72.00							3999	CS-40108
CS-40120			104.00		84.00							4227	CS-40120
CS-40132			116.00		96.00							4456	CS-40132

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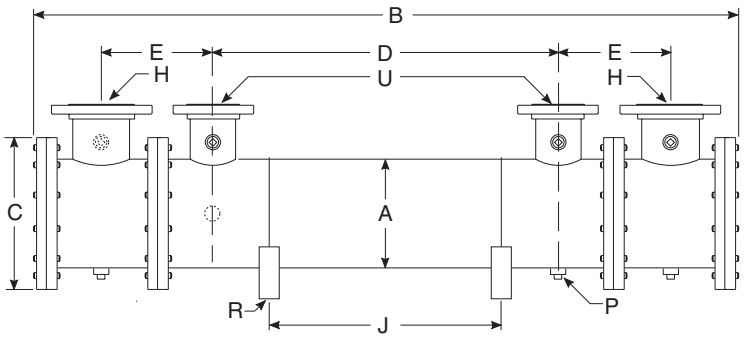
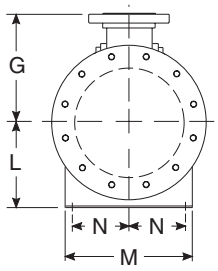
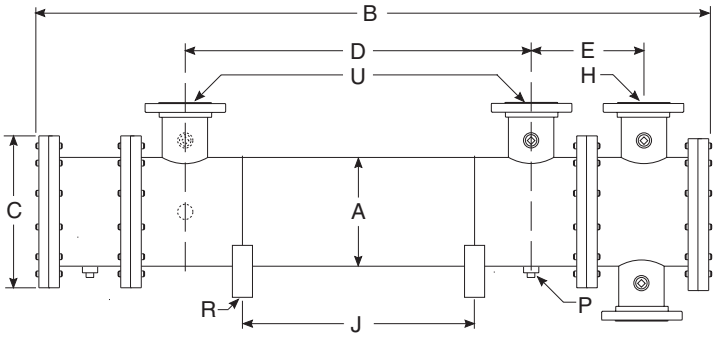
CS-4400 Series *dimensions*

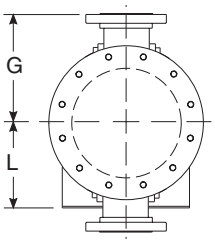




Model	B	E	H
CS-4448	95.00	21.63	14.00" ANSI Flange 150# RF
CS-4460	107.00		
CS-4472	119.00		
CS-4484	131.00		
CS-4496	143.00		
CS-44108	155.00		
CS-44120	167.00		
CS-44132	179.00		

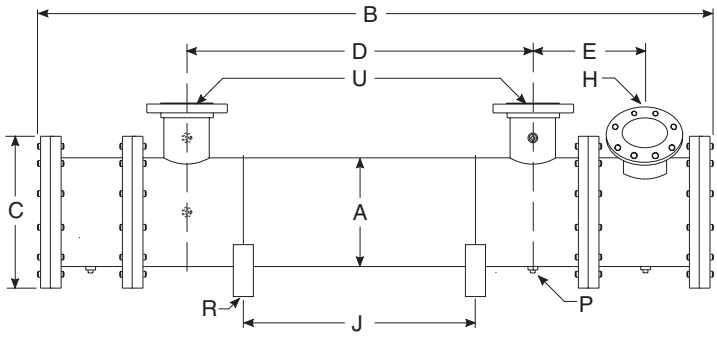
Single Pass (SP)

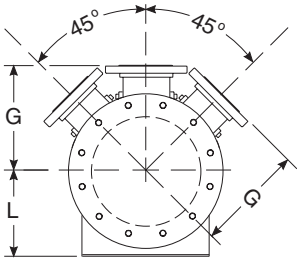




Model	B	E	H
CS-4448	90.00	21.63	10.00" ANSI Flange 150# RF
CS-4460	102.00		
CS-4472	114.00		
CS-4484	126.00		
CS-4496	138.00		
CS-44108	150.00		
CS-44120	162.00		
CS-44132	174.00		

Two Pass (TP)





Model	B	E	H
CS-4448	90.00	21.63	6.00" ANSI Flange 150# RF
CS-4460	102.00		
CS-4472	114.00		
CS-4484	126.00		
CS-4496	138.00		
CS-44108	150.00		
CS-44120	162.00		
CS-44132	174.00		

FOUR PASS (FP)

COMMON DIMENSIONS & WEIGHTS

Model	A	C	D	G	J adjustable	L	M	N	P NPT	R	U	Weight	Model
CS-4448	22.00	28.00	29.00	17.00	5.00	18.00	24.00	8.50	.50	.781"Ø x 1.50" Thru Slot	12.00" ANSI Flange 150# RF	3456	CS-4448
CS-4460			41.00		17.00							3733	CS-4460
CS-4472			53.00		29.00							4099	CS-4472
CS-4484			65.00		41.00							4285	CS-4484
CS-4496			77.00		53.00							4562	CS-4496
CS-44108			89.00		65.00							4839	CS-44108
CS-44120			101.00		77.00							5115	CS-44120
CS-44132			113.00		89.00							5391	CS-44132

note: AIHTI reserves the right to make reasonable design changes without notice.

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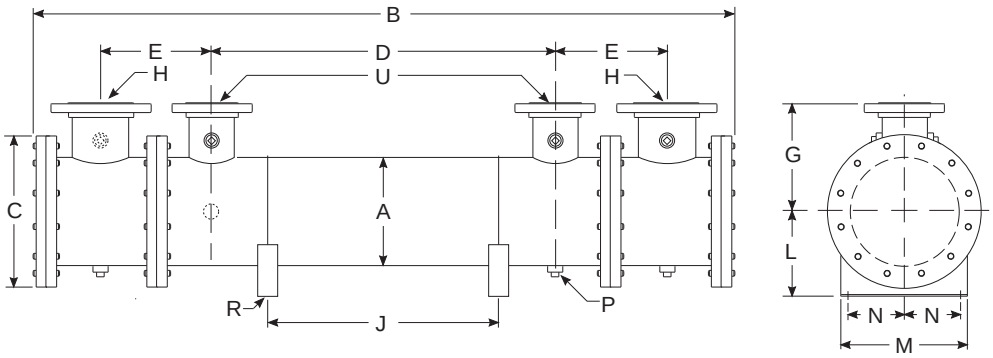
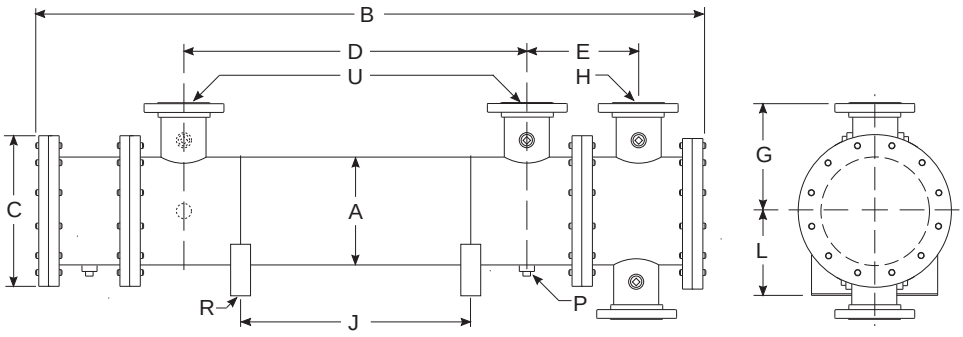


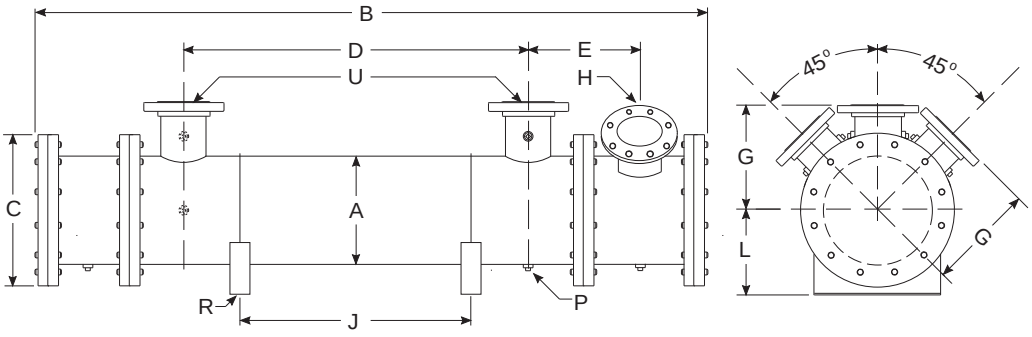
Model	B	E	H
CS-4848	95.00	21.63	14.00" ANSI Flange 150# RF
CS-4860	107.00		
CS-4872	119.00		
CS-4884	131.00		
CS-4896	143.00		
CS-48108	155.00		
CS-48120	167.00		
CS-48132	179.00		

Single Pass (SP)



Model	B	E	H
CS-4848	91.50	21.63	10.00" ANSI Flange 150# RF
CS-4860	103.50		
CS-4872	115.50		
CS-4884	127.50		
CS-4896	139.50		
CS-48108	151.50		
CS-48120	163.50		
CS-48132	175.50		

Two Pass (TP)



Model	B	E	H
CS-4848	91.50	21.63	8.00" ANSI Flange 150# RF
CS-4860	103.50		
CS-4872	115.50		
CS-4884	127.50		
CS-4896	139.50		
CS-48108	151.50		
CS-48120	163.50		
CS-48132	175.50		

FOUR PASS (FP)

COMMON DIMENSIONS & WEIGHTS

Model	A	C	D	G	J adjustable	L	M	N	P NPT	R	U	Weight	Model
CS-4848	24.00	30.00	29.00	18.00	5.00	19.00	26.00	10.00	.50	.781"Ø x 1.50" Thru Slot	12.00" ANSI Flange 150# RF	4113	CS-4848
CS-4860			41.00		17.00							4442	CS-4860
CS-4872			53.00		29.00							4771	CS-4872
CS-4884			65.00		41.00							5100	CS-4884
CS-4896			77.00		53.00							5429	CS-4896
CS-48108			89.00		65.00							5758	CS-48108
CS-48120			101.00		77.00							6087	CS-48120
CS-48132			113.00		89.00							6416	CS-48132

note: AIHTI reserves the right to make reasonable design changes without notice.

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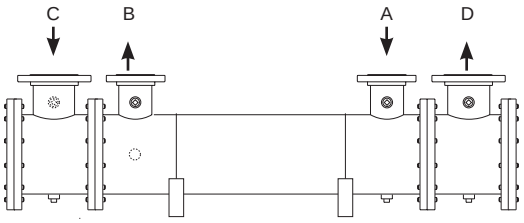
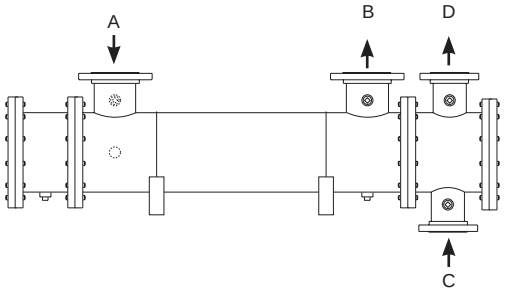
PIPING HOOK-UP



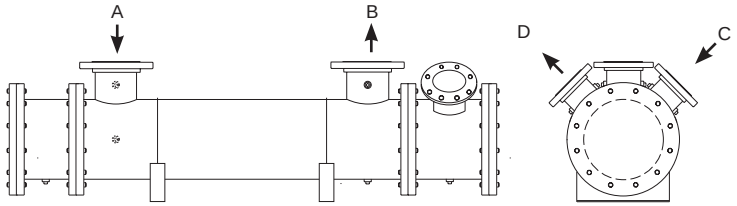
Single Pass

A ..... Hot fluid to be cooled
B ..... Cooled fluid
C ..... Cooling water in
D ..... Cooling water out

SP ..... Single Pass
TP ..... Two Pass
FP .....Four Pass



Two Pass



Two Pass

Receiving / Installation

a) Inspect unit for any shipping damage before uncrating. Indicate all damages to the trucking firms' delivery person, and mark it on the receiving bill before accepting the freight. Make sure that there is no visible damage to the outside surface of the heat exchanger. The published weight information located in this brochure is approximate. True shipment weights are determined at the time of shipping and may vary. Approximate weight information published herein is for engineering approximation purposes and should not be used for exact shipping weight. Since the warranty is based upon the unit date code located on the model identification tags, removal or manipulation of the identification tags will void the manufacturers warranty.

b) When handling the shell & tube heat exchanger, special care should be taken to avoid dropping the unit since mishandling could cause the heat exchanger to crack and leak externally. Mishandling of the unit is not covered under the manufacturers warranty. All units are shipped with partial wood/corrugated cardboard containers for safe handling.

c) Storage: American Industrial heat exchangers are protected against the elements during shipment. If the heat exchanger cannot be installed and put into operation immediately upon receipt, certain precautions are required to prevent deterioration during storage. The responsibility for integrity of the heat exchanger(s) is assumed by the user. American Industrial will not be responsible for damage, corrosion, or other deterioration of the heat exchanger during transit or storage.
Proper storage practices are important when considering the high costs of repair or replacement, and the possible delays for items which require long lead times for manufacture. The following listed practices are provided solely as a convenience to the user, who shall make their own decision on whether to use all or any of them.

1) Heat exchangers not to be placed in immediate service, require precautionary measures to prevent corrosion or contamination.
2) Heat exchangers made of ferrous materials, may be pressure-tested using compressed air at the factory. Residual oil coating on the inside surfaces of the heat exchanger(s) as a result of flushing does not discount the possibility of internal corrosion. Upon receipt, fill the heat exchanger(s) with the appropriate grade of oil or apply a corrosion preventing inhibitor for storage.
3) Corrosion protection compounds for interior surfaces for long term storage or other applications are applied solely at the request of customers. Upon request, American Industrial can provide a customer approved corrosion preventative if available when included in the original purchase order specifications.
4) Remove all dirt, water, ice, or snow and wipe dry before moving heat exchanger(s) into storage. Heat exchangers are generally shipped empty, open drain plugs to remove any accumulated condensation moisture, then reseal. Accumulation of moisture usually indicates corrosion has already started and remedial action should be taken.
5) Store in a covered, environmentally stable area. The ideal storage environment for heat exchangers is in a dry, low-humidity atmosphere which is sealed to prevent the entry of blowing dust, rain, or snow. Maintain in atmospheric temperatures between 70°F and 105°F (Large temperature swings may cause condensation and moisture to form on steel components, threads, shell, etc...) Use thermometers and humidity indicators and maintain the atmosphere at 40% relative humidity, or lower.

d) Standard Enamel Coating: American Industrial provides its standard products with a normal base coat of oil base air cure enamel paint. The enamel paint is applied as a temporary protective and esthetic coating prior to shipment. While the standard enamel coating is durable, American Industrial does not warranty it as a long-term finish coating. It is strongly suggested that a more durable final coating be applied after installation or prior to long-term storage in a corrosive environment to cover any accidental scratches, enhance esthetics, and further prevent corrosion. It is the responsibility of the customer to provide regular maintenance against chips, scratches, etc... and regular touch up maintenance must be provided for long-term benefits and corrosion prevention.

e) Special Coatings: American Industrial offers as customer options, Air-Dry Epoxy, and Heresite (Air-Dry Phenolic) coatings at additional cost. American Industrial offers special coatings upon request, however American Industrial does not warranty coatings to be a permanent solution for any equipment against corrosion. It is the responsibility of the customer to provide regular maintenance against chips, scratches, etc... and regular touch up maintenance must be provided for long-term benefits and corrosion prevention.

f) American Industrial recommends that the equipment supplied should be installed by qualified personnel who have solid understanding of system design, pressure and temperature ratings, and piping assembly. Verify the service conditions of the system prior to applying any shell & tube heat exchanger. If the system pressure or temperature does not fall within the parameters on model rating tag located on the heat exchanger, contact our factory prior to installation or operation.

g) Plan the installation to meet the requirements indicated on the piping installation diagram as illustrated above. It is recommended to put the

hot fluid to be cooled through the shell side and the cold fluid through the tube side. The indicated port assembly sequence in the diagram maximizes the performance, and minimizes the possibility of thermal shock. In instances where the fluids are required to be reversed, *hot fluid in the tubes and cold fluid in the shell* the heat exchanger will work with reduced performance. Installation may be vertical or horizontal or a combination thereof. However, the installation must allow for complete draining of the heat exchanger regardless of Single Pass, Two Pass, or four pass construction. Complete drainage is important to prevent the heat exchanger from freezing, over-heating of a fluid, or mineral deposit buildup.
For fixed bundle heat exchangers, provide sufficient clearance at one end to allow for the removal or replacement of tubes. On the opposite end, provide enough space to allow removal of the channel cover and complete channel to provide sufficient clearance to permit tube rolling and cleaning. Channel covers can be removed to aid in cleaning the tubes without disassembling channel, plumbing, or mounting hardware. Allow accessible room for scheduled cleaning as needed. Include thermometer wells and pressure gauge pipe ports in piping to and from the heat exchanger located as close to the heat exchanger as possible. For more information please contact American Industrial.

h) It is recommended to use flexible hose wherever possible to reduce vibration and allow slight movement. However, hoses are not required. Hydraulic carrying lines should be sized to handle the appropriate flow and to meet system pressure drop requirements based upon the systems parameters, and not based upon the units supply and return connection size. We recommend that a low cracking pressure direct acting relief valve be installed at the heat exchanger inlet to protect it from pressure spikes by bypassing oil in the event the system experiences a high flow surge. If preventative filtration is used it should be located ahead of the cooler on both shell and tube side to catch any scale or sludge from the system before it enters the cooler. Failure to install filters ahead of the heat exchanger could lead to possible heat exchanger failure due to high pressure if the system filters plug.

i) Standard shell & tube coolers are built with a rolled tube-sheet construction. However, the differential operating temperature between the entering shell side fluid and the entering tube side fluid should not exceed 150°F. If this condition exists, a severe thermal shock could occur leading to product failure and mixing of the fluids. For applications with a differential temperatures of 150°F or more, we recommend using a series with a floating tube-sheet, u-tube, or expansion joint to reduce the potential for the effects of thermal shock.

j) Water requirements vary from location to location. If the source of cooling water is from other than a municipal water supply, it is recommended that a water strainer be installed ahead of the heat exchanger to prevent dirt and debris from entering and clogging the flow passages. If a water modulating valve is used it is recommended to be installed at the inlet to the cooler to regulate the water flow.

k) For steam service, or other related applications, please consult our engineering department for additional information.

Maintenance
a) Inspect the heat exchanger for loosened bolts, connections, rust spots, corrosion, and for internal or external fluid leakage. Any corroded surfaces should be cleaned and recoated with paint.

b) Shell side: In many cases with clean hydraulic system oils it will not be necessary to flush the interior of the shell side of the cooler. In circumstances where the quality of hydraulic fluid is in question, the shell side should be disconnected and flushed on a yearly basis with a clean flushing oil/solvent to remove any sludge that has been deposited. For severe cases where the unit is plugged and cannot be flushed clean with solvent, the heat exchanger should be replaced to maintain the proper cooling performance.

c) Tube side: In many cases it will be necessary to clean the tube side of the heat exchanger due to poor fluid quality, debris, calcium deposits, corrosion, mud, sludge, seaweed, etc.... To clean the tube side, flush with clean water or any good quality commercial cleaner that does not attack the particular material of construction. With straight tube heat exchangers you can use a rod to carefully push any debris out of the tubes.

d) Zinc anodes are normally used to reduce the risk of failure due to electrolysis. Zinc anodes are a sacrificial component designed to wear and dissolve through normal use. Normally, zinc anodes are applied to the water supply side of the heat exchanger. Depending upon the amount of corrosive action, one, two, three, or more anodes can be applied to help further reduce the risk of failure. American Industrial Heat Transfer, Inc. offers zinc anodes as an option, to be specified and installed at the request our customers. It is the responsibility of the customer to periodically check and verify the condition of the zinc anode and replace it as needed.

Applications vary due to water chemical makeup and quality, material differences, temperature, flow rate, piping arrangements, and machine grounding. For those reasons, zinc anodes do not follow any scheduled factory predetermined maintenance plan moreover they must be checked routinely by the customer, and a maintenance plan developed based upon the actual wear rate.

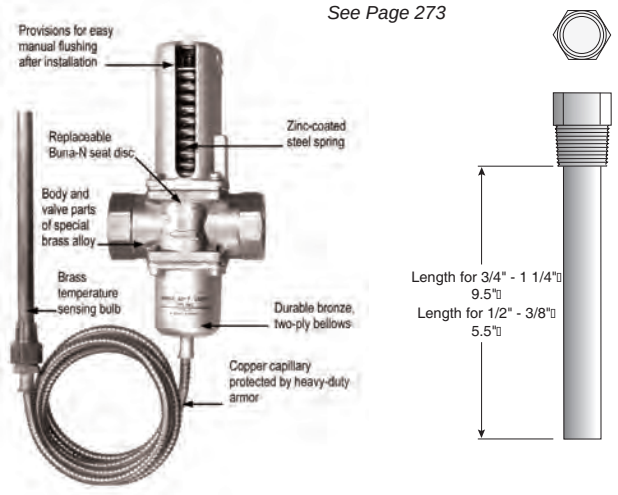
If substantial wear occurs or zinc dissolves without replacement, premature failure or permanent damage may occur to the heat exchanger. American Industrial does not warranty customer applications. It is the responsibility of the customer to verify and apply the proper system materials of construction and overall system requirements. Failures resulting from properly applied or misapplied use of zinc anode(s) into non-specified or specified applications will be the sole responsibility of the customer.

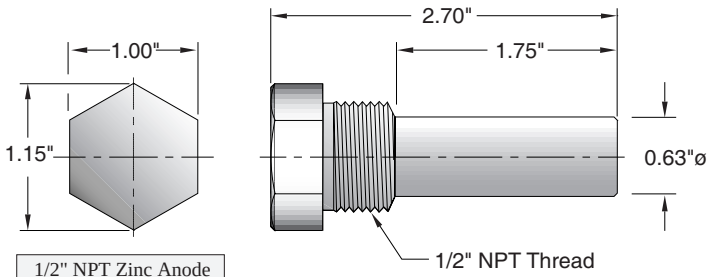
e) A routine maintenance schedule should be developed and adjusted to meet your systems requirements based upon water quality, etc….Failure to regularly maintain and clean your heat exchanger can result in a reduction in operational performance and life expectancy.

Note: *Since applications can vary substantially, the installation and maintenance information contained in this catalog should be used as a basic guideline. The safe installation, maintenance, and use of any American Industrial Heat Transfer, Inc. heat exchanger are solely the responsibility of the user.*

THERMOSTATIC MODULATING WATER VALVE WITH BULB WELL ASSEMBLY
(for Shell & Tube Heat Exchangers And Air/Oil Coolers)

See Page 273





1/2" NPT Zinc Anode PN: 301-0003
CS-2400thru CS-4800

 355 American Industrial Drive LaCrosse, VA 23950 tel: 434-757-1800 fax: 434-757-1810 email: sales@aihti.com

American Industrial Heat Transfer Inc.
Manufacturer of Quality Heat Exchangers

website : www.aihti.com
general email : sales@aihti.com
technical email : engineering@aihti.com

Shell & Tube Application Request: *(For liquid to liquid heat exchangers)*

For SRCS Series

Email form to: sales@aihti.com or engineering@aihti.com or fax to 434-757-1810

Contact Name _____ Telephone _____ Date _____

Company Name _____ Email _____

Address: _____ Fax _____

_____

Hot Side

Fluid Type _____

If available:

Density _____ lb/ft3
Viscosity _____ cP
Conductivity _____ Btu/hr.ft.°F
Specific Heat _____ Btu/lb.°F

1. Flow Rate _____
2. Temperature In _____
3. Desired Temperature Out _____
4. Heat Load _____

Cold Side

Fluid Type _____

If available:

Density _____ lb/ft3
Viscosity _____ cP
Conductivity _____ Btu/hr.ft.°F
Specific Heat _____ Btu/lb.°F

1. Flow Rate _____
2. Temperature In _____

Maximum Allowable Pressure Drop:

Hot Side _____ Cold Side _____

To properly size the heat exchanger we need 3 of the 4 perameter on the Hot Side and 2 on the Cold Side.

Fixed Tube Bundle ☐ Removable Tube Bundle ☐ U-Tube Fixed Tube Bundle ☐ U-Tube Removable Tube Bundle ☐

Shell Material Construction:

Steel ☐ Stainless Steel ☐

Tube Sheet Material

Steel ☐ Stainless Steel ☐

Brass ☐ (Applies to removable bundle only)

Tube Material Construction:

Copper ☐
90/10 Copper Nickel ☐
Stainless Steel ☐

End Bonnets Material:

Steel ☐
Stainless Steel ☐

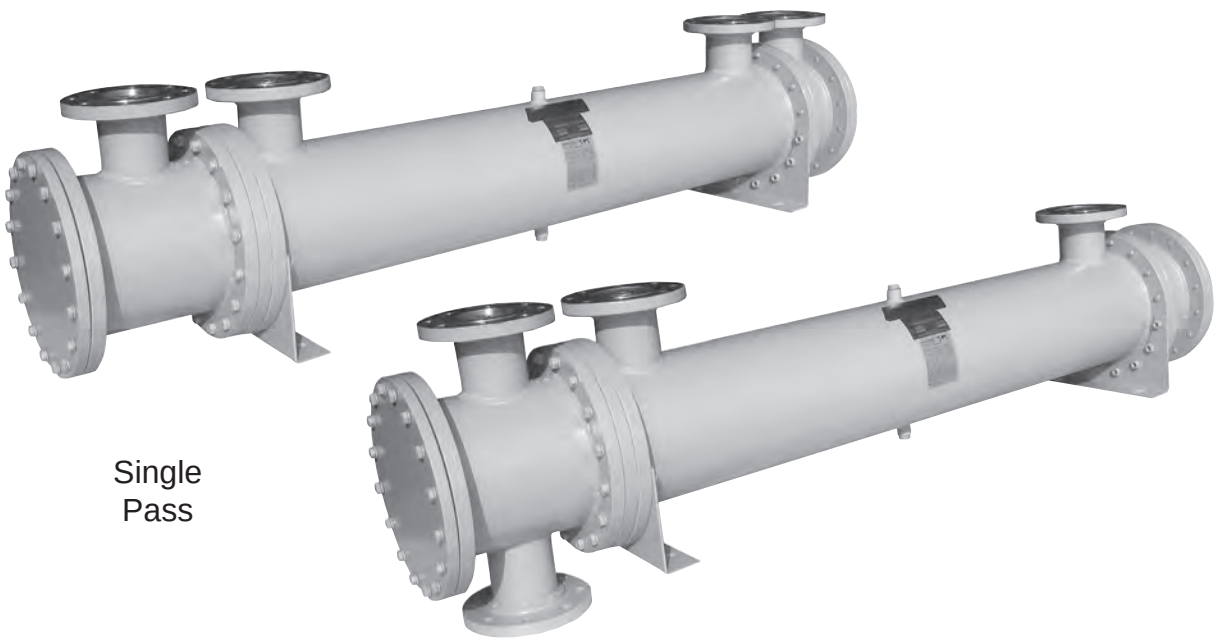
Require All Stainless Steel Heat Exchanger Yes ☐ No ☐

ASME Code and Certified Yes ☐ No ☐

Comment: _____

_____

SRCS SERIES



Single Pass

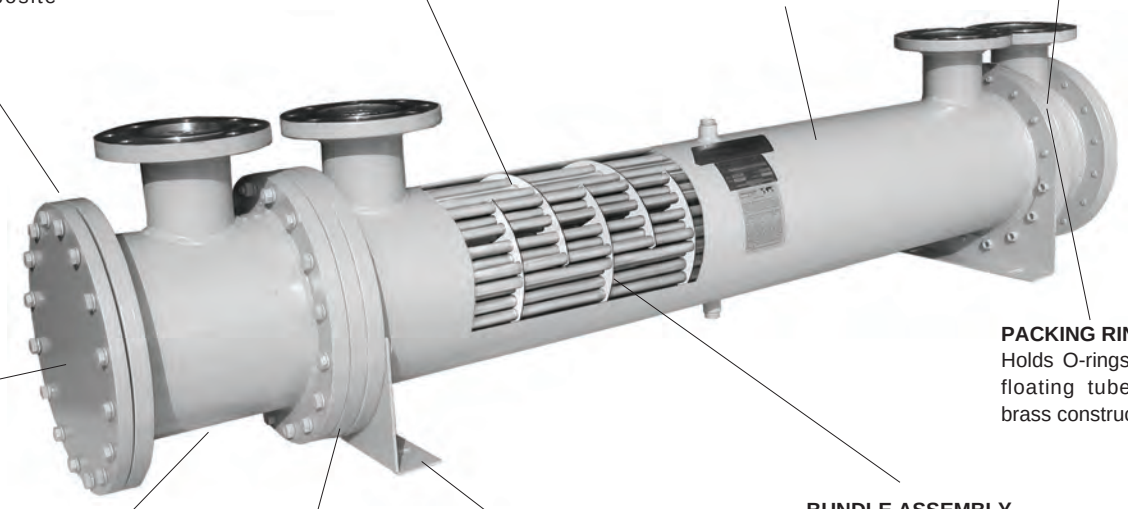
Two Pass

Straight Tube Removable Bundle / Liquid Cooled

HEAT EXCHANGERS

- Computer generated data sheet available for any application
- Removable straight-tube bundle
- Brass stationary and floating tube sheets.
- Brass packing and retaining rings.
- Dual Viton O-ring packing seals.
- Removable channel covers for access to tubes without disturbing existing plumbing.
- As an option, available in ASME code and certified
- Operating pressure, 150 PSI tubes, 250 PSI shell.
- Operating temperature 400°F
- Can be customized to fit any applications.

SRCS Series *overview*



BAFFLES
CNC manufactured baffles to provide maximum turbulence and heat transfer with a minimum fluid pressure drop.

FINISH
Gray semigloss enamel. Can be used as a base for additional coats.

RETAINING RING
Holds packing O-rings in place, brass construction.

FULL FACE GASKET
Full-face composite gasket.

REMOVABLE CHANNEL COVER
For easy access to tubes for cleaning without removing the channel.

PACKING RING
Holds O-rings against floating tube sheet, brass construction.

BUNDLE ASSEMBLY
CNC precision manufactured parts to guarantee a close fit between the baffles, tubes, and shell. Clearances are minimized to provide for maximum heat transfer.

STEEL FOOT BRACKET

CHANNEL
Provides fluid into tubes with minimum restriction. One or Two Pass interchangeability.

STATIONARY TUBE SHEET
Roller expanded tube joint to tube-sheet made of brass construction.

UNIT CODING

Example Model

Options

SRCS - 2496 - 8 - 6 - TP - CNT - SB - Z

Model
SRCS

Shell Diameter
1700 = 8.00"
2000 = 10.75"
2400 = 12.75"
2800 = 14.00"
3200 = 16.00"
3600 = 18.00"
4000 = 20.00"

Effective Tube Length
(12" increments)

Baffle Spacing
4.0"
6.0"
8.0"
12.0"
18.0"
24.0"

Cooling Tube Diamenter
6 = 3/8"
10 = 5/8"

Tube Side Passes
SP = 1 pass
TP = 2 pass

Tubing
Blank = Standard

Options
CNT= 90/10 Cu Ni
STS = Stainless Steel
C = Carbon Steel

End Bonnets
Blank = Fabricated Steel

Options
SB = Stainless Steel

Zinc Anode
Z = 1 Zinc Anode
2Z = 2 Zinc Anode etc.

STANDARD CONSTRUCTION MATERIALS & RATINGS

Standard Model	SRCS 1700 - 4000	Options	Standard Unit Ratings
Shell	Steel	Stainless Steel	Operating Pressure Tubes 150 psig Operating Pressure Shell 300 psig Operating Temperature 400 ºF Optional 500 °F
Tubes	Copper	90/10 Cu. Ni. / Stainless Steel	
Baffles	Steel	Brass / Stainless Steel	
Tube Sheets	Brass	Steel / Stainless Steel	
Retaining Ring	Brass	Steel / Stainless Steel	
Packing Ring	Brass	Steel / Stainless Steel	
Gaskets / Packing	Hypalon / Viton	Viton / EPDM / EPR	
Mounting Brackets	Steel	Stainless Steel	
Bonnets / Channels	Cast Iron / Steel	Stainless Steel	

note: AIHTI reserves the right to make reasonable design changes without notice.

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STEP 1: Calculate the heat load

The heat load in BTU/HR or (Q) can be derived by using several methods. To simplify things, we will consider general specifications for hydraulic system oils and other fluids that are commonly used with shell & tube heat exchangers.

Terms					
GPM	=	Gallons Per Minute	Kw	=	Kilowatt (watts x 1000)
CN	=	Constant Number for a given fluid	T_{in}	=	Hot fluid entering temperature in °F
△T	=	Temperature differential across the potential	T_{out}	=	Hot fluid exiting temperature in °F
PSI	=	Pounds per Square Inch (pressure) of the operating side of the system	t_{in}	=	Cold fluid temperature entering in °F
MHP	=	Horsepower of the electric motor driving the hydraulic pump	t_{out}	=	Cold fluid temperature exiting in °F
			Q	=	BTU / HR

For example purposes, a hydraulic system has a total input 1200 HP (894Kw) electric motor installed coupled to a pump that produces a flow of 600 GPM @ 3000 PSIG. The temperature differential of the oil entering the pump *vs* exiting the system is about 6.6°F. Even though return line pressure operates below 200 psi, calculate the system heat load potential (Q) based upon the prime movers (pump) capability, cooling fluid is water @ 80ºF use one of the following equations to accomplish this:

To derive the required heat load (Q) to be removed by the heat exchanger, apply ONE of the following. Note: The calculated heat loads may differ slightly from one formula to the next. This is due to assumptions made when estimating heat removal requirements. The factor *(v)* represents the percentage of the overall input energy to be rejected by the heat exchanger. The *(v)* factor is generally about 30% for most hydraulic systems, however it can range from 20%-70% depending upon the installed system components and heat being generated (ie. servo valves, proportional valves, etc…will increase the percentage required).

Formula	Example
A) Q = GPM x CN x actual △T	A) Q =600 x 210 x 6.6°F = 831,600 BTU/HR
B) Q = [(PSI x GPM) / 1714] x (*v*) x 2545	B) Q =[(3000x600)/1714] x .30 x 2545 = 801,808 BTU/HR
C) Q = MHP x (*v*) x 2545	C) Q =1200 x .30 x 2545 = 916,200 BTU/HR
D) Q = Kw to be removed x 3415	D) Q =894 x .30 x 3415 = 915,909 BTU/HR
E) Q = HP to be removed x 2545	E) Q =300 x 2545 = 736,500 BTU/HR

Constant for a given fluid (CN)

1) Oil ..... CN = 210
2) Water..... CN = 500
3) 50% E. Glycol..... CN = 450

STEP 2: Calculate the Mean Temperature Difference

When calculating the MTD you will be required to choose a liquid flow rate to derive the Cold Side △T. If the water flow is unknown you may need to assume a number based on what is available. As a normal rule of thumb, for oil to water cooling a 2:1 oil to water ratio is used. For applications of water to water or 50 % Ethylene Glycol to water, a 1:1 ratio is common.

	Formula	Example (from step 1,item C)
HOT FLUID Oil	$\triangle T = \frac{Q}{CN \times GPM}$	$\triangle T = \frac{916{,}200\ BTU/hr}{210\ CN \times 600 GPM} = 7.37°F$ = △T Rejected
COLD FLUID Water	$\triangle t = \frac{BTU\ /\ hr}{CN \times GPM}$	$\triangle t = \frac{916{,}200\ BTU/hr}{500\ CN \times 300 GPM} = 3.81°F$ = △t Absorbed

T_{in}	= Hot Fluid entering temperature in degrees F	T_{in} = 117.3 °F
T_{out}	= Hot Fluid exiting temperature in degrees F	T_{out} = 110.0 °F
t_{in}	= Cold Fluid entering temperature in degrees F	t_{in} = 80.0 °F
t_{out}	= Cold Fluid exiting temperature in degrees F	t_{out} = 86.1 °F

$$\frac{T_{out} - t_{in}}{T_{in} - t_{out}} = \frac{S[\text{smaller temperature difference}]}{L\ [\text{larger temperature difference}]} = \left(\frac{S}{L}\right)$$

$$\frac{110.0°F - 80.0°F}{117.3°F - 86.1°F} = \frac{30.0°F}{31.2°F} = .962$$

STEP 3: Calculate Log Mean Temperature Difference (LMTD)

To calculate the LMTD please use the following method;
L = Larger temperature difference from step 2.
M = S/L number (LOCATED IN TABLE A). .962 = .980
$LMTD_i$ = L x M
$LMTD_i$ = 31.2 x .980 (FROM TABLE A) = 30.6

To correct the $LMTD_i$ for a multipass heat exchangers calculate **R** & **K** as follows:

Formula	Example
$R = \frac{T_{in} - T_{out}}{t_{out} - t_{in}}$	$R = \frac{117.3°F - 100°F}{86.1°F - 90°F} = \frac{17.3°F}{6.1°F}$ = **{2.82=R}**
$K = \frac{t_{out} - t_{in}}{T_{in} - t_{in}}$	$K = \frac{86.1°F - 80°F}{117.3°F - 80°F} = \frac{6.1°F}{37.3°F}$ = **{.163=K}**

Locate the correction factor CF_B (FROM TABLE B)
$LMTD_c = LMTD_i \times CF_B$
$LMTD_c$ = 30.6 x .997 = **30.5**

STEP 4: Calculate the area required

$$\textbf{Required Area sq.ft.} = \frac{Q\ (BTU\ /\ HR)}{LMTD_c \times U\ (\text{FROM TABLE C})} \qquad \frac{916{,}200}{30.5 \times 100} = \textbf{300.4 sq.ft.}$$

SRCS Series *selection*

STEP 5: Selection

a) From TABLE E choose the correct series size, baffle spacing, and number of passes that best fits your flow rates for both shell and tube side. Note that the tables suggest minimum and maximum information. Try to stay within the 20-80 percent range of the indicated numbers.

Example

Oil Flow Rate = 600 GPM = Series Required from Table E = **2400 Series**
Baffle Spacing from Table E = **18 baffle**
Water Flow Rate = 300 GPM = Passes required in 2000 series = **TP**

b) From TABLE D choose the heat exchanger model size based upon the sq.ft. or surface area in the series size that will accommodate your flow rate.

Example

Required Area = 300.4 sq.ft Closest model required based upon sq.ft. & series = **SRCS-2484-18-6-TP**

If you require a computer generated data sheet for the application, or if the information that you are trying to apply does not match the corresponding information, please contact our engineering services department for further assistance.

TABLE E

Shell Dia. Code	Max. Liquid Flow - Shell Side						Liquid Flow - Tube Side					
	4	6	8	12	18	24	SP		TP		FP	
							Min.	Max.	Min.	Max.	Min.	Max.
1700	140	165	190	210	220	—	52	418	26	164	13	82
2000	150	220	300	440	550	—	82	590	41	290	23	145
2400	155	235	310	470	700	930	125	980	64	486	31	240
2800	170	255	345	510	770	1030	150	1200	75	600	38	300
3200	200	295	395	590	890	1175	200	1600	100	800	50	400
3600	225	335	445	665	1000	1330	258	2068	129	1031	65	514
4000	250	375	495	745	1120	1490	322	2586	160	1290	81	645

TABLE C

U	TUBE FLUID	SHELL FLUID
400	Water	Water
350	Water	50% E. Glycol
100	Water	Oil
300	50% E. Glycol	50% E. Glycol
90	50% E. Glycol	Oil

TABLE A- FACTOR M/LMTD = L x M

S/L	M	S/L	M	S/L	M	S/L	M
		.25	.541	.50	.721	.75	.870
.01	.215	.26	.549	.51	.728	.76	.874
.02	.251	.27	.558	.52	.734	.77	.879
.03	.277	.28	.566	.53	.740	.78	.886
.04	.298	.29	.574	.54	.746	.79	.890
.05	.317	.30	.582	.55	.753	.80	.896
.06	.334	.31	.589	.56	.759	.81	.902
.07	.350	.32	.597	.57	.765	.82	.907
.08	.364	.33	.604	.58	.771	.83	.913
.09	.378	.34	.612	.59	.777	.84	.918
.10	.391	.35	.619	.60	.783	.85	.923
.11	.403	.36	.626	.61	.789	.86	.928
.12	.415	.37	.634	.62	.795	.87	.934
.13	.427	.38	.641	.63	.801	.88	.939
.14	.438	.39	.648	.64	.806	.89	.944
.15	.448	.40	.655	.65	.813	.90	.949
.16	.458	.41	.662	.66	.818	.91	.955
.17	.469	.42	.669	.67	.823	.92	.959
.18	.478	.43	.675	.68	.829	.93	.964
.19	.488	.44	.682	.69	.836	.94	.970
.20	.497	.45	.689	.70	.840	.95	.975
.21	.506	.46	.695	.71	.848	.96	.979
.22	.515	.47	.702	.72	.852	.97	.986
.23	.524	.48	.709	.73	.858	.98	.991
.24	.533	.49	.715	.74	.874	.99	.995

TABLE B- LMTD correction factor for Multipass Exchangers

R

	.05	.1	.15	.2	.25	.3	.35	.4	.45	.5	.6	.7	.8	.9	1.0
.2	1	1	1	1	1	1	1	.999	.993	.984	.972	.942	.908	.845	.71
.4	1	1	1	1	1	1	.994	.983	.971	.959	.922	.855	.70		
.6	1	1	1	1	1	.992	.980	.965	.948	.923	.840				
.8	1	1	1	1	.995	.981	.965	.945	.916	.872					
1.0	1	1	1	1	.988	.970	.949	.918	.867	.770					
2.0	1	1	.977	.973	.940	.845	.740								
3.0	1	1	.997	.933	.835										
4.0	1	.993	.950	.850											
5.0	1	.982	.917												
6.0	1	.968	.885												
8.0	1	.930													
10.0	.996	.880													
12.0	.985	.720													
14.0	.972														
16.0	.958														
18.0	.940														
20.0	.915														

K

TABLE D- Surface Area

Model Number	Surface Area in Sq. ft.		Model Number	Surface Area in Sq. ft.		Model Number	Surface Area in Sq. ft.		Model Number	Surface Area in Sq. ft.	
	3/8" O.D. Tubing	5/8" O.D. Tubing		3/8" O.D. Tubing	5/8" O.D. Tubing		3/8" O.D. Tubing	5/8" O.D. Tubing		3/8" O.D. Tubing	5/8" O.D. Tubing
SRCS-1736	55.3	33.3	SRCS-2472	286.3	149.2	SRCS-3248	336.9	179.3	SRCS-36144	1324.0	730.0
SRCS-1748	73.8	44.5	SRCS-2484	334.0	174.1	SRCS-3260	421.1	224.1	SRCS-36156	1434.0	791.0
SRCS-1760	92.2	55.6	SRCS-2496	381.7	199.0	SRCS-3272	505.4	268.9	SRCS-36168	1544.0	852.0
SRCS-1772	110.7	66.7	SRCS-24108	429.4	223.8	SRCS-3284	589.6	313.8	SRCS-36180	1655.0	913.0
SRCS-1784	129.1	77.8	SRCS-24120	477.1	248.7	SRCS-3296	673.8	358.6			
SRCS-1796	147.6	89.0	SRCS-24132	524.8	273.6	SRCS-32108	758.1	403.4	SRCS-4048	545.8	299.7
SRCS-17108	166.1	100.1	SRCS-24144	572.5	298.5	SRCS-32120	842.3	448.3	SRCS-4060	682.3	374.7
						SRCS-32132	926.5	493.1	SRCS-4072	818.7	449.6
SRCS-2036	104.8	53.9	SRCS-2836	186.1	96.2	SRCS-32144	1010.8	537.9	SRCS-4084	955.2	524.5
SRCS-2048	139.8	72.0	SRCS-2848	248.1	128.2	SRCS-32156	1095.0	582.8	SRCS-4096	1091.7	599.5
SRCS-2060	174.7	90.0	SRCS-2860	310.2	160.5	SRCS-32168	1179.2	627.6	SRCS-40108	1228.0	674.4
SRCS-2072	209.7	108.0	SRCS-2872	372.2	192.4				SRCS-40120	1364.6	749.4
SRCS-2084	244.6	126.0	SRCS-2884	434.3	224.4	SRCS-3648	441.4	243.5	SRCS-40132	1501.0	824.3
SRCS-2096	279.6	144.0	SRCS-2896	496.3	256.5	SRCS-3660	551.7	304.3	SRCS-40144	1637.5	899.2
SRCS-20108	314.5	162.0	SRCS-28108	558.4	290.4	SRCS-3672	662.1	356.2	SRCS-40156	1774.0	974.2
SRCS-20120	349.5	180.0	SRCS-28120	620.4	320.7	SRCS-3684	772.4	426.1	SRCS-40168	1910.4	1049.1
			SRCS-28132	682.5	352.7	SRCS-3696	882.8	486.9	SRCS-40180	2046.9	1124.1
SRCS-2436	143.1	74.6	SRCS-28144	744.5	384.8	SRCS-36108	993.1	547.8			
SRCS-2448	190.9	99.5	SRCS-28156	806.6	416.9	SRCS-36120	1103.5	608.7			
SRCS-2460	238.6	124.4	SRCS-28168	868.6	448.9	SRCS-36132	1213.8	669.6			

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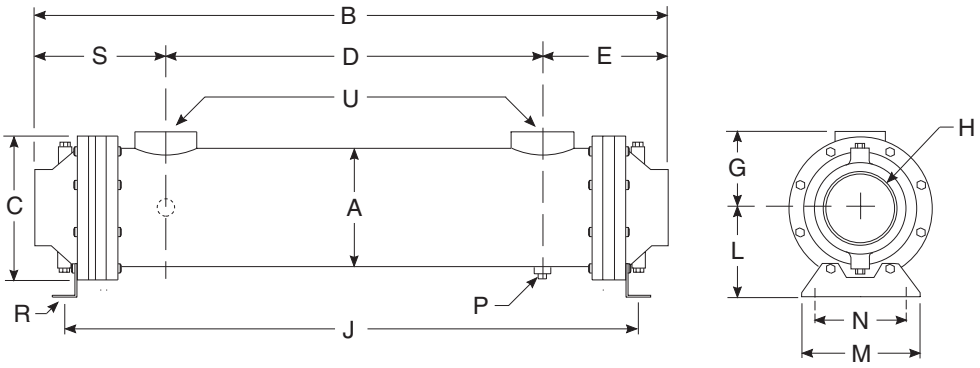
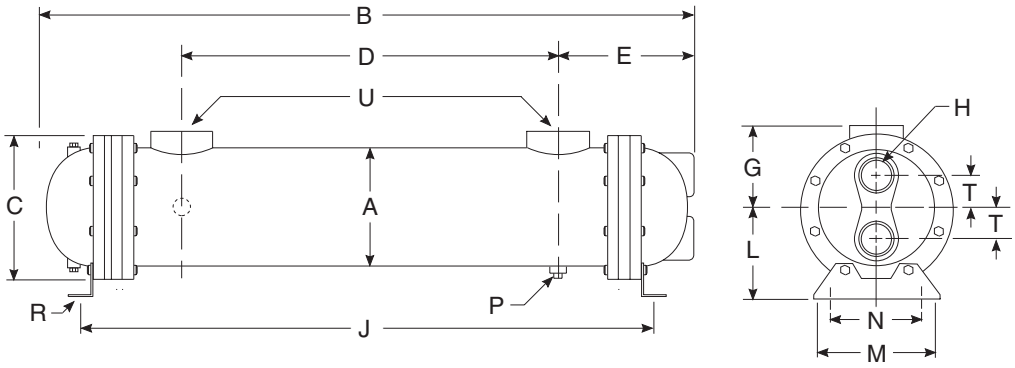


Model	B	S	E	H NPT
SRCS-1736	45.4	8.35	8.04	4.0
SRCS-1748	57.4			
SRCS-1760	69.4			
SRCS-1772	81.4			
SRCS-1784	93.4			
SRCS-1796	105.4			
SRCS-17108	117.4			
SRCS-17120	129.4			

Single Pass (SP)



Model	B	E	H NPT	T
SRCS-1736	44.5	7.88	2.5	1.88
SRCS-1748	56.5			
SRCS-1760	68.5			
SRCS-1772	80.5			
SRCS-1784	92.5			
SRCS-1796	104.5			
SRCS-17108	116.5			
SRCS-17120	128.5			

Two Pass (TP)

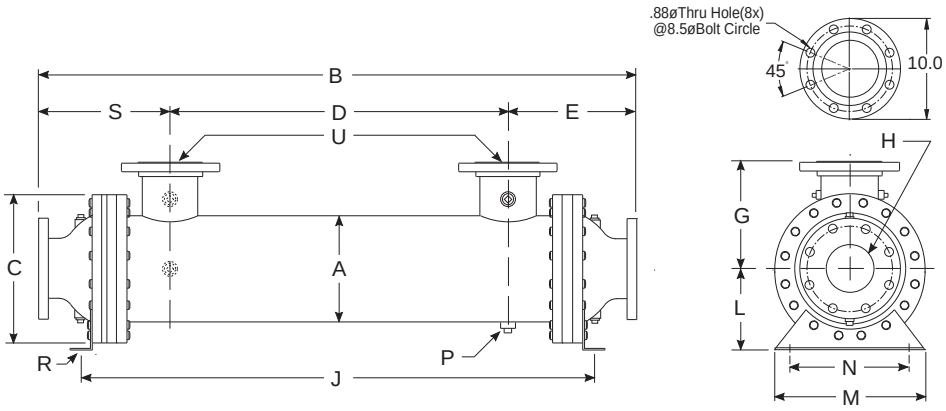
COMMON DIMENSIONS & WEIGHTS

Model	A	C	D	G	J	L	M	N	P NPT	R	U NPT	Weight	Model
SRCS-1736	8.0	10.12	29.00	5.62	41.4	5.75	8.25	7.0	(2) .38	.44Ø x 1.00" Thru Slot	3.0	205	SRCS-1736
SRCS-1748			41.00		53.4							245	SRCS-1748
SRCS-1760			53.00		65.4							285	SRCS-1760
SRCS-1772			65.00		77.4							325	SRCS-1772
SRCS-1784			77.00		89.4							365	SRCS-1784
SRCS-1796			89.00		101.4							405	SRCS-1796
SRCS-17108			101.00		113.4							445	SRCS-17108
SRCS-17120			113.00		125.4							485	SRCS-17120

Notes

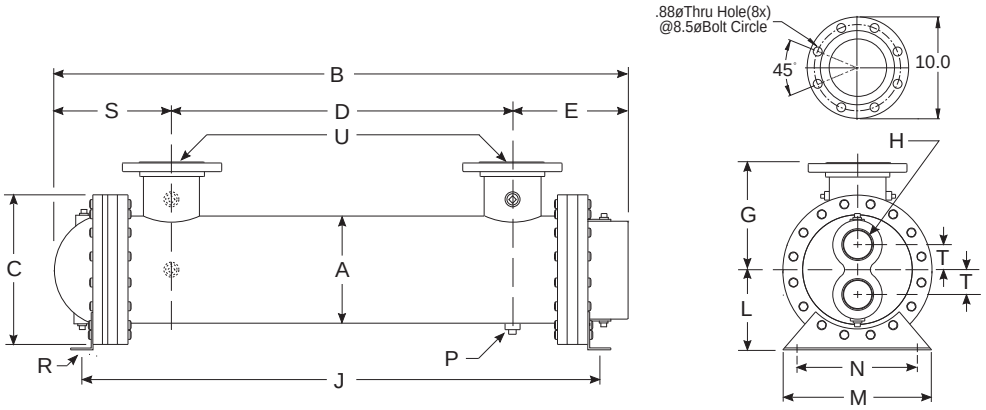
- SRCS Series tube bundle is removable. For replacement bundles consult factory.
- It is recommended that when a heat exchanger is disassembled, new gaskets and O-rings to be used in reassembly.
- Replacement gasket and O-Ring seal part numbers are available. For more information consult factory.

SRCS-2000 Series *dimensions*



Model	B	S	E	H
SRCS-2036	53.40	14.38	13.90	5.0" ANSI Flange
SRCS-2048	65.40			
SRCS-2060	77.40			
SRCS-2072	89.40			
SRCS-2084	101.40			
SRCS-2096	113.40			
SRCS-20108	125.40			
SRCS-20120	137.40			

Single Pass (SP)



Model	B	E	H NPT	T
SRCS-2036	49.2	11.94	3.00	2.50
SRCS-2048	61.2			
SRCS-2060	73.2			
SRCS-2072	85.2			
SRCS-2084	97.2			
SRCS-2096	109.2			
SRCS-20108	121.2			
SRCS-20120	133.2			

Two Pass (TP)

COMMON DIMENSIONS & WEIGHTS

Model	A	C	D	G	J	L	M	N	P NPT	R	U	Weight	Model
SRCS-2036	10.75	15.00	26.00	10.75	44.63	8.0	12.0	5.0	(4x) .50	.75"Ø x 1.25" Thru Slot	4.00" ANSI Flange 150# RF	720	SRCS-2036
SRCS-2048			38.00		56.63							780	SRCS-2048
SRCS-2060			50.00		68.63							840	SRCS-2060
SRCS-2072			62.00		80.63							900	SRCS-2072
SRCS-2084			74.00		92.63							960	SRCS-2084
SRCS-2096			86.00		104.63							1020	SRCS-2096
SRCS-20108			98.00		116.63							1080	SRCS-20108
SRCS-20120			110.00		128.63							1150	SRCS-20120

Notes

- SRCS Series tube bundle is removable. For replacement bundles consult factory.
- It is recommended that when a heat exchanger is disassembled, new gaskets and O-rings to be used in reassembly.
- Replacement gasket and O-Ring seal part numbers are available. For more information consult factory.

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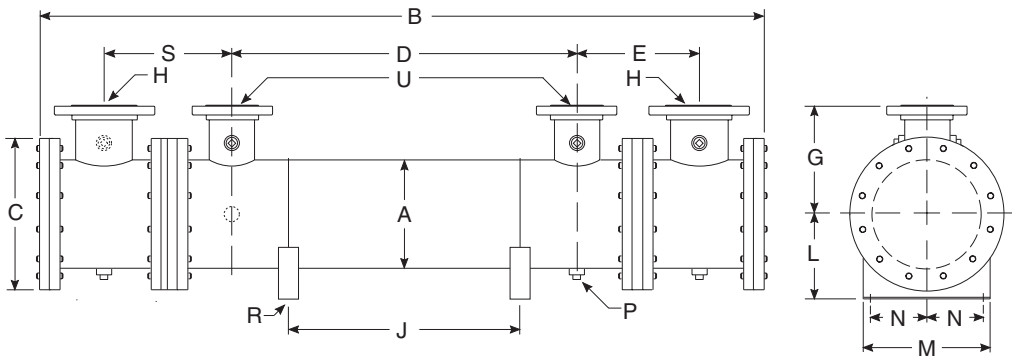
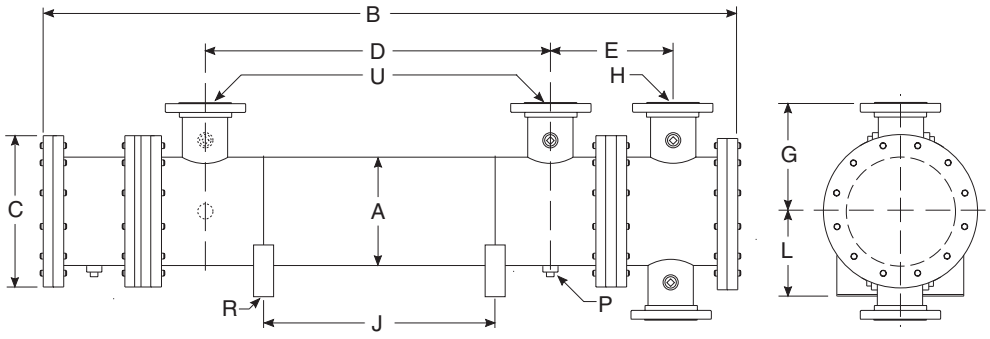


Single Pass (SP)

Model	B	E	H
SRCS-2436	70.63	15.56	8.0 ANSI Flange 150# RF
SRCS-2448	82.63		
SRCS-2460	94.63		
SRCS-2472	106.63		
SRCS-2484	118.63		
SRCS-2496	130.63		
SRCS-24108	142.63		
SRCS-24120	154.63		
SRCS-24132	166.63		
SRCS-24144	178.63		
SRCS-24156	190.63		



Two Pass (TP)

Model	B	E	H
SRCS-2436	70.63	15.56	6.0 ANSI Flange 150# RF
SRCS-2448	82.63		
SRCS-2460	94.63		
SRCS-2472	106.63		
SRCS-2484	118.63		
SRCS-2496	130.63		
SRCS-24108	142.63		
SRCS-24120	154.63		
SRCS-24132	166.63		
SRCS-24144	178.63		
SRCS-24156	190.63		

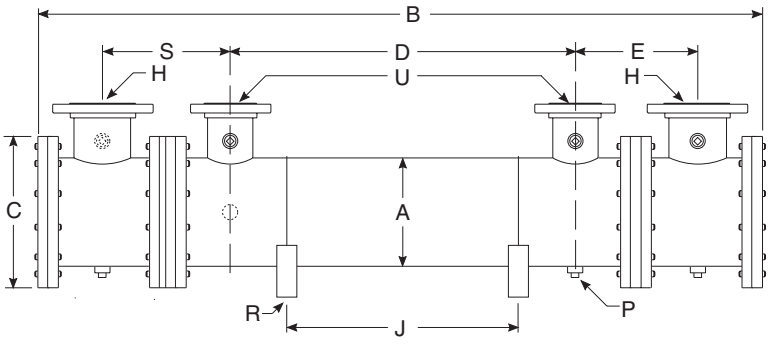
COMMON DIMENSIONS & WEIGHTS

Model	A	C	D	G	J	L	M	N	P NPT	R	U	Weight	Model
SRCS-2436	12.75	16.25	24.00	11.38	31.00	12.00	12.75	5.00	.50 (10x)	.75"Ø x 1.00" Thru Slot	6.0 ANSI Flange 150# RF	1040	SRCS-2436
SRCS-2448			36.00		43.00							1130	SRCS-2448
SRCS-2460			48.00		55.00							1221	SRCS-2460
SRCS-2472			60.00		67.00							1312	SRCS-2472
SRCS-2484			72.00		79.00							1402	SRCS-2484
SRCS-2496			84.00		91.00							1493	SRCS-2496
SRCS-24108			96.00		103.00							1584	SRCS-24108
SRCS-24120			108.00		115.00							1675	SRCS-24120
SRCS-24132			120.00		127.00							1766	SRCS-24132
SRCS-24144			132.00		139.00							1857	SRCS-24144
SRCS-24156			144.00		151.00							1869	SRCS-24156

Notes

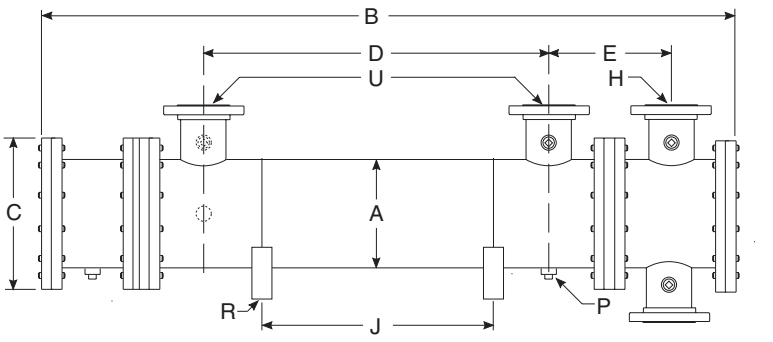
- SRCS Series tube bundle is removable. For replacement bundles consult factory.
- It is recommended that when a heat exchanger is disassembled, new gaskets and O-rings to be used in reassembly.
- Replacement gasket and O-Ring seal part numbers are available. For more information consult factory.

SRCS-3000 Series *dimensions*



Single Pass (SP)

Model	B	E	H
SRCS-2836	70.63	16.56	8.00" ANSI Flange 150# RF
SRCS-2848	82.63		
SRCS-2860	94.63		
SRCS-2872	106.63		
SRCS-2884	118.63		
SRCS-2896	130.63		
SRCS-28108	142.63		
SRCS-28120	154.63		
SRCS-28132	166.63		
SRCS-28144	178.63		
SRCS-28156	190.63		
SRCS-28168	202.63		



Two Pass (TP)

Model	B	E	H
SRCS-2836	70.63	16.56	6.00" ANSI Flange 150# RF
SRCS-2848	82.63		
SRCS-2860	94.63		
SRCS-2872	106.63		
SRCS-2884	118.63		
SRCS-2896	130.63		
SRCS-28108	142.63		
SRCS-28120	154.63		
SRCS-28132	166.63		
SRCS-28144	178.63		
SRCS-28156	190.63		
SRCS-28168	202.63		

COMMON DIMENSIONS & WEIGHTS

Model	A	C	D	G	J	L	M	N	P NPT	R	U	Weight	Model
SRCS-2836	14.00	18.00	22.00	12.00	31.00	13.00	14.00	5.00	.50 (10x)	.75"Ø x 1.00" Thru Slot	8.00" ANSI Flange 150# RF	1288	SRCS-2836
SRCS-2848			34.00		43.00							1400	SRCS-2848
SRCS-2860			46.00		55.00							1512	SRCS-2860
SRCS-2872			58.00		67.00							1624	SRCS-2872
SRCS-2884			70.00		79.00							1736	SRCS-2884
SRCS-2896			82.00		91.00							1848	SRCS-2896
SRCS-28108			94.00		103.00							1960	SRCS-28108
SRCS-28120			106.00		115.00							2072	SRCS-28120
SRCS-28132			112.00		127.00							2184	SRCS-28132
SRCS-28144			130.00		139.00							2296	SRCS-28144
SRCS-28156			142.00		151.00							2408	SRCS-28156
SRCS-28168			154.00		163.00							2520	SRCS-28168

Notes

- SRCS Series tube bundle is removable. For replacement bundles consult factory.
- It is recommended that when a heat exchanger is disassembled, new gaskets and O-rings to be used in reassembly.
- Replacement gasket and O-Ring seal part numbers are available. For more information consult factory.

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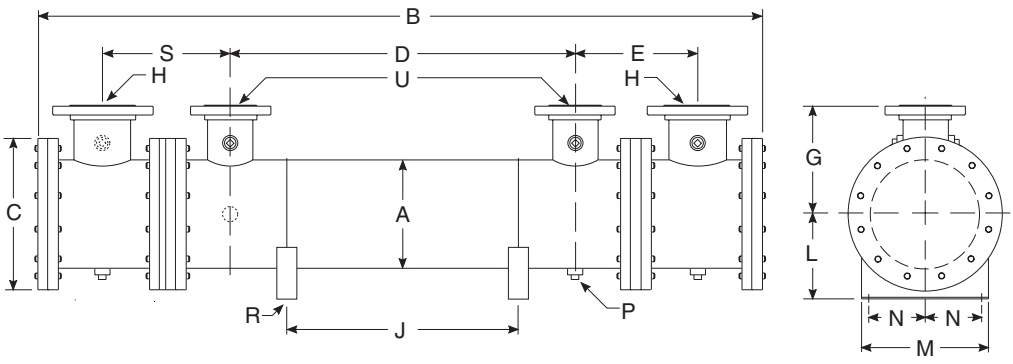
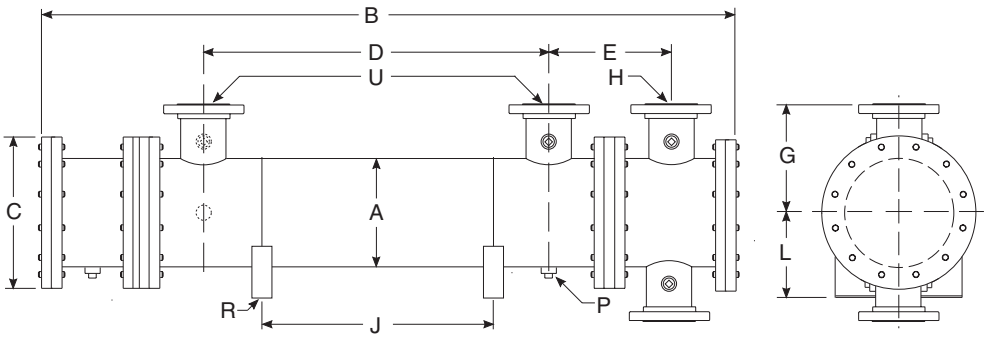


Single Pass (SP)

Model	B	E	H
SRCS-3248	87.63	18.13	10.00" ANSI Flange 150# RF
SRCS-3260	99.63		
SRCS-3272	111.63		
SRCS-3284	123.63		
SRCS-3296	135.63		
SRCS-32108	147.63		
SRCS-32120	159.63		
SRCS-32132	171.63		
SRCS-32144	183.63		
SRCS-32156	195.63		
SRCS-32168	207.63		



Two Pass (TP)

Model	B	E	H
SRCS-3248	87.63	18.13	6.00" ANSI Flange 150# RF
SRCS-3260	99.63		
SRCS-3272	111.63		
SRCS-3284	123.63		
SRCS-3296	135.63		
SRCS-32108	147.63		
SRCS-32120	159.63		
SRCS-32132	171.63		
SRCS-32144	183.63		
SRCS-32156	195.63		
SRCS-32168	207.63		

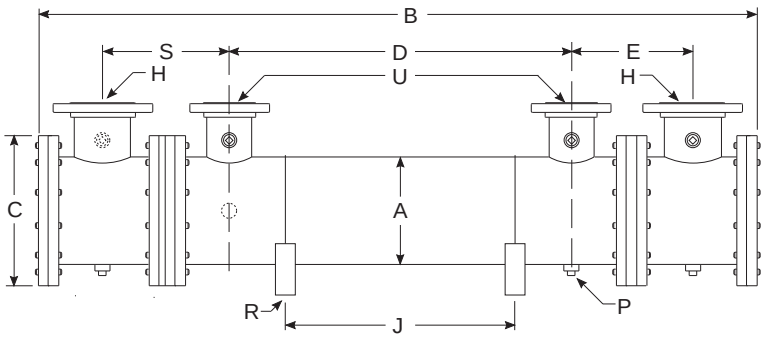
COMMON DIMENSIONS & WEIGHTS

Model	A	C	D	G	J	L	M	N	P NPT	R	U	Weight	Model
SRCS-3248	16.00	20.00	34.00	13.00	43.00	14.00	16.00	6.00	.50 (10x)	.781"Ø x 1.50" Thru Slot	8.00" ANSI Flange 150# RF	2377	SRCS-3248
SRCS-3260			46.00		55.00							1975	SRCS-3260
SRCS-3272			58.00		67.00							2121	SRCS-3272
SRCS-3284			70.00		79.00							2266	SRCS-3284
SRCS-3296			82.00		91.00							2414	SRCS-3296
SRCS-32108			94.00		103.00							2558	SRCS-32108
SRCS-32120			106.00		115.00							2705	SRCS-32120
SRCS-32132			112.00		127.00							2852	SRCS-32132
SRCS-32144			130.00		139.00							2999	SRCS-32144
SRCS-32156			142.00		151.00							3146	SRCS-32156
SRCS-32168			154.00		163.00							3293	SRCS-32168

Notes

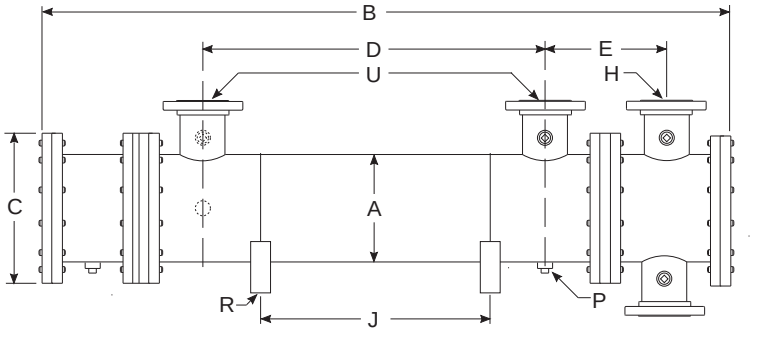
- SRCS Series tube bundle is removable. For replacement bundles consult factory.
- It is recommended that when a heat exchanger is disassembled, new gaskets and O-rings to be used in reassembly.
- Replacement gasket and O-Ring seal part numbers are available. For more information consult factory.

SRCS-3600 Series *dimensions*



One Pass (TP)

Model	B	E	H
SRCS-3648	87.63	19.13	10.00" ANSI Flange 150# RF
SRCS-3660	99.63		
SRCS-3672	111.63		
SRCS-3684	123.63		
SRCS-3696	135.63		
SRCS-36108	147.63		
SRCS-36120	159.63		
SRCS-36132	171.63		
SRCS-36144	183.63		
SRCS-36156	195.63		
SRCS-36168	207.63		
SRCS-36180	219.63		



Two Pass (TP)

Model	B	E	H
SRCS-3648	87.63	19.13	8.00" ANSI Flange 150# RF
SRCS-3660	99.63		
SRCS-3672	111.63		
SRCS-3684	123.63		
SRCS-3696	135.63		
SRCS-36108	147.63		
SRCS-36120	159.63		
SRCS-36132	171.63		
SRCS-36144	183.63		
SRCS-36156	195.63		
SRCS-36168	207.63		
SRCS-36180	219.63		

Model	A	C	D	G	J	L	M	N	P NPT	R	U	Weight	Model
SRCS-3648	18.00	22.00	32.00	14.00	43.00	15.00	16.00	7.00	.50 (6X)	.781"Ø x 1.50" Thru Slot	10.00" ANSI Flange 150# RF	2314	SRCS-3648
SRCS-3660			44.00		55.00							2498	SRCS-3660
SRCS-3672			56.00		67.00							2684	SRCS-3672
SRCS-3684			68.00		79.00							2869	SRCS-3684
SRCS-3696			80.00		91.00							3054	SRCS-3696
SRCS-36108			92.00		103.00							3239	SRCS-36108
SRCS-36120			104.00		115.00							3424	SRCS-36120
SRCS-36132			116.00		127.00							3609	SRCS-36132
SRCS-36144			128.00		139.00							3794	SRCS-36144
SRCS-36156			140.00		151.00							3979	SRCS-36156
SRCS-36168			152.00		163.00							4164	SRCS-36168
SRCS-36180			164.00		175.00							4349	SRCS-36180

Notes

- SRCS Series tube bundle is removable. For replacement bundles consult factory.
- It is recommended that when a heat exchanger is disassembled, new gaskets and O-rings to be used in reassembly.
- Replacement gasket and O-Ring seal part numbers are available. For more information consult factory.

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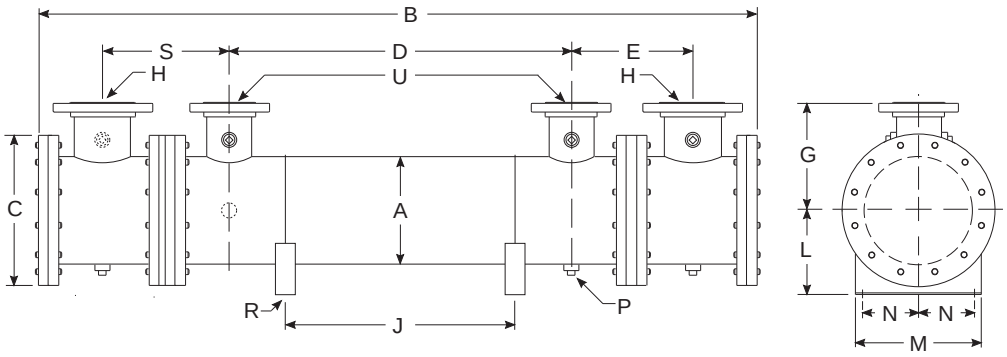
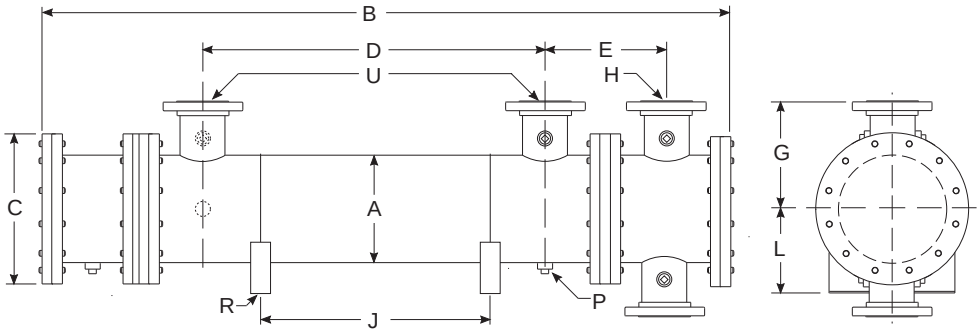


One Pass (TP)

Model	B	E	H
SRCS-4048	93.68	20.68	12.00" ANSI Flange 150# RF
SRCS-4060	105.68		
SRCS-4072	117.68		
SRCS-4084	129.68		
SRCS-4096	141.68		
SRCS-40108	153.68		
SRCS-40120	165.68		
SRCS-40132	177.68		
SRCS-40144	189.68		
SRCS-40156	201.68		
SRCS-40168	213.68		
SRCS-40180	225.68		



Two Pass (TP)

Model	B	E	H
SRCS-4048	93.68	20.68	8.00" ANSI Flange 150# RF
SRCS-4060	105.68		
SRCS-4072	117.68		
SRCS-4084	129.68		
SRCS-4096	141.68		
SRCS-40108	153.68		
SRCS-40120	165.68		
SRCS-40132	177.68		
SRCS-40144	189.68		
SRCS-40156	201.68		
SRCS-40168	213.68		
SRCS-40180	225.68		

COMMON DIMENSIONS & WEIGHTS

Model	A	C	D	G	J	L	M	N	P NPT	R	U	Weight	Model
SRCS-4048	20.00	25.00	32.00	16.00	43.00	17.00	20.00	8.00	.50 (6X)	.781"Ø x 1.50" Thru Slot	10.00" ANSI Flange 150# RF	2856	SRCS-4048
SRCS-4060			44.00		55.00							3085	SRCS-4060
SRCS-4072			56.00		67.00							3313	SRCS-4072
SRCS-4084			68.00		79.00							3542	SRCS-4084
SRCS-4096			80.00		91.00							3770	SRCS-4096
SRCS-40108			92.00		103.00							3999	SRCS-40108
SRCS-40120			104.00		115.00							4227	SRCS-40120
SRCS-40132			116.00		127.00							4456	SRCS-40132
SRCS-40144			128.00		139.00							4686	SRCS-40144
SRCS-40156			140.00		151.00							4916	SRCS-40156
SRCS-40168			152.00		163.00							5146	SRCS-40168
SRCS-40180			164.00		175.00							5376	SRCS-40180

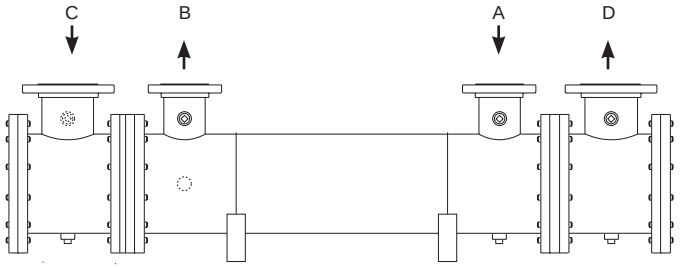
Notes

- SRCS Series tube bundle is removable. For replacement bundles consult factory.
- It is recommended that when a heat exchanger is disassembled, new gaskets and O-rings to be used in reassembly.
- Replacement gasket and O-Ring seal part numbers are available. For more information consult factory.

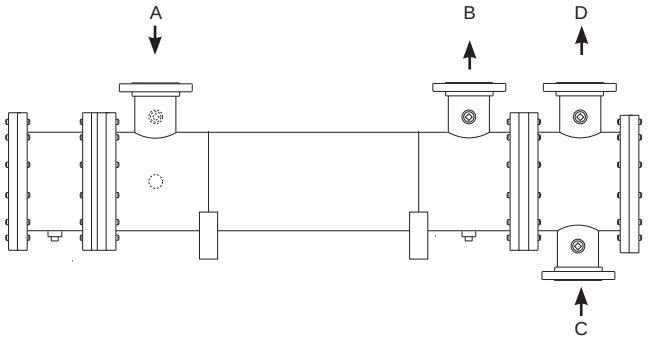
PIPING HOOK-UP

A ..... Hot fluid to be cooled
B ..... Cooled fluid
C ..... Cooling water in
D ..... Cooling water out

SP ..... Single Pass
TP ..... Two Pass



Single Pass



Two Pass

Receiving / Installation

a) Inspect unit for any shipping damage before uncrating. Indicate all damages to the trucking firms' delivery person, and mark it on the receiving bill before accepting the freight. Make sure that there is no visible damage to the outside surface of the heat exchanger. The published weight information located in this brochure is approximate. True shipment weights are determined at the time of shipping and may vary. Approximate weight information published herein is for engineering approximation purposes and should not be used for exact shipping weight. Since the warranty is based upon the unit date code located on the model identification tags, removal or manipulation of the identification tags will void the manufacturers warranty.

b) When handling the shell & tube heat exchanger, special care should be taken to avoid dropping the unit since mishandling could cause the heat exchanger to crack and leak externally. Mishandling of the unit is not covered under the manufacturers warranty. All units are shipped with partial wood/corrugated cardboard containers for safe handling.

c) Storage: American Industrial heat exchangers are protected against the elements during shipment. If the heat exchanger cannot be installed and put into operation immediately upon receipt, certain precautions are required to prevent deterioration during storage. The responsibility for integrity of the heat exchanger(s) is assumed by the user. American Industrial will not be responsible for damage, corrosion, or other deterioration of the heat exchanger during transit or storage.

Proper storage practices are important when considering the high costs of repair or replacement, and the possible delays for items which require long lead times for manufacture. The following listed practices are provided solely as a convenience to the user, who shall make their own decision on whether to use all or any of them.

1) Heat exchangers not to be placed in immediate service, require precautionary measures to prevent corrosion or contamination.
2) Heat exchangers made of ferrous materials, may be pressure-tested using compressed air at the factory. Residual oil coating on the inside surfaces of the heat exchanger(s) as a result of flushing does not discount the possibility of internal corrosion. Upon receipt, fill the heat exchanger(s) with the appropriate grade of oil or apply a corrosion preventing inhibitor for storage.
3) Corrosion protection compounds for interior surfaces for long term storage or other applications are applied solely at the request of customers. Upon request, American Industrial can provide a customer approved corrosion preventative if available when included in the original purchase order specifications.
4) Remove all dirt, water, ice, or snow and wipe dry before moving heat exchanger(s) into storage. Heat exchangers are generally shipped empty, open drain plugs to remove any accumulated condensation moisture, then reseal. Accumulation of moisture usually indicates corrosion has already started and remedial action should be taken.
5) Store in a covered, environmentally stable area. The ideal storage environment for heat exchangers is in a dry, low-humidity atmosphere which is sealed to prevent the entry of blowing dust, rain, or snow. Maintain in atmospheric temperatures between 70°F and 105°F (Large temperature swings may cause condensation and moisture to form on steel components, threads, shell, etc...) Use thermometers and humidity indicators and maintain the atmosphere at 40% relative humidity, or lower.

d) Standard Enamel Coating: American Industrial provides its standard products with a normal base coat of oil base air cure enamel paint. The enamel paint is applied as a temporary protective and esthetic coating prior to shipment. While the standard enamel coating is durable, American Industrial does not warranty it as a long-term finish coating. It is strongly suggested that a more durable final coating be applied after installation or prior to long-term storage in a corrosive environment to cover any accidental scratches, enhance esthetics, and further prevent corrosion. It is the responsibility of the customer to provide regular maintenance against chips, scratches, etc... and regular touch up maintenance must be provided for long-term benefits and corrosion prevention.

e) Special Coatings: American Industrial offers as customer options, Air-Dry Epoxy, and Heresite (Air-Dry Phenolic) coatings at additional cost. American Industrial offers special coatings upon request, however American Industrial does not warranty coatings to be a permanent solution for any equipment against corrosion. It is the responsibility of the customer to provide regular maintenance against chips, scratches, etc... and regular touch up maintenance must be provided for long-term benefits and corrosion prevention.

f) American Industrial recommends that the equipment supplied should be installed by qualified personnel who have solid understanding of system design, pressure and temperature ratings, and piping assembly. Verify the service conditions of the system prior to applying any shell & tube heat exchanger. If the system pressure or temperature does not fall within the parameters on model rating tag located on the heat exchanger, contact our factory prior to installation or operation.

note: AIHTI reserves the right to make reasonable design changes without notice.
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g) Plan the installation to meet the requirements indicated on the piping installation diagram as illustrated above. It is recommended to put the hot fluid to be cooled through the shell side and the cold fluid through the tube side. The indicated port assembly sequence in the installation diagram maximizes the performance, and minimizes the possibility of thermal shock. In instances where the fluids are required to be reversed, *hot fluid in the tubes and cold fluid in the shell* the heat exchanger will work with reduced performance. Installation may be vertical or horizontal or a combination thereof. However, the installation must allow for complete draining of the heat exchanger regardless of Two Pass or four pass construction. Complete drainage is important to prevent the heat exchanger from freezing, over-heating of a fluid, or mineral deposit buildup.
For removable bundle heat exchangers, provide sufficient clearance at the stationary tube-sheet end to allow for the removal of the tube bundle from the shell. Channel cover can be removed to aid in cleaning the tubes without disassembling the tube bundle. For more information please contact American Industrial.

h) It is recommended to use flexible hose wherever possible to reduce vibration and allow slight movement. However, hoses are not required. Hydraulic carrying lines should be sized to handle the appropriate flow and to meet system pressure drop requirements based upon the systems parameters, and not based upon the units supply and return connection size. We recommend that a low cracking pressure direct acting relief valve be installed at the heat exchanger inlet to protect it from pressure spikes by bypassing oil in the event the system experiences a high flow surge. If preventative filtration is used it should be located ahead of the cooler on both shell and tube side to catch any scale or sludge from the system before it enters the cooler. Failure to install filters ahead of the heat exchanger could lead to possible heat exchanger failure due to high pressure if the system filters plug.

i) Standard shell & tube coolers are built with a rolled tube-sheet construction. However, the differential operating temperature between the entering shell side fluid and the entering tube side fluid should not exceed 150°F. If this condition exists, a severe thermal shock could occur leading to product failure and mixing of the fluids. For applications with a differential temperatures of 150°F or more, we recommend using a series with a floating tube-sheet, u-tube, or expansion joint to reduce the potential for the effects of thermal shock.

j) Water requirements vary from location to location. If the source of cooling water is from other than a municipal water supply, it is recommended that a water strainer be installed ahead of the heat exchanger to prevent dirt and debris from entering and clogging the flow passages. If a water modulating valve is used it is recommended to be installed at the inlet to the cooler to regulate the water flow.

k) For steam service, or other related applications, please consult our engineering department for additional information.

Maintenance
a) Inspect the heat exchanger for loosened bolts, connections, rust spots, corrosion, and for internal or external fluid leakage. Any corroded surfaces should be cleaned and recoated with paint.

b) Shell side: In many cases with clean hydraulic system oils it will not be necessary to flush the interior of the shell side of the cooler. In circumstances where the quality of hydraulic fluid is in question, the shell side should be disconnected and flushed on a yearly basis with a clean flushing oil/solvent to remove any sludge that has been deposited. For severe cases where the unit is plugged and cannot be flushed clean with solvent, the heat exchanger should be replaced to maintain the proper cooling performance.

c) Tube side: In many cases it will be necessary to clean the tube side of the heat exchanger due to poor fluid quality, debris, calcium deposits, corrosion, mud, sludge, seaweed, etc.... To clean the tube side, flush with clean water or any good quality commercial cleaner that does not attack the particular material of construction. With straight tube heat exchangers you can use a rod to carefully push any debris out of the tubes.

d) Zinc anodes are normally used to reduce the risk of failure due to electrolysis. Zinc anodes are a sacrificial component designed to wear and dissolve through normal use. Normally, zinc anodes are applied to the water supply side of the heat exchanger. Depending upon the amount of corrosive action, one, two, three, or more anodes can be applied to help further reduce the risk of failure. American Industrial Heat Transfer, Inc. offers zinc anodes as an option, to be specified and installed at the request our customers. It is the responsibility of the customer to periodically check and verify the condition of the zinc anode and replace it as needed.

Applications vary due to water chemical makeup and quality, material differences, temperature, flow rate, piping arrangements, and machine grounding. For those reasons, zinc anodes do not follow any scheduled factory predetermined maintenance plan moreover they must be checked routinely by the customer, and a maintenance plan developed based upon the actual wear rate.

If substantial wear occurs or zinc dissolves without replacement, premature failure or permanent damage may occur to the heat exchanger. American Industrial does not warranty customer applications. It is the responsibility of the customer to verify and apply the proper system materials of construction and overall system requirements. Failures resulting from properly applied or misapplied use of zinc anode(s) into non-specified or specified applications will be the sole responsibility of the customer.

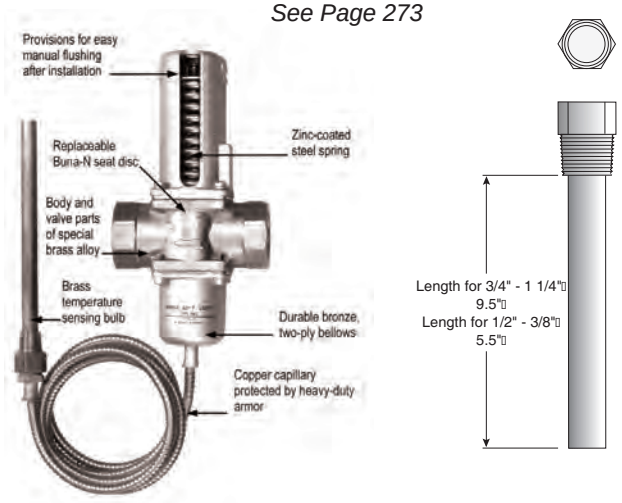
e) A routine maintenance schedule should be developed and adjusted to meet your systems requirements based upon water quality, etc… .Failure to regularly maintain and clean your heat exchanger can result in a reduction in operational performance and life expectancy.

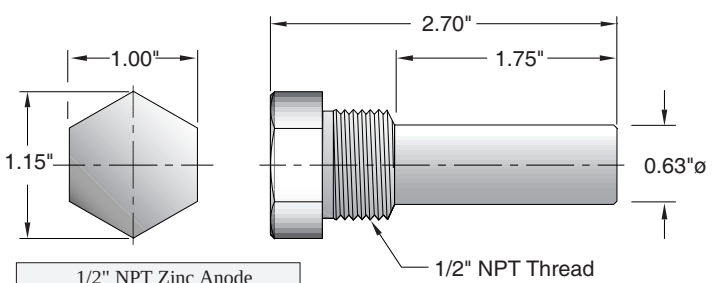
Note: *Since applications can vary substantially, the installation and maintenance information contained in this catalog should be used as a basic guideline. The safe installation, maintenance, and use of any American Industrial Heat Transfer, Inc. heat exchanger are solely the responsibility of the user.*

ACCESSORIES: THERMOSTATIC MODULATING WATER VALVE WITH BULB WELL ASSEMBLY

(for Shell & Tube Heat Exchangers And Air/Oil Coolers)

See Page 273





1/2" NPT Zinc Anode PN: 301-0003
SRCS-1700 thru SRCS-4800

American Industrial Heat Transfer Inc.
Manufacturer of Quality Heat Exchangers

website : www.aihti.com
general email : sales@aihti.com
technical email : engineering@aihti.com

Shell & Tube Application Request: *(For liquid to liquid heat exchangers)*

For UCS & URCS Series

Email form to: sales@aihti.com or engineering@aihti.com or fax to 434-757-1810

Contact Name _____ Telephone _____ Date _____

Company Name _____ Email _____

Address: _____ Fax _____

_____

Hot Side

Fluid Type _____

If available:

Density _____ lb/ft3
Viscosity _____ cP
Conductivity _____ Btu/hr.ft.°F
Specific Heat _____ Btu/lb.°F

1. Flow Rate _____
2. Temperature In _____
3. Desired Temperature Out _____
4. Heat Load _____

Cold Side

Fluid Type _____

If available:

Density _____ lb/ft3
Viscosity _____ cP
Conductivity _____ Btu/hr.ft.°F
Specific Heat _____ Btu/lb.°F

1. Flow Rate _____
2. Temperature In _____

Maximum Allowable Pressure Drop:

Hot Side _____ Cold Side _____

To properly size the heat exchanger we need 3 of the 4 perameter on the Hot Side and 2 on the Cold Side.

U-Tube Fixed Tube Bundle ☐ U-Tube Removable Tube Bundle ☐

Shell Material Construction:

Steel ☐ Stainless Steel ☐ Brass ☐

Tube Sheet Material

Steel ☐ Stainless Steel ☐
Brass ☐ (Applies to removable bundle only)

Tube Material Construction:

Copper ☐
90/10 Copper Nickel ☐
Stainless Steel ☐

End Bonnets Material:

Cast Iron ☐
Cast Bronze ☐
Stainless Steel ☐

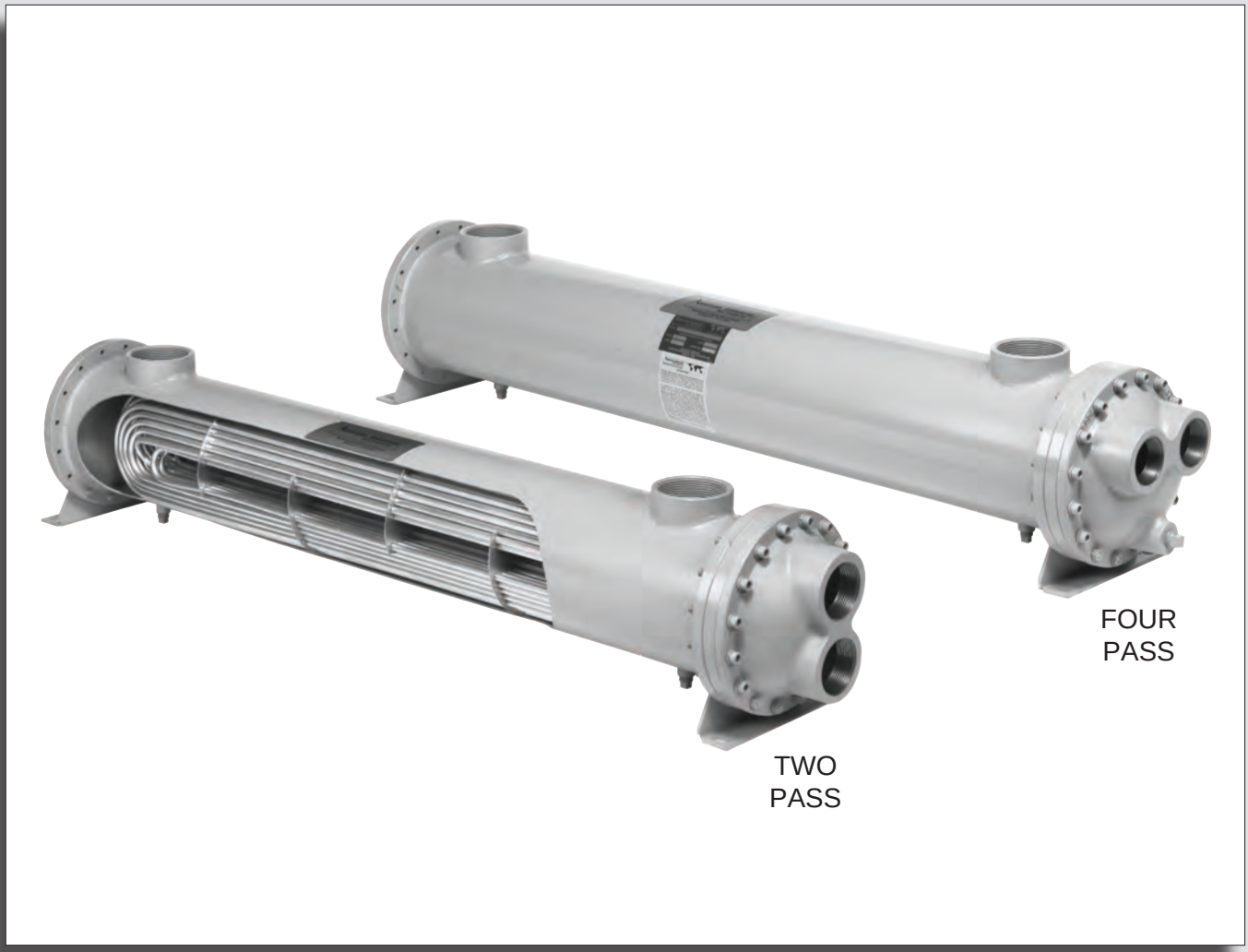
ASME Code and Certified Yes ☐ No ☐

Require All Stainless Steel Heat Exchanger Yes ☐ No ☐

Comment: _____

_____

UCS & URCS SERIES



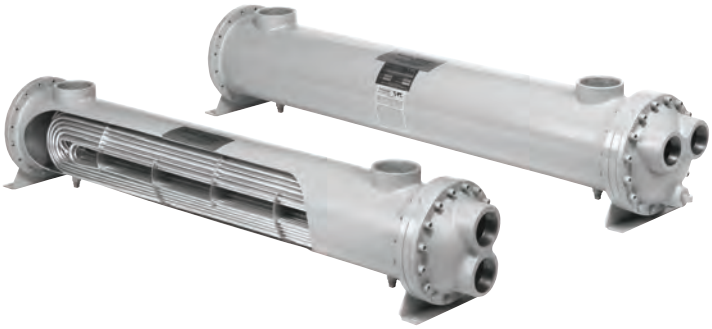
U-TUBE FIXED & REMOVEABLE BUNDLE

HEAT EXCHANGERS

For severe temperature differences between entering hot fluid and cold fluid to minimize thermal shock

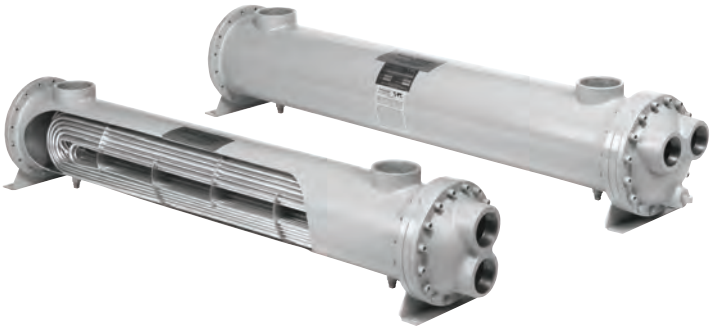
- Removable tube bundle.
- Operating pressure for tubes 150 PSI.
- Operating pressure for shell 250 PSI.
- Operating temperature 400 °F.
- Computer generated data sheet available for any application
- Can be customized to fit any applications.
- Option up to 600 °F

UCS & URCS Series *overview*



UCS SERIES

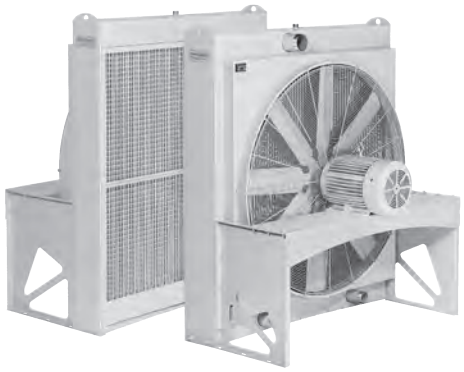
U-tube heat exchangers with fixed tube bundle for fluids with high differential inlet temperatures or where tube bundle requires removal. Normally applied when the differential temperature between the hot fluid entering and the cooling fluid entering is 150°F or greater. U-tube design allows tubing to freely expand and contract independently of the shell. Welded outer shell construction made of carbon steel. Sizes from 3" to 10" diameters. Standard two and four pass units available. Optional 90/10 copper nickel, stainless steel, and carbon steel tube. Can be modified to meet your requirements.



URCS SERIES

U-tube heat exchangers with removeable tube bundle for fluids with high differential inlet temperatures. Normally applied when the differential temperature between the hot fluid entering and the cooling fluid entering is 150°F or greater. U-tube design allows tubing to freely expand and contract independently of the shell. Welded outer shell construction made of carbon steel. Sizes from 3" to 10" diameters. Standard two and four pass units available. Optional 90/10 copper nickel, stainless steel, and carbon steel tube. Can be modified to meet your requirements.

AC-ACF-ACHM Series



AOCS Series

AOCH Series

EOC - EOCF Series

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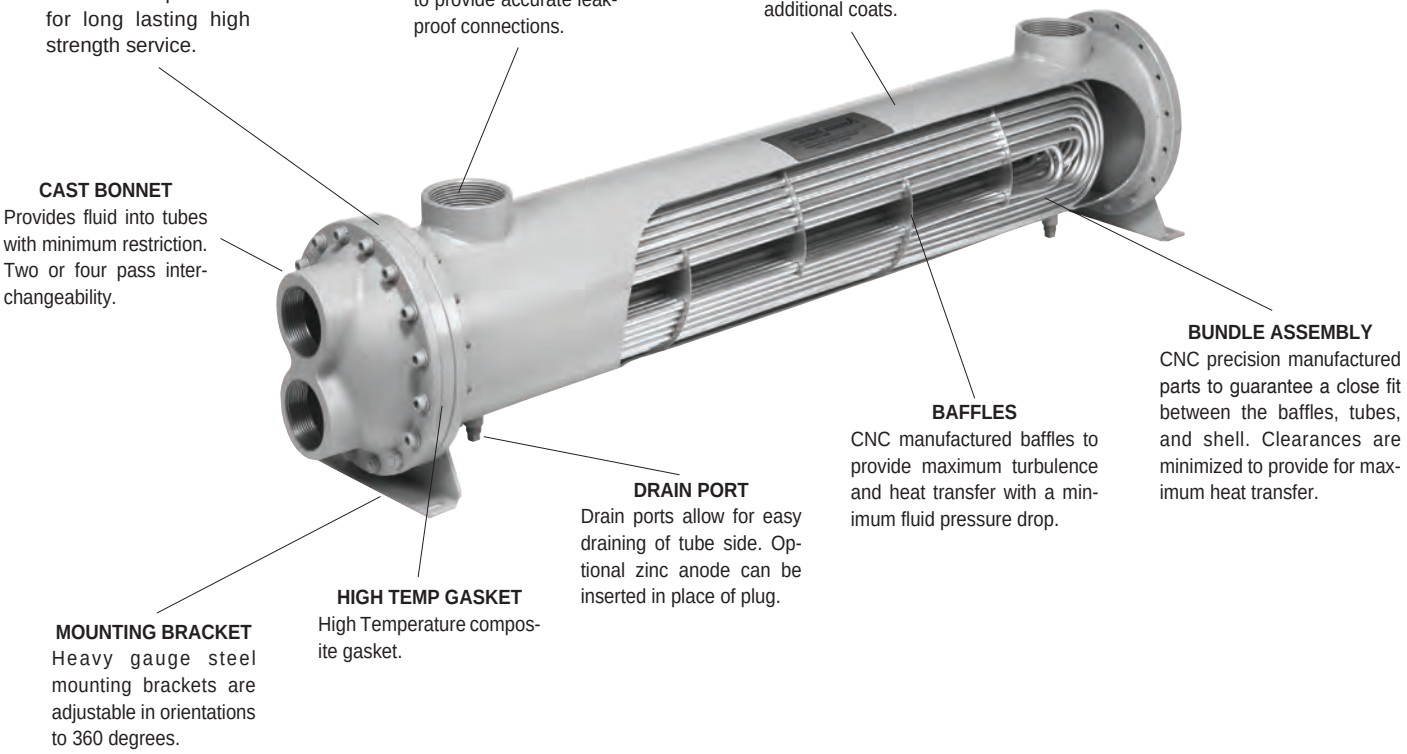

UNIT CODING

Example Model

Options

UCS - 1748 - 6 - TP - CNT - B - Z - BT

Model
UCS
URCS

Shell Diameter
600 = 3.25"
700 = 3.50"
800 = 4.25"
1000 = 5.25"
1200 = 6.25"
1700 = 8.00"
2000 = 10.75"

Effective Tube Length
(6" or 12" increments)

Cooling Tube Diamenter
4 = 1/4"
6 = 3/8"
10 = 5/8"

Tube Side Passes
TP = 2 pass
FP = 4 pass

Tubing
Blank = Standard
Options
CNT= 90/10 Cu Ni
STS = Stainless Steel
C = Carbon Steel

End Bonnets
Blank = Standard
Options
B = Bronze
SB = Stainless Bonnet

Zinc Anode
Z = 1 Zinc Anode
2Z = 2 Zinc Anode etc.

Tube Sheet
BT = Brass
ST = Stainless Steel

STANDARD CONSTRUCTION MATERIALS & RATINGS

Standard Model	UCS / URCS	Options	**Standard Unit Ratings**
Shell	Steel	Stainless Steel	Operating Pressure Tubes
Tubes	Copper	90/10 Cu. Ni. / Stainless Steel	150 psig
Baffles	Steel	Brass / Stainless Steel	Operating Pressure Shell
Tube Sheet	Steel	Brass / Stainless Steel	250 psig
End Bonnets	Cast Iron	Stainless Steel	Operating Temperature
Mounting Brackets	Steel	Stainless Steel	400 ºF
Gasket	High Temperature Gasket	Hypalon / Viton / EPR	Optional up to 600 °F

note: AIHTI reserves the right to make reasonable design changes without notice.

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STEP 1: Calculate the heat load

The heat load in BTU/HR or (Q) can be derived by using several methods. To simplify things, we will consider general specifications for hydraulic system oils and other fluids that are commonly used with shell & tube heat exchangers.

Terms

GPM = Gallons Per Minute
CN = Constant Number for a given fluid
△T = Temperature differential across the potential
PSI = Pounds per Square Inch (pressure) of the operating side of the system
MHP = Horsepower of the electric motor driving the hydraulic pump
Kw = Kilowatt (watts x 1000)
T_{in} = Hot fluid entering temperature in °F
T_{out} = Hot fluid exiting temperature in °F
t_{in} = Cold fluid temperature entering in °F
t_{out} = Cold fluid temperature exiting in °F
Q = BTU / HR

For example purposes, a 2,000 HP gear box lubrication system is provided with a flow of 80 GPM. The temperature differential of the oil entering the pump @ 200°F *vs* exiting the system @ 230°F is about 30.0°F. Though our return line pressure is below 100 psi, calculate the system heat load potential (Q) based upon the measured △T and the flow rate or by using the overall efficiency in our case 90%.

To derive the required heat load (Q) to be removed by the heat exchanger, apply the following. Note: The calculated heat load may differ slightly from one formula to the next. This is due to assumptions made when estimating heat removal requirements.

Formula	Example
A) Q = GPM x CN x actual △T	A) Q = 80 x 210 x 30°F = 504,000 BTU/HR
B) Q = [(PSI x GPM) / 1714] x (*v*) x 2545	
C) Q = MHP x (*v*) x 2545	
D) Q = Kw to be removed x 3415	D) Q = 1,490 x (1 - 0.9) x 3415 = 508,835 BTU/HR
E) Q = HP x (1 - % efficiency) x 2545	E) Q = 2,000 x (1 - 0.9) x 2545 = 509,000 BTU/HR

Constant for a given fluid (CN)

1) Oil ..... CN = 210
2) Water..... CN = 500
3) 50% E. Glycol..... CN = 450

STEP 2: Calculate the Mean Temperature Difference

When calculating the MTD you will be required to choose a liquid flow rate to derive the Cold Side △T. If the water flow is unknown, assume a number based on what is available. As a normal rule of thumb, for oil to water cooling a 2:1 oil to water ratio is used. For applications of water to water or 50 % Ethylene Glycol to water, a 1:1 ratio is common.

Formula	Example
HOT FLUID △T Oil = $\frac{Q}{CN \times GPM}$	**△T** = $\frac{504{,}000\ BTU/hr}{210\ CN \times 80GPM}$ (from step 1,item B) = 30°F = △T Rejected
COLD FLUID △ t Water = $\frac{BTU / hr}{CN \times GPM}$	**△t** = $\frac{504{,}000\ BTU/hr}{500\ CN \times 40GPM}$ (for a 2:1 ratio) = 25.2°F = △T Absorbed

T_{in} = Hot Fluid entering temperature in degrees F
T_{out} = Hot Fluid exiting temperature in degrees F
t_{in} = Cold Fluid entering temperature in degrees F
t_{out} = Cold Fluid exiting temperature in degrees F

T_{in} = 125.3 °F
T_{out} = 120.0 °F
t_{in} = 70.0 °F
t_{out} = 74.5 °F

$$\frac{T_{out} - t_{in}}{T_{in} - t_{out}} = \frac{S\text{[smaller temperature difference]}}{L\text{ [larger temperature difference]}} = \left(\frac{S}{L}\right)$$

$$\frac{230°F - 40°F = 190°F}{230°F - 65.2°F = 164.8°F} = \left(\frac{S}{L}\right) = \frac{164.8°F}{190°F} = .867$$

STEP 3: Calculate Log Mean Temperature Difference (LMTD)

To calculate the LMTD please use the following method;

L = Larger temperature difference from step 2
M = S/L number (LOCATED IN TABLE A).

L = 190°F
M = .933

$LMTD_i$ = L x M

$LMTD_i$ = 190 x .933 (FROM TABLE A) = **177.3**

To correct the $LMTD_i$ for a multipass heat exchangers calculate **R** & **K** as follows:

Formula	Example
R = $\frac{T_{in} - T_{out}}{t_{out} - t_{in}}$	**R** = $\frac{230°F - 200°F}{65.2°F - 40°F}$ = $\frac{30°F}{25.2°F}$ = **{1.19=R}**
K = $\frac{t_{out} - t_{in}}{T_{in} - t_{in}}$	**K** = $\frac{65.2°F - 40°F}{230°F - 40°F}$ = $\frac{25.2°F}{190°F}$ = **{0.132=K}**

Locate the correction factor CF_B (FROM TABLE B)
$LMTD_c = LMTD_i$ x CF_B
$LMTD_c$ = 177.3 x 1 = **177.3**

STEP 4: Calculate the area required

Required Area sq.ft. = $\frac{\text{Q (BTU / HR)}}{\text{LMTD}_c \text{ x U (FROM TABLE C)}}$ $\frac{504{,}000}{177.3 \text{ x } 100}$ = **28.5 sq.ft.**

STEP 5: Selection

a) From TABLE E choose the correct series size, baffle spacing, and number of passes that best fits your flow rates for both shell and tube side. Note that the tables suggest minimum and maximum information. Try to stay within the 20-80 percent range of the indicated numbers.

Example

Oil Flow Rate = 80 GPM = Series Required from Table E = **1200 Series**
Baffle Spacing from Table E = **4**
Water Flow Rate = 40 GPM = Passes required in 1200 series = **4 (FP)**

b) From TABLE D choose the heat exchanger model size based upon the sq.ft. or surface area in the series size that will accommodate your flow rate.

Example

Required Area = 28.5sq.ft Closest model required based upon sq.ft. & series = **UCS - 1248 - 4 - 6 - FP**

If you require a computer generated data sheet for the application, or if the information that you are trying to apply does not match the corresponding information, please contact our engineering services department for further assistance.

TABLE A- FACTOR M/LMTD = L x M

S/L	M	S/L	M	S/L	M	S/L	M
		.25	.541	.50	.721	.75	.870
.01	.215	.26	.549	.51	.728	.76	.864
.02	.251	.27	.558	.52	.734	.77	.879
.03	.277	.28	.566	.53	.740	.78	.886
.04	.298	.29	.574	.54	.746	.79	.890
.05	.317	.30	.582	.55	.753	.80	.896
.06	.334	.31	.589	.56	.759	.81	.902
.07	.350	.32	.597	.57	.765	.82	.907
.08	.364	.33	.604	.58	.771	.83	.913
.09	.378	.34	.612	.59	.777	.84	.918
.10	.391	.35	.619	.60	.783	.85	.923
.11	.403	.36	.626	.61	.789	.86	.928
.12	.415	.37	.634	.62	.795	.87	.934
.13	.427	.38	.641	.63	.801	.88	.939
.14	.438	.39	.648	.64	.806	.89	.944
.15	.448	.40	.655	.65	.813	.90	.949
.16	.458	.41	.662	.66	.818	.91	.955
.17	.469	.42	.669	.67	.823	.92	.959
.18	.478	.43	.675	.68	.829	.93	.964
.19	.488	.44	.682	.69	.836	.94	.970
.20	.497	.45	.689	.70	.840	.95	.975
.21	.506	.46	.695	.71	.848	.96	.979
.22	.515	.47	.702	.72	.852	.97	.986
.23	.524	.48	.709	.73	.858	.98	.991
.24	.533	.49	.715	.74	.864	.99	.995

TABLE B- LMTD correction factor for Multipass Exchangers

R \ K	.05	.1	.15	.2	.25	.3	.35	.4	.45	.5	.6	.7	.8	.9	1.0
.2	1	1	1	1	1	1	1	.999	.993	.984	.972	.942	.908	.845	.71
.4	1	1	1	1	1	1	.994	.983	.971	.959	.922	.855	.70		
.6	1	1	1	1	1	.992	.980	.965	.948	.923	.840				
.8	1	1	1	1	.995	.981	.965	.945	.916	.872					
1.0	1	1	1	1	.988	.970	.949	.918	.867	.770					
2.0	1	1	.977	.973	.940	.845	.740								
3.0	1	1	.997	.933	.835										
4.0	1	.993	.950	.850											
5.0	1	.982	.917												
6.0	1	.968	.885												
8.0	1	.930													
10.0	.996	.880													
12.0	.985	.720													
14.0	.972														
16.0	.958														
18.0	.940														
20.0	.915														

TABLE D- Surface Area in Sq. ft. for UCS & URCS Series

Model Number Code	1/4" O.D. Tubing Code 4	Model Number Code	1/4" O.D. Tubing Code 6	3/8" O.D. Tubing Code 6	5/8" O.D. Tubing Code 10
614	3.6	1024		11.0	6.5
		1036		16.5	9.8
624	6.8	1048		22.0	13.0
630	7.8				
		1224		17.3	9.1
636	9.4	1236		25.9	13.7
		1248		34.5	18.3
		1260		43.2	22.9
712	3.4	1272		51.8	27.5
718	5.1	1284		60.5	32.0
724	6.8	1724		32.2	17.0
		1736		48.3	25.5
730	8.5	1748		64.4	34.0
736	10.2	1760		80.5	42.5
		1772		96.6	51.0
		1784		112.7	59.5
814	7.0				
		2036		80.1	41.2
824	12.0	2048		106.8	55.0
		2060		133.5	68.7
830	15.1	2072		160.2	82.5
836	19.2	2084		186.9	96.2

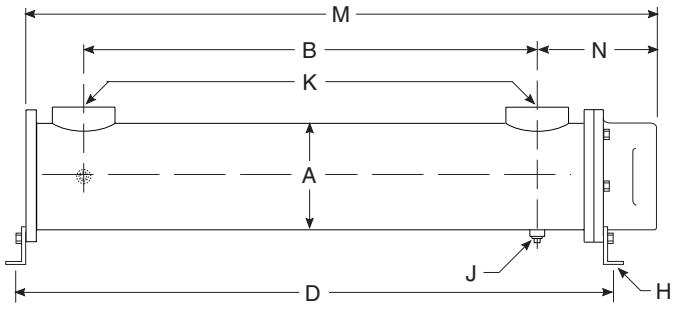
TABLE E- Flow Rate for Shell & Tube

Shell dia. Code	Max. Liquid Flow - Shell Side					Liquid Flow - Tube Side			
	Baffle Spacing					TP		FP	
	1.5	2	3	4	6	Min.	Max.	Min.	Max.
600	15	20	25	30	–	3.5	24	2	12
800	20	34	45	60	–	4.5	38	3	21
1000	30	36	50	65	–	10	70	5	37
1200	45	50	70	100	125	15	112	7.5	56
1700	50	65	100	140	220	29	180	14	90
2000	–	–	140	190	320	45	320	25	160

TABLE C

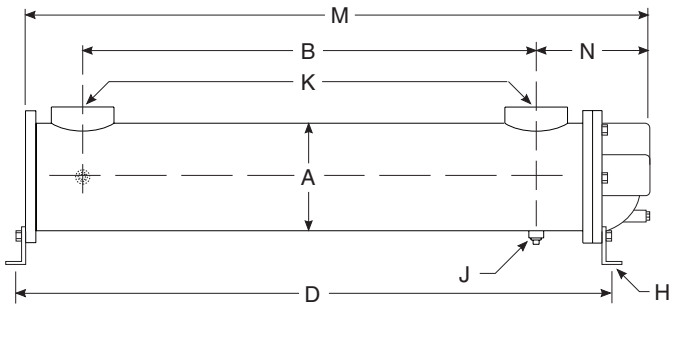
U	TUBE FLUID	SHELL FLUID
400	Water	Water
350	Water	50% E. Glycol
100	Water	Oil
300	50% E. Glycol	50% E. Glycol
90	50% E. Glycol	Oil

UCS Series *dimensions*



Two Pass (TP)

Model	M	N	Q NPT	R
UCS-614 UCS-624 UCS-630 UCS-636	17.79 27.79 33.79 39.79	3.70	1.00	1.00
UCS-712 UCS-718 UCS-724 UCS-730 UCS-736	16.56 22.56 28.56 34.56 40.56	4.85	1.00	.88
UCS-814 UCS-824 UCS-830 UCS-836	18.44 28.44 34.44 40.44	4.82	1.25	1.06



UCS-600, UCS-800

Four Pass (FP)

Model	M	N	Q NPT	R
UCS-614 UCS-624 UCS-630 UCS-636	17.78 27.78 33.78 39.78	3.68	.75	1.00
UCS-712 UCS-718 UCS-724 UCS-730 UCS-736	16.53 22.53 28.53 34.53 40.53	4.82	.75	
UCS-814 UCS-824 UCS-830 UCS-836	18.44 28.44 34.44 40.44	4.81	.75	1.25

COMMON DIMENSIONS

Model	A	B	C	D	E	F	G	H	J NPT	K NPT	Weight	Model
UCS-614 UCS-624 UCS-630 UCS-636	3.25	10.0 20.0 26.0 32.0	2.63	18.38 28.38 34.38 40.38	2.75	4.18	1.62	.39 x 1.00 Thru Slot	.25 (2x)	1.00	17 24 30 36	UCS-614 UCS-624 UCS-630 UCS-636
UCS-712 UCS-718 UCS-724 UCS-730 UCS-736	3.75	7.0 13.0 19.0 25.0 31.0	2.88	16.75 22.75 28.75 34.75 40.75	3.62	5.25	1.50	.39 x 1.00 Thru Slot	.25 (2x)	1.50	18 20 22 24 26	UCS-712 UCS-718 UCS-724 UCS-730 UCS-736
UCS-814 UCS-824 UCS-830 UCS-836	4.25	9.0 19.0 25.0 31.0	3.12	19.09 29.09 35.09 41.09	3.50	4.25	1.75	.39 x 1.00 Thru Slot	.25 (2x)	1.50	32 41 47 53	UCS-814 UCS-824 UCS-830 UCS-836

note: AIHTI reserves the right to make reasonable design changes without notice.

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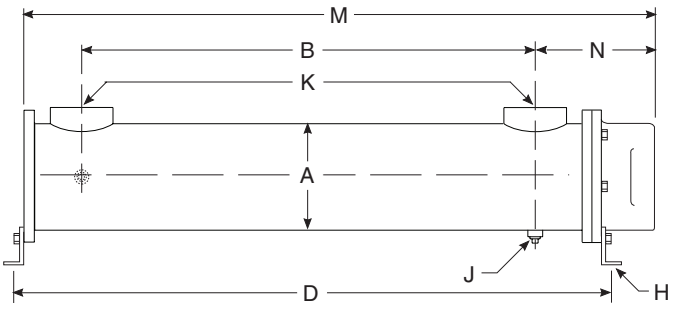
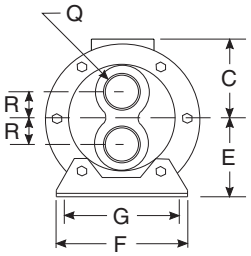
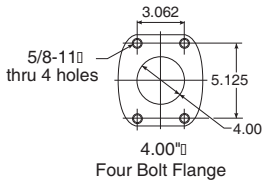
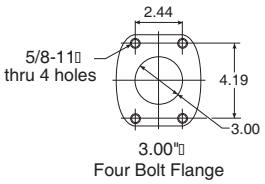


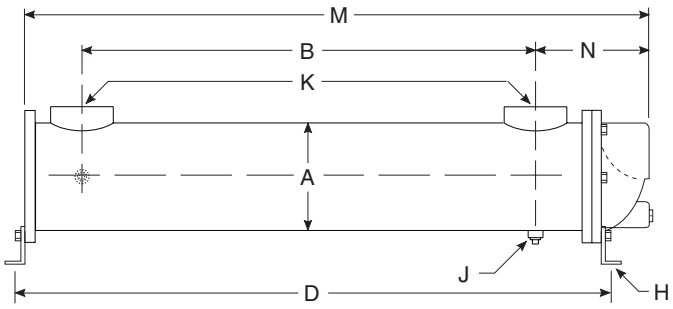


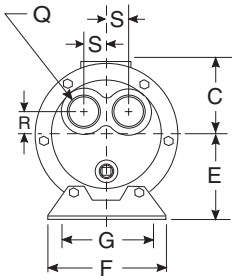
Two Pass (TP)



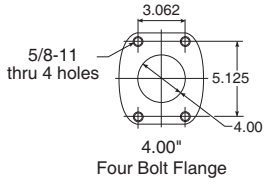


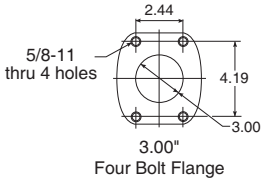
Model	M	N	Q NPT	R
UCS-1024	28.88	4.94	1.50	1.19
UCS-1036	40.88			
UCS-1048	52.88			
UCS-1224	29.17	5.35	2.00	1.44
UCS-1236	41.17			
UCS-1248	53.17			
UCS-1260	65.17			
UCS-1272	77.17			
UCS-1284	89.17			
UCS-1724	30.13	7.31	2.50	1.88
UCS-1736	42.13			
UCS-1748	54.13			
UCS-1760	66.13			
UCS-1772	78.13			
UCS-1784	90.13			
UCS-2036	43.91	9.57	3.00	2.50
UCS-2048	55.91			
UCS-2060	67.91			
UCS-2072	79.91			
UCS-2084	91.91			





Four Pass (FP)





Model	M	N	Q NPT	R	S
UCS-1024	29.21	5.27	1.00	.75	1.19
UCS-1036	41.21				
UCS-1048	53.21				
UCS-1224	29.58	5.76	1.50	1.06	1.44
UCS-1236	41.58				
UCS-1248	53.58				
UCS-1260	65.58				
UCS-1272	77.58				
UCS-1284	89.58				
UCS-1724	29.78	6.96	2.00	1.38	1.88
UCS-1736	41.78				
UCS-1748	53.78				
UCS-1760	65.78				
UCS-1772	77.78				
UCS-1784	89.78				
UCS-2036	44.00	9.66	2.50	1.75	2.50
UCS-2048	56.00				
UCS-2060	68.00				
UCS-2072	80.00				
UCS-2084	92.00				

COMMON DIMENSIONS

Model	A	B	C	D	E	F	G	H	J NPT	K NPT	K SAE	Weight	Model
UCS-1024	5.25	19.00	3.69	29.13	4.00	5.25	2.00	.44 x 1.00 thru slot	.375	1.50	#24 1.875-12 SAE O-Ring	55.00	UCS-1024
UCS-1036		31.00		41.13								70.00	UCS-1036
UCS-1048		43.00		53.13								85.00	UCS-1048
UCS-1224	6.25	18.25	4.19	29.59	4.50	6.25	2.50	.44 x 1.00 thru slot	.375	2.00	#32 2.50-12 SAE O-Ring	83.00	UCS-1224
UCS-1236		30.25		41.59								108.00	UCS-1236
UCS-1248		42.25		53.59								132.00	UCS-1248
UCS-1260		54.25		65.59								158.00	UCS-1260
UCS-1272		66.25		77.59								182.00	UCS-1272
UCS-1284		78.25		89.59								206.00	UCS-1284
UCS-1724	8.00	17.00	5.06	29.50	5.75	8.25	3.50	.44 x 1.00 thru slot	.375	3.00	3.0" Four Bolt Flange	138.00	UCS-1724
UCS-1736		29.00		41.50								180.00	UCS-1736
UCS-1748		41.00		53.50								219.00	UCS-1748
UCS-1760		53.00		65.50								258.00	UCS-1760
UCS-1772		65.00		77.50								300.00	UCS-1772
UCS-1784		77.00		89.50								342.00	UCS-1784
UCS-2036	10.75	28.50	6.88	42.63	8.00	11.50	5.00	.781 x 1.25 thru slot	.50	4.00	4.0" Four Bolt Flange	620.00	UCS-2036
UCS-2048		40.50		54.63								670.00	UCS-2048
UCS-2060		52.50		66.63								730.00	UCS-2060
UCS-2072		64.50		78.63								820.00	UCS-2072
UCS-2084		76.50		90.63								870.00	UCS-2084

note: AIHTI reserves the right to make reasonable design changes without notice.

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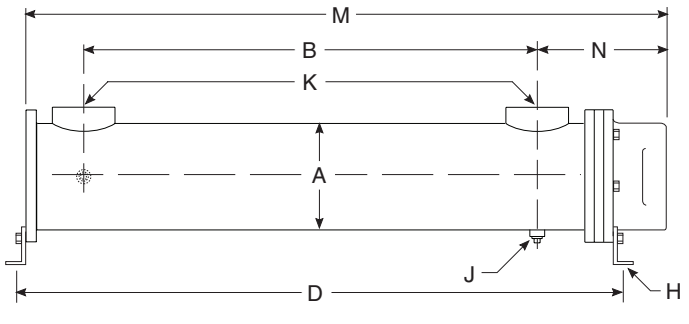
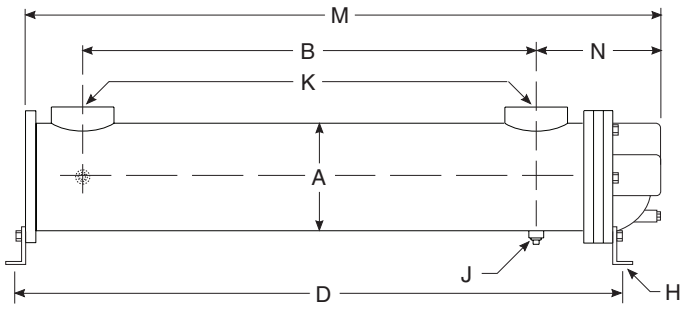
URCS Series *dimensions*



Two Pass (TP)

Model	M	N	Q NPT	R
URCS-614 URCS-624 URCS-630 URCS-636	17.61 27.61 33.61 39.61	4.55	1.00	1.00
URCS-712 URCS-718 URCS-724 URCS-730 URCS-736	16.63 22.63 28.63 34.63 40.63	5.66	1.00	.88
URCS-814 URCS-824 URCS-830 URCS-836	18.50 28.50 34.50 40.50	5.63	1.25	1.06



URCS-600, URCS-800

FOUR PASS (FP)

Model	M	N	Q NPT	R
URCS-614 URCS-624 URCS-630 URCS-636	17.59 27.59 33.59 39.59	4.49	.75	1.00
URCS-712 URCS-718 URCS-724 URCS-730 URCS-736	16.60 22.60 28.60 34.60 40.60	5.63	.75	
URCS-814 URCS-824 URCS-830 URCS-836	18.50 28.50 34.50 40.50	5.62	.75	1.25

COMMON DIMENSIONS

Model	A	B	C	D	E	F	G	H	J NPT	K NPT	Weight	Model
URCS-614 URCS-624 URCS-630 URCS-636	3.25	10.0 20.0 26.0 32.0	2.63	18.19 28.19 34.19 40.19	2.75	4.18	1.62	.39 x 1.00 Thru Slot	.25 (2x)	1.00	17 24 30 36	URCS-614 URCS-624 URCS-630 URCS-636
URCS-712 URCS-718 URCS-724 URCS-730 URCS-736	3.75	7.0 13.0 19.0 25.0 31.0	2.88	16.81 22.81 28.81 34.81 40.81	3.62	5.25	1.50	.39 x 1.00 Thru Slot	.25 (2x)	1.50	18 20 22 24 26	URCS-712 URCS-718 URCS-724 URCS-730 URCS-736
URCS-814 URCS-824 URCS-830 URCS-836	4.25	9.0 19.0 25.0 31.0	3.12	19.15 29.15 35.15 41.15	3.50	4.25	1.75	.39 x 1.00 Thru Slot	.25 (2x)	1.50	32 41 47 53	URCS-814 URCS-824 URCS-830 URCS-836

note: AIHTI reserves the right to make reasonable design changes without notice.

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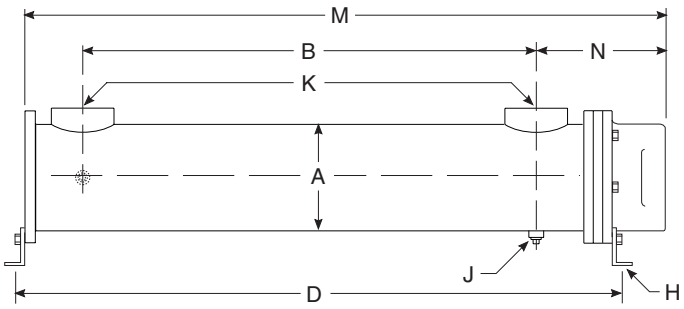
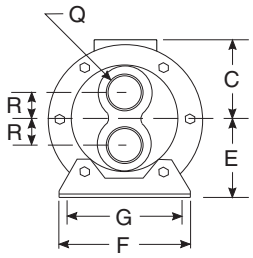
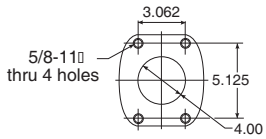
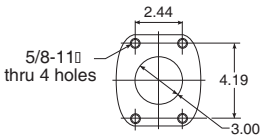


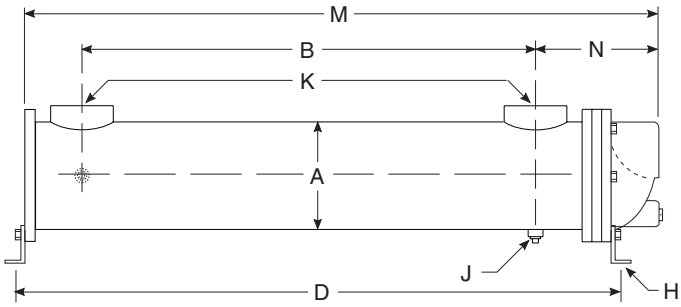


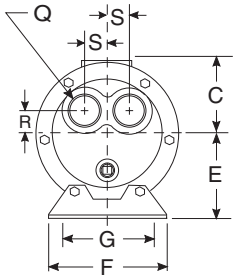
Two Pass (TP)



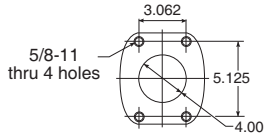


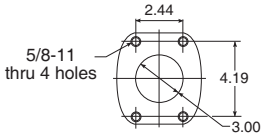
Model	M	N	Q NPT	R
URCS-1024	28.88			
URCS-1036	40.88	5.75	1.50	1.19
URCS-1048	52.88			
URCS-1224	29.17			
URCS-1236	41.17			
URCS-1248	53.17	6.16	2.00	1.44
URCS-1260	65.17			
URCS-1272	77.17			
URCS-1284	89.17			
URCS-1724	30.13			
URCS-1736	42.13			
URCS-1748	54.13	8.12	2.50	1.88
URCS-1760	66.13			
URCS-1772	78.13			
URCS-1784	90.13			
URCS-2036	43.91			
URCS-2048	55.91			
URCS-2060	67.91	10.78	3.00	2.50
URCS-2072	79.91			
URCS-2084	91.91			





FOUR PASS (FP)





Model	M	N	Q NPT	R	S
URCS-1024	29.21				
URCS-1036	41.21	6.08	1.00	.75	1.19
URCS-1048	53.21				
URCS-1224	29.58				
URCS-1236	41.58				
URCS-1248	53.58	6.57	1.50	1.06	1.44
URCS-1260	65.58				
URCS-1272	77.58				
URCS-1284	84.58				
URCS-1724	29.78				
URCS-1736	41.78				
URCS-1748	53.78	7.77	2.00	1.38	1.88
URCS-1760	65.78				
URCS-1772	77.78				
URCS-1784	89.78				
URCS-2036	44.00				
URCS-2048	56.00				
URCS-2060	68.00	10.78	2.50	1.75	2.50
URCS-2072	80.00				
URCS-2084	92.00				

COMMON DIMENSIONS

Model	A	B	C	D	E	F	G	H	J NPT	K NPT	K SAE	Weight	Model
URCS-1024		19.00		29.13								55.00	URCS-1024
URCS-1036	5.25	31.00	3.69	41.13	4.00	5.25	4.00	.44 x 1.00 thru slot	.375	1.50	#24 1.875-12 SAE O-Ring	70.00	URCS-1036
URCS-1048		43.00		53.13								85.00	URCS-1048
URCS-1224		18.25		29.59								83.00	URCS-1224
URCS-1236		30.25		41.59							#32	108.00	URCS-1236
URCS-1248	6.25	42.25	4.19	53.59	4.50	6.25	5.00	.44 x 1.00 thru slot	.375	2.00	2.50-12 SAE	132.00	URCS-1248
URCS-1260		54.25		65.59							O-Ring	158.00	URCS-1260
URCS-1272		66.25		77.59								182.00	URCS-1272
URCS-1284		78.25		89.59								206.00	URCS-1284
URCS-1724		17.00		29.50								138.00	URCS-1724
URCS-1736		29.00		41.50								180.00	URCS-1736
URCS-1748	8.00	41.00	5.06	53.50	5.75	8.25	7.00	.44 x 1.00 thru slot	.375	3.00	3.0" Four Bolt Flange	219.00	URCS-1748
URCS-1760		53.00		65.50								258.00	URCS-1760
URCS-1772		65.00		77.50								300.00	URCS-1772
URCS-1784		77.00		89.50								342.00	URCS-1784
URCS-2036		28.50		42.63								620.00	URCS-2036
URCS-2048		40.50		54.63								670.00	URCS-2048
URCS-2060	10.75	52.50	6.88	66.63	8.00	11.50	10.00	.781 x 1.25 thru slot	.50	4.00	4.0" Four Bolt Flange	730.00	URCS-2060
URCS-2072		64.50		78.63								820.00	URCS-2072
URCS-2084		76.50		90.63								870.00	URCS-2084

note: AIHTI reserves the right to make reasonable design changes without notice.

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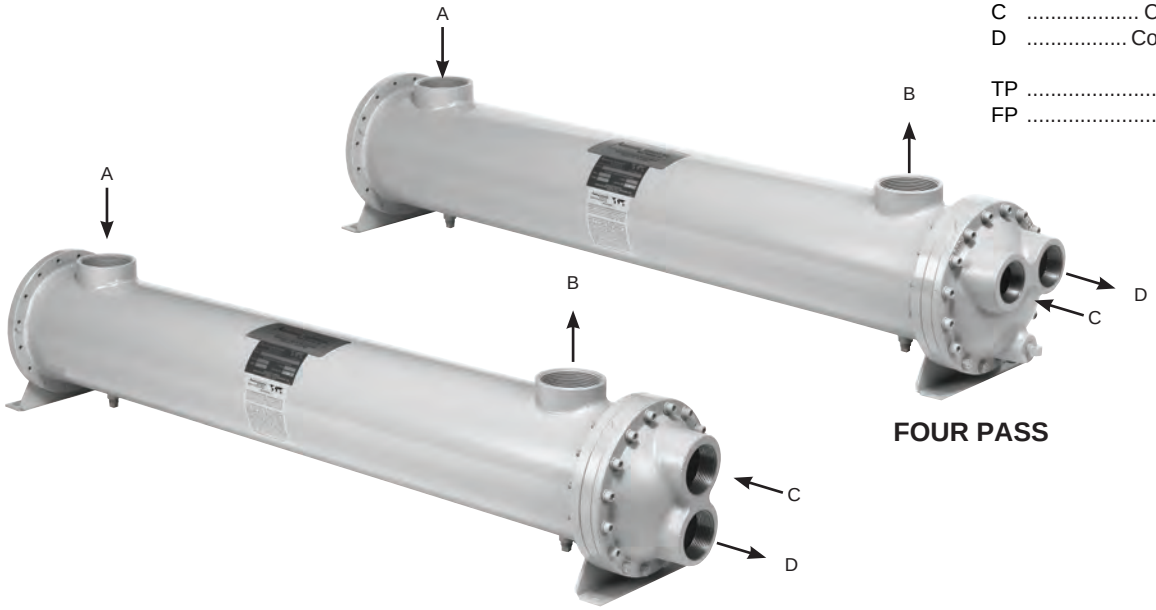
PIPING HOOK-UP

A ..... Hot fluid to be cooled
B ..... Cooled fluid
C ..... Cooling water in
D ..... Cooling water out

TP ..... Two Pass
FP .....Four Pass



FOUR PASS

Two Pass

Receiving / Installation

a) Inspect unit for any shipping damage before uncrating. Indicate all damages to the trucking firms' delivery person, and mark it on the receiving bill before accepting the freight. Make sure that there is no visible damage to the outside surface of the heat exchanger. The published weight information located in this brochure is approximate. True shipment weights are determined at the time of shipping and may vary. Approximate weight information published herein is for engineering approximation purposes and should not be used for exact shipping weight. Since the warranty is based upon the unit date code located on the model identification tags, removal or manipulation of the identification tags will void the manufacturers warranty.

b) When handling the shell & tube heat exchanger, special care should be taken to avoid dropping the unit since mishandling could cause the heat exchanger to crack and leak externally. Mishandling of the unit is not covered under the manufacturers warranty. All units are shipped with partial wood/corrugated cardboard containers for safe handling.

c) Storage: American Industrial heat exchangers are protected against the elements during shipment. If the heat exchanger cannot be installed and put into operation immediately upon receipt, certain precautions are required to prevent deterioration during storage. The responsibility for integrity of the heat exchanger(s) is assumed by the user. American Industrial will not be responsible for damage, corrosion, or other deterioration of the heat exchanger during transit or storage.

Proper storage practices are important when considering the high costs of repair or replacement, and the possible delays for items which require long lead times for manufacture. The following listed practices are provided solely as a convenience to the user, who shall make their own decision on whether to use all or any of them.

1) Heat exchangers not to be placed in immediate service, require precautionary measures to prevent corrosion or contamination.
2) Heat exchangers made of ferrous materials, may be pressure-tested using compressed air at the factory. Residual oil coating on the inside surfaces of the heat exchanger(s) as a result of flushing does not discount the possibility of internal corrosion. Upon receipt, fill the heat exchanger(s) with the appropriate grade of oil or apply a corrosion preventing inhibitor for storage.
3) Corrosion protection compounds for interior surfaces for long term storage or other applications are applied solely at the request of customers. Upon request, American Industrial can provide a customer approved corrosion preventative if available when included in the original purchase order specifications.
4) Remove all dirt, water, ice, or snow and wipe dry before moving heat exchanger(s) into storage. Heat exchangers are generally shipped empty, open drain plugs to remove any accumulated condensation moisture, then reseal. Accumulation of moisture usually indicates corrosion has already started and remedial action should be taken.
5) Store in a covered, environmentally stable area. The ideal storage environment for heat exchangers is in a dry, low-humidity atmosphere which is sealed to prevent the entry of blowing dust, rain, or snow. Maintain in atmospheric temperatures between 70ºF and 105ºF (Large temperature swings may cause condensation and moisture to form on steel components, threads, shell, etc...) Use thermometers and humidity indicators and maintain the atmosphere at 40% relative humidity, or lower.

d) Standard Enamel Coating: American Industrial provides its standard products with a normal base coat of oil base air cure enamel paint. The enamel paint is applied as a temporary protective and esthetic coating prior to shipment. While the standard enamel coating is durable, American Industrial does not warranty it as a long-term finish coating. It is strongly suggested that a more durable final coating be applied after installation or prior to long-term storage in a corrosive environment to cover any accidental scratches, enhance esthetics, and further prevent corrosion. It is the responsibility of the customer to provide regular maintenance against chips, scratches, etc... and regular touch up maintenance must be provided for long-term benefits and corrosion prevention.

e) Special Coatings: American Industrial offers as customer options, Air-Dry Epoxy, and Heresite (Air-Dry Phenolic) coatings at additional cost. American Industrial offers special coatings upon request, however American Industrial does not warranty coatings to be a permanent solution for any equipment against corrosion. It is the responsibility of the customer to provide regular maintenance against chips, scratches, etc... and regular touch up maintenance must be provided for long-term benefits and corrosion prevention.

f) American Industrial recommends that the equipment supplied should be installed by qualified personnel who have solid understanding of system design, pressure and temperature ratings, and piping assembly. Verify the service conditions of the system prior to applying any shell & tube heat exchanger. If the system pressure or temperature does not fall within the parameters on model

rating tag located on the heat exchanger, contact our factory prior to installation or operation.

g) Plan the installation to meet the requirements indicated on the piping installation diagram as illustrated. It is recommended to put the hot fluid to be cooled through the shell side and the cold fluid through the tube side. The indicated port assembly sequence in the installation diagram maximizes the performance, and minimizes the possibility of thermal shock. In instances where the fluids are required to be reversed, *hot fluid in the tubes and cold fluid in the shell* the heat exchanger will work with reduced performance. Installation may be vertical or horizontal or a combination thereof. However, the installation must allow for complete draining of the heat exchanger regardless of Two Pass or four pass construction. Complete drainage is important to prevent the heat exchanger from freezing, over-heating of a fluid, or mineral deposit buildup.
For removable bundle heat exchangers, provide sufficient clearance at the stationary tube-sheet end to allow for the removal of the tube bundle from the shell. Bonnet can be removed to aid in cleaning the tubes without disassembling the tube bundle. For more information please contact American Industrial.

h) It is recommended to use flexible hose wherever possible to reduce vibration and allow slight movement. However, hoses are not required. Hydraulic carrying lines should be sized to handle the appropriate flow and to meet system pressure drop requirements based upon the systems parameters, and not based upon the units supply and return connection size. We recommend that a low cracking pressure direct acting relief valve be installed at the heat exchanger inlet to protect it from pressure spikes by bypassing oil in the event the system experiences a high flow surge. If preventative filtration is used it should be located ahead of the cooler on both shell and tube side to catch any scale or sludge from the system before it enters the cooler. Failure to install filters ahead of the heat exchanger could lead to possible heat exchanger failure due to high pressure if the system filters plug.

i) Standard shell & tube coolers are built with a rolled tube-sheet construction. However, the differential operating temperature between the entering shell side fluid and the entering tube side fluid should not exceed 150°F. If this condition exists, a severe thermal shock could occur leading to product failure and mixing of the fluids. For applications with a differential temperatures of 150°F or more, we recommend using a series with a floating tube-sheet, u-tube, or expansion joint to reduce the potential for the effects of thermal shock.

j) Water requirements vary from location to location. If the source of cooling water is from other than a municipal water supply, it is recommended that a water strainer be installed ahead of the heat exchanger to prevent dirt and debris from entering and clogging the flow passages. If a water modulating valve is used it is recommended to be installed at the inlet to the cooler to regulate the water flow.

k) For steam service, or other related applications, please consult our engineering department for additional information.

Maintenance
a) Inspect the heat exchanger for loosened bolts, connections, rust spots, corrosion, and for internal or external fluid leakage. Any corroded surfaces should be cleaned and recoated with paint.

b) Shell side: In many cases with clean hydraulic system oils it will not be necessary to flush the interior of the shell side of the cooler. In circumstances where the quality of hydraulic fluid is in question, the shell side should be disconnected and flushed on a yearly basis with a clean flushing oil/solvent to remove any sludge that has been deposited. For severe cases where the unit is plugged and cannot be flushed clean with solvent, the heat exchanger should be replaced to maintain the proper cooling performance.

c) Tube side: In many cases it will be necessary to clean the tube side of the heat exchanger due to poor fluid quality, debris, calcium deposits, corrosion, mud, sludge, seaweed, etc.... To clean the tube side, flush with clean water or any good quality commercial cleaner that does not attack the particular material of construction. With straight tube heat exchangers you can use a rod to carefully push any debris out of the tubes.

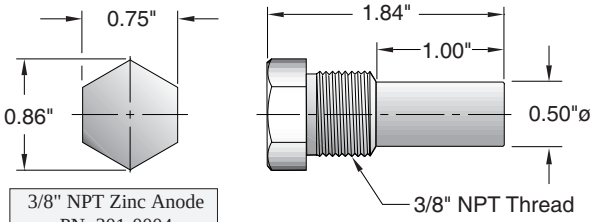
d) Zinc anodes are normally used to reduce the risk of failure due to electrolysis. Zinc anodes are a sacrificial component designed to wear and dissolve through normal use. Normally, zinc anodes are applied to the water supply side of the heat exchanger. Depending upon the amount of corrosive action, one, two, three, or more anodes can be applied to help further reduce the risk of failure. American Industrial Heat Transfer, Inc. offers zinc anodes as an option, to be specified and installed at the request our customers. It is the responsibility of the customer to periodically check and verify the condition of the zinc anode and replace it as needed.

Applications vary due to water chemical makeup and quality, material differences, temperature, flow rate, piping arrangements, and machine grounding. For those reasons, zinc anodes do not follow any scheduled factory predetermined maintenance plan moreover they must be checked routinely by the customer, and a maintenance plan developed based upon the actual wear rate.

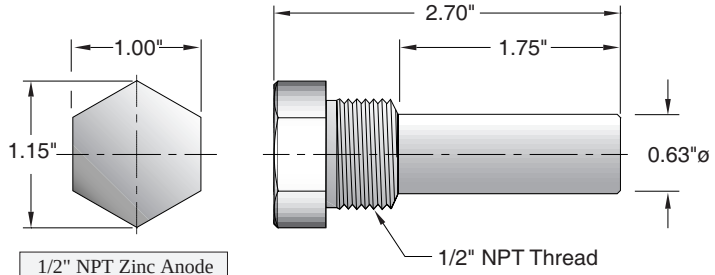
If substantial wear occurs or zinc dissolves without replacement, premature failure or permanent damage may occur to the heat exchanger. American Industrial does not warranty customer applications. It is the responsibility of the customer to verify and apply the proper system materials of construction and overall system requirements. Failures resulting from properly applied or misapplied use of zinc anode(s) into non-specified or specified applications will be the sole responsibility of the customer.

e) A routine maintenance schedule should be developed and adjusted to meet your systems requirements based upon water quality, etc….Failure to regularly maintain and clean your heat exchanger can result in a reduction in operational performance and life expectancy.

Note: *Since applications can vary substantially, the installation and maintenance information contained in this catalog should be used as a basic guideline. The safe installation, maintenance, and use of any American Industrial Heat Transfer, Inc. heat exchanger are solely the responsibility of the user.*



3/8" NPT Zinc Anode PN: 301-0004
AB-400 thru AB-1000 AA-400 thru AA-1000 CS-600 thru CS-1000



1/2" NPT Zinc Anode PN: 301-0003
AB-1200 thru AB-2000 AA-1200 thru AA-1600 CS-1200 thru CS-1700

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American Industrial Heat Transfer Inc.
Manufacturer of Quality Heat Exchangers

website : www.aihti.com
general email : sales@aihti.com
technical email : engineering@aihti.com

Shell & Tube Application Request: *(For steam to liquid heat exchangers)*

For UCN, URCN, & UCF, URCF Series

Email form to: sales@aihti.com or engineering@aihti.com or fax to 434-757-1810

Contact Name _____ Telephone _____ Date _____

Company Name _____ Email _____

Address: _____ Fax _____

_____

Heated Fluid

Fluid Type _____

If available:

Density _____ lb/ft3
Viscosity _____ cP
Conductivity _____ Btu/hr.ft.°F
Specific Heat _____ Btu/lb.°F

1. Flow Rate _____
2. Temperature In _____
3. Temperature Out: _____
4. Maximum Allowable Pressure Drop: _____

Hot Side

Fluid Steam

1. Steam Pressure _____
2. Temperature In _____
3. Flow Rate of steam _____
4. Heat Load _____

To properly size the heat exchanger we need 3 of the 4 perameter on the Hot Side and 2 on the Cold Side.

Shell Material Construction:

Brass ☐ Steel ☐ Stainless Steel ☐

Tube Material Construction:

Copper ☐ 90/10 Copper Nickel ☐ Stainless Steel ☐

ASME Code and Certified Yes ☐ No ☐

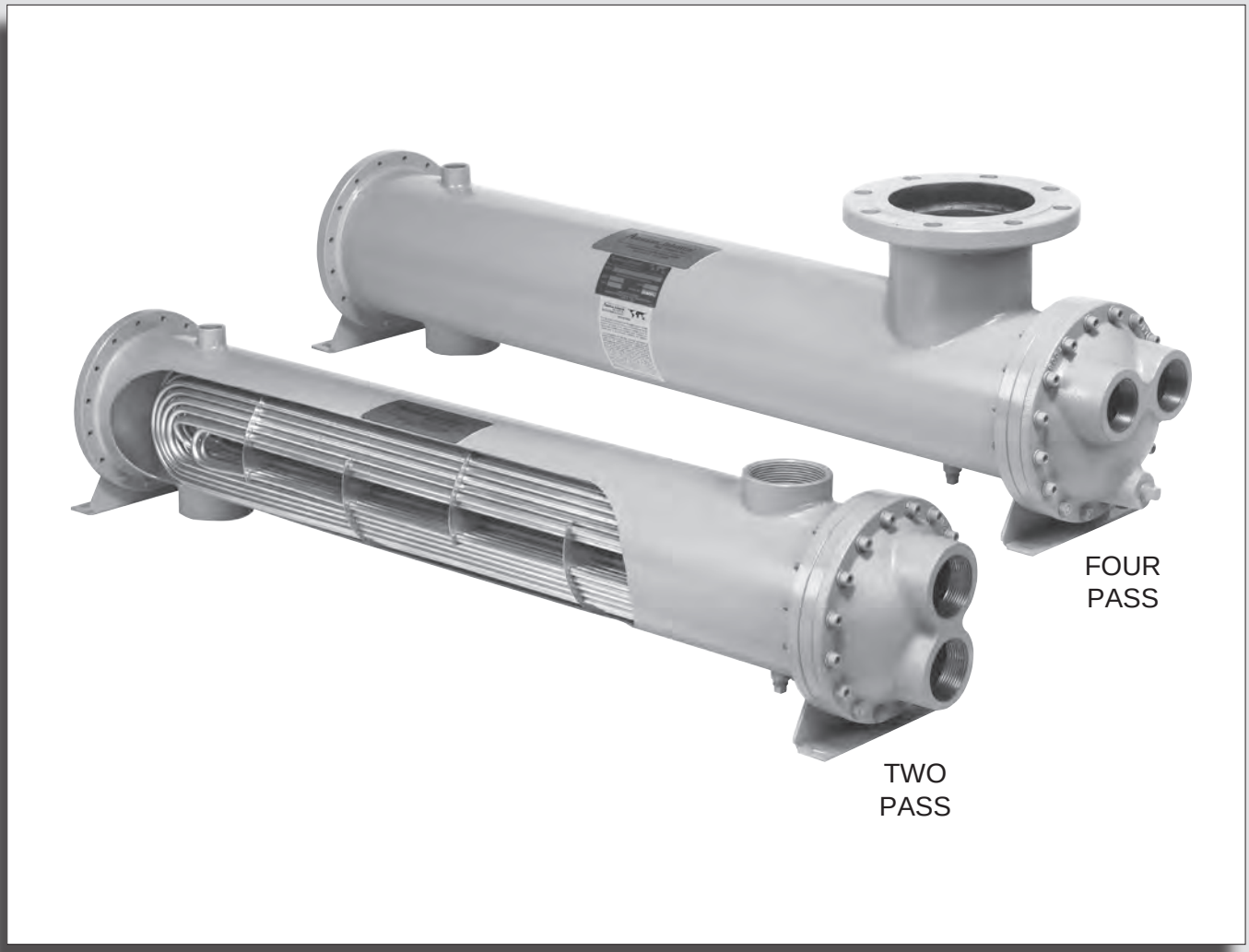
Require All Stainless Steel Heat Exchanger Yes ☐ No ☐

Comment: _____

_____

_____

UCN, URCN & UCF, URCF SERIES



U-TUBE FIXED & REMOVEABLE BUNDLE

HEAT EXCHANGERS

For steam to liquid service

- Operating pressure for tubes 100 PSI.
- Operating pressure for shell 100 PSI.
- Operating temperature 400 °F.
- Can be customized to fit any application.
- Computer generated data sheet available for any application
- As an option, available in ASME Code and Certified

UCN, URCN, UCF & URCF Series *overview*

UCN, URCN SERIES

U-tube heat exchangers with fixed or removeable tube bundle for steam service. Normally applied when the differential temperature between the hot fluid entering and the cooling fluid entering is 150°F or greater. U-tube design allows tubing to freely expand and contract independently of the shell. Welded outer shell construction made of carbon steel with NPT connection ports. Sizes from 5" to 10" diameters. Standard two and four pass units available. Optional 90/10 copper nickel, stainless steel, and carbon steel tube. Can be modified to meet your requirements.

UCF & URCF SERIES

U-tube heat exchangers with fixed or removeable tube bundle for steam service. Normally applied when the differential temperature between the hot fluid entering and the cooling fluid entering is 150°F or greater. U-tube design allows tubing to freely expand and contract independently of the shell. Welded outer shell construction made of carbon steel with ANSI flange ports. Sizes from 5" to 10" diameters. Standard two and four pass units available. Optional 90/10 copper nickel, stainless steel, and carbon steel tube. Can be modified to meet your requirements.

STANDARD URCS STOCK UNIT FOR STEAM APPLICATION

U-tube heat exchangers with removeable tube bundle for fluids with high differential inlet temperatures or where tube bundle requires removal. Normally applied when the differential temperature between the hot fluid entering and the cooling fluid entering is 150°F or greater. U-tube design allows tubing to freely expand and contract independently of the shell. Welded outer shell construction made of carbon steel with NPT or ANSI flange ports and viton o-ring seals. Sizes from 4" to 8" diameters. Standard Two Pass units available. Can be modified to meet your requirements. See page 140 for detailed dimension.

ACW / AOCHW SERIES

Can be used as a Space heater by using steam or hot water

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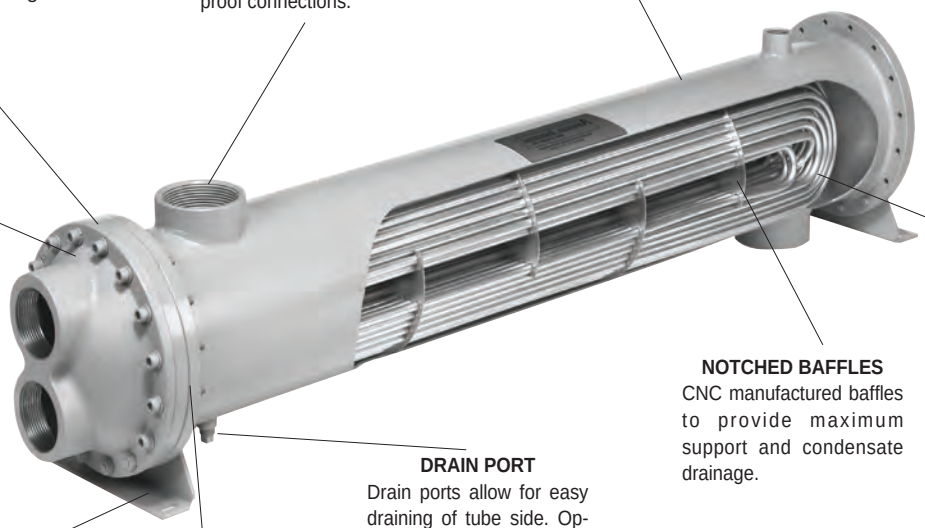

TUBE SHEET
Precision-machined tube-sheet provides for long lasting high strength service.

THREAD
CNC precision threading to provide accurate leak-proof connections.

FINISH
Gray semigloss enamel. Can be used as a base for additional coats.

CAST BONNET
Provides fluid into tubes with minimum restriction. Two or four pass inter-changeability.

BUNDLE ASSEMBLY
CNC precision manufactured parts to guarantee a close fit between the baffles, tubes, and shell. Clearances are minimized to provide for maximum heat transfer.

NOTCHED BAFFLES
CNC manufactured baffles to provide maximum support and condensate drainage.

DRAIN PORT
Drain ports allow for easy draining of tube side. Optional zinc anode can be inserted in place of plug.

GASKET
High Temperature composite gasket.

MOUNTING BRACKET
Heavy gauge steel mounting brackets are adjustable in orientations to 360 degrees.

UNIT CODING

Example Model

Options

UCN - 1748 - 6 - TP - CNT - B - Z - BT

Model
UCN
URCN
UCF
URCF

Shell Diameter
1000 = 5.25"
1200 = 6.25"
1700 = 8.00"
2000 = 10.75"

Effective Tube Length
(12" increments)

Cooling Tube Diamenter
4 = 1/4"
6 = 3/8"
10 = 5/8"

Tube Side Passes
TP = 2 pass
FP = 4 pass

Tubing
Blank = Copper
Options
CNT= 90/10 Cu Ni
STS = Stainless Steel

End Bonnets
Blank = Cast Iron
Options
B = Bronze
SB = Stainless Steel

Zinc Anode
Z = 1 Zinc Anode
2Z = 2 Zinc Anode etc.

Tube Sheets
Blank = Steel
BT = Brass
ST = Stainless Steel

STANDARD CONSTRUCTION MATERIALS & RATINGS

Standard Model	UCN / URCN & UCF / URCF	Options	Standard Unit Ratings
Shell	Steel	Stainless Steel	Operating Pressure Tubes 100 psig Operating Pressure Shell 100 psig Operating Temperature 400 °F
Tubes	Copper	90/10 Cu. Ni. / Stainless Steel	
Baffles	Aluminum / Brass	Stainless Steel	
Tube Sheet	Steel	Brass / Stainless Steel	
End Bonnets	Cast Iron	Stainless Steel	
Mounting Brackets	Steel	Stainless Steel	
Gasket	High Temperature Gasket	Viton	

Example [A] Calculate surface area required.

Heat 50gpm fresh water from 70°F to 170°F, using saturated steam at 50psig.

T_s = Steam temperature °F
t_{in} = Cold Side entering fluid °F
t_{out} = Cold Side exiting fluid °F

Step 1. Calculate the heat load Btu/hr [Q].

Q = GPM x CN x △T
Q = 50gpm x 500 x (170°F-70°F) = 2,500,000 Btu/hr

Step 2 Acquire steam temperature and enthalpy from graphs *T&L*

50psig = 297°F steam. From graph **T** (pg. 110).
50psig = 912 Btu/lb. From graph **L** (pg. 111).

Step 3. Calculate the mean temperature difference (MTD)

$$\frac{T_s - t_{in}}{T_s - t_{out}} = \frac{297^oF - 70^oF}{297^oF - 170^oF} = \frac{227^oF \text{ (Larger) L}}{127^oF \text{ (Smaller) S}}$$

$$\frac{S}{L} = \frac{127^oF}{227^oF} = .559 \quad \text{Go to Table A } .559 = .758$$

Find the LMTD = [.758 x (L) 227] = 172.0

Step 4. Calculate the surface area required.

$$A_s = \frac{Q \text{ (Btu/hr)}}{LMTD \times U} = \frac{2{,}500{,}000}{172 \times 300} = 48.4 \text{ sq. ft.}$$

Step 5. Calculate the Capacity Factor [F_c] for steam.

$$F_c = \frac{Q}{Btu/lb} = \frac{2{,}500{,}000 \text{ Btu/hr}}{912 \text{ Btu/lb}} = 2{,}741.3 \text{ lbs/hr steam}$$

Step 6. Select a the proper diameter heat exchanger using graphs F or G and F_c from step 5.

Capacity = 2741.3 @ 50psig = 1700 series 3/8 or 5/8 tubes from chart (G).

Use table **D** to determine the final heat exchanger size.
48.4 sq.ft. = **URCF-1748-6-TP**

Application [B] Calculate using the graphs.

Heat 70gpm fresh water from 50°F to 180°F using 65psig saturated steam.

Step 1. Calculate the heat load Btu/hr [Q].

Q = GPM x CN x △T
Q = 70 x 500 x (180°F - 50°F) = 4,550,000 Btu/hr

Step 2. Derive the steam temperature [T_s] from the graph **T**. *Derive the capacity factor [F_c] from graph* **L**.

65psig = 312°F steam. From graph **T**
65psig = 901 Btu/lb. From graph **L**

Step 3. Calculate the F_s required.

$$F_s = \frac{Btu/hr \text{ [Q]}}{T_s - t_{out}} = \frac{4{,}550{,}000}{312^oF - 180^oF} = 34{,}470$$

Step 4. Calculate the Capacity Factor F_c for steam.

$$F_c = \frac{Q}{Btu/lb} = \text{lbs/hr} \quad \frac{2{,}500{,}000 \text{ Btu/hr}}{912 \text{ Btu/lb}} = 5{,}050 \text{ lbs/hr steam required}$$

Step 5. Select the proper diameter heat exchanger using the capacity graphs F or G and F_c from step 4.

Capacity = 5050 = 2000 series with 5/8" Tubes.

Step 6. Select the proper size heat exchanger from the performance curves corresponding to the series selected using the capacity factor. Select the heat exchanger closest to the line landing on or above the calculated point.

F_s = 34,470 Btu/hr f = URCF 2084-6-TP

Application [C] Calculate batch heating of a tank.

Heat a 1000 gallon stainless steel tank of water from 50°F to 150°F in 1.5 hours using 40psig saturated steam, circulating at 30gpm. Tank size 6ft w x 6ft h x 6ft d. Ambient air temperature 60°F worse case.

Step 1. Calculate the total heat load [Q] Btu/hr.

Q = Total Gallons x lbs/gallon x Specific heat Btu/lb x △T
Q = 1000 x 8.34 x 1.0 x 100°F = 834,000 Btu

$$\text{Corrected Q for time} = \frac{834{,}000 \times 60 \text{ min}}{(1.5\text{hours}) \times 60 \text{ min}} = 556{,}00 \text{ Btu/hr}$$

Step 2. Calculate the $\triangle T_{average}$ (T_a) for the heated water.

$$\triangle T_a = \frac{T_f - T_i}{2} + T_i \quad T_a = \frac{150^oF - 50^oF}{1.5 \text{ hours}} + 50^oF = 116.7^oF$$

Q_{Loss} = Surface area tank sq.ft x .001 x $\triangle t_a$ x 2545
Q_{Loss} = 6x6x6 x .001 x (116.7°F_a - 60°F) x 2545 = 31,169 Btu/hr

$Q_t = Q + Q_{Loss} = Q_t$ 556,000 + 31,169 = 587,169 Btu/hr

Step 3. Derive the steam temperature [T_s] from graph T. Derive the capacity factor from graph L.

Given 40psig saturated steam = 287°F steam acquired from graph T.
Given 40psig saturated steam = 920 Btu/lb acquired from graph L.

Step 4. Calculate the mean temperature difference (MTD)

$$\frac{T_s - T_a}{T_s - T_e} = \frac{287^oF - 100^oF}{287^oF - 150^oF} = \frac{187^oF}{137^oF}$$

$$\frac{S}{L} = \frac{137^oF}{187^oF} = .732 \text{ Goto Table A. } .732 = .659$$

Calculate the Log mean temperature difference LMTD

LMTD = [.659 x (L) 187°F] = 123.2

Step 5. Calculate the required surface area.

$$A_s = \frac{Q}{LMTD \times U} = \frac{587{,}169 \text{ Btu/hr}}{123.2 \times 300} = 15.9 \text{ sq. ft.}$$

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Step 6. Select the proper diameter heat exchanger by calculating the capacity factor.

$$F_c = \frac{Q}{Btu/lb} = lbs/hr \quad \frac{587{,}169\ Btu/hr}{920\ Btu/lb} = 639\ lbs/hr$$

From graph F or G select the proper diameter heat exchanger. Capacity 639 lbs/hr saturated steam required @ 40psig.

Capacity = 639 lbs/hr = 1000 series 3/8" tubes

Step 7. Select the proper size heat exchanger from the surface area chart in table D.

Minimum surface area required = 15.9 sq.ft. = URCN1036-6-TP

Step 8. Select same using the performance chart.

$$F_s = \frac{Btu/hr}{T_s - T_{exit}} = \frac{587{,}169}{287 - 150} = 4{,}286\ F_s$$

From the chart 1000, 3/8" tubes on page ( ) select unit landing closest on or above intersection point of 30gpm & 4,286 Btu/hr ^{O}F

Selection = URCN1036-6-TP

TABLE A- FACTOR M/LMTD = L x M

S/L	M	S/L	M	S/L	M	S/L	M
		.25	.541	.50	.721	.75	.870
.01	.215	.26	.549	.51	.728	.76	.874
.02	.251	.27	.558	.52	.734	.77	.879
.03	.277	.28	.566	.53	.740	.78	.886
.04	.298	.29	.574	.54	.746	.79	.890
.05	.317	.30	.582	.55	.753	.80	.896
.06	.334	.31	.589	.56	.759	.81	.902
.07	.350	.32	.597	.57	.765	.82	.907
.08	.364	.33	.604	.58	.771	.83	.913
.09	.378	.34	.612	.59	.777	.84	.918
.10	.391	.35	.619	.60	.783	.85	.923
.11	.403	.36	.626	.61	.789	.86	.928
.12	.415	.37	.634	.62	.795	.87	.934
.13	.427	.38	.641	.63	.801	.88	.939
.14	.438	.39	.648	.64	.806	.89	.944
.15	.448	.40	.655	.65	.813	.90	.949
.16	.458	.41	.662	.66	.818	.91	.955
.17	.469	.42	.669	.67	.823	.92	.959
.18	.478	.43	.675	.68	.829	.93	.964
.19	.488	.44	.682	.69	.836	.94	.970
.20	.497	.45	.689	.70	.840	.95	.975
.21	.506	.46	.695	.71	.848	.96	.979
.22	.515	.47	.702	.72	.852	.97	.986
.23	.524	.48	.709	.73	.858	.98	.991
.24	.533	.49	.715	.74	.864	.99	.995

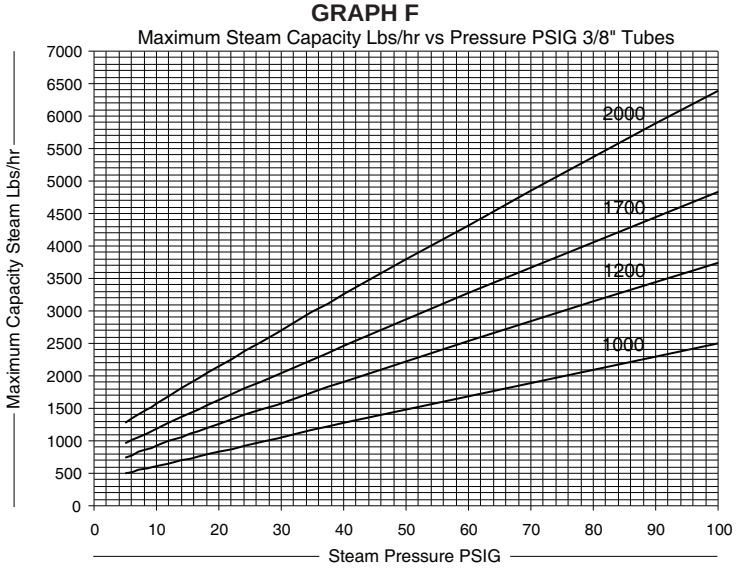
TABLE D- Surface Area

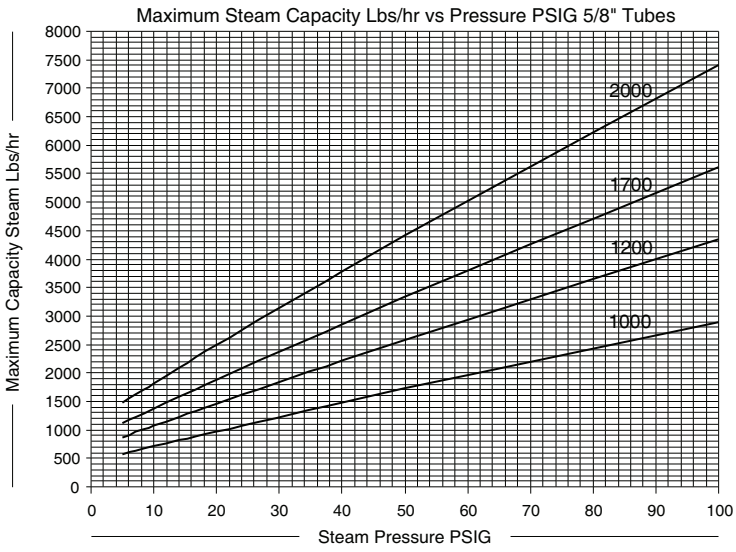
Model Number	Surface Area in Sq.ft.		Model Number	Surface Area in Sq.ft.	
	3/8" O.D Tubing Code 6	5/8" O.D Tubing Code 10		3/8" O.D Tubing Code 6	5/8" O.D Tubing Code 10
1024	11.0	6.5	1724	32.2	17.0
1036	16.5	9.8	1736	48.3	25.5
1048	22.0	13.0	1748	64.4	34.0
			1760	80.5	42.5
1224	17.3	9.1	1772	96.6	51.0
1236	25.9	13.7	1784	112.7	59.5
1248	34.5	18.3			
1260	43.2	22.9	2036	80.1	41.2
1272	51.8	27.5	2048	106.8	55.0
1284	60.5	32.0	2060	133.5	68.7
			2072	160.2	82.5
			2084	186.9	96.2

TABLE E- Flow Rate for Shell & Tube

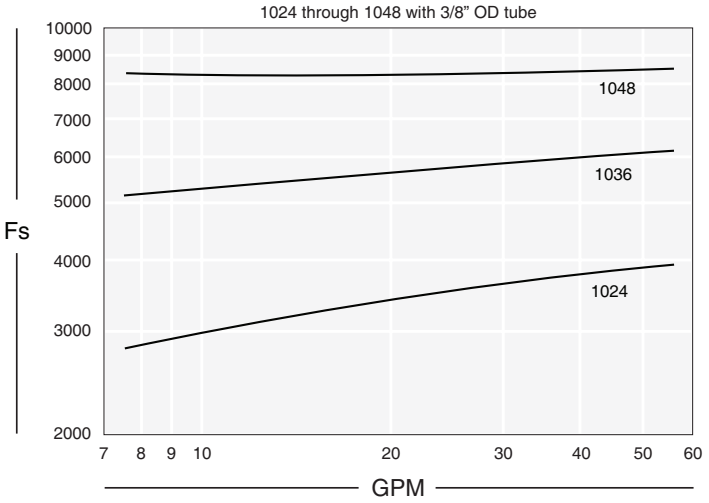
Shell dia. Code	Liquid Flow - Tube Side							
	3/8" TP		5/8" TP		3/8" FP		5/8" FP	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
1000	5	60	5	60	5	37	5	33
1200	5	100	5	100	7.5	56	7.5	50
1700	10	180	10	160	14	90	14	80
2000	15	340	15	300	25	160	25	145

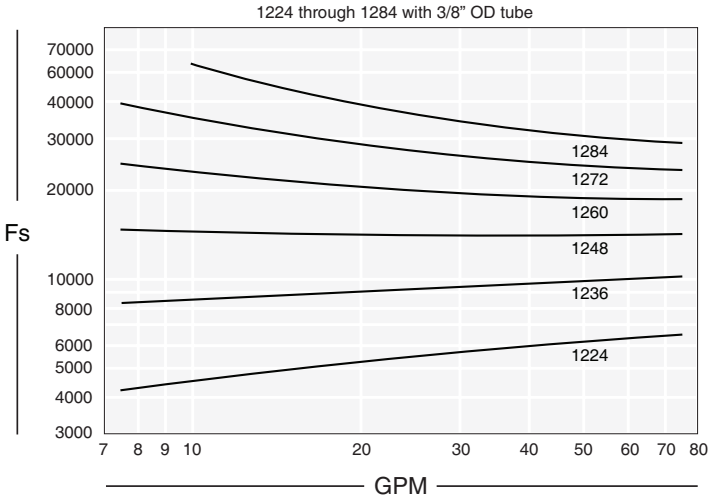
GRAPH F

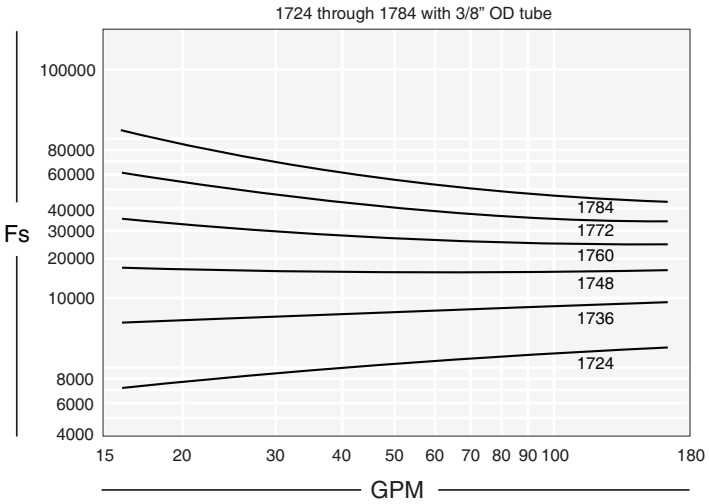


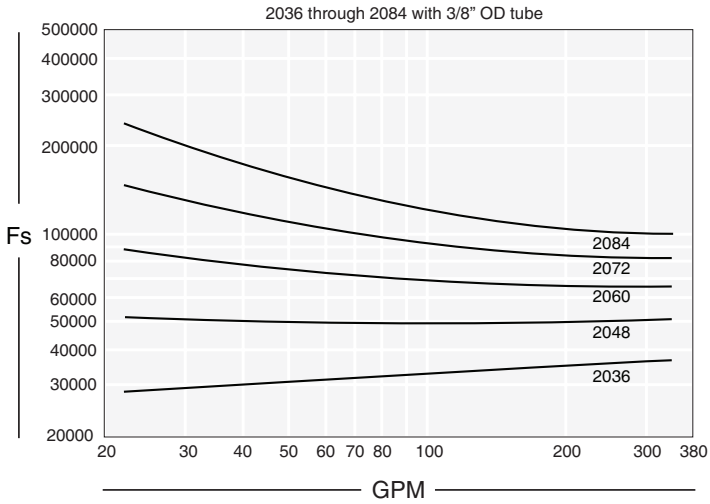


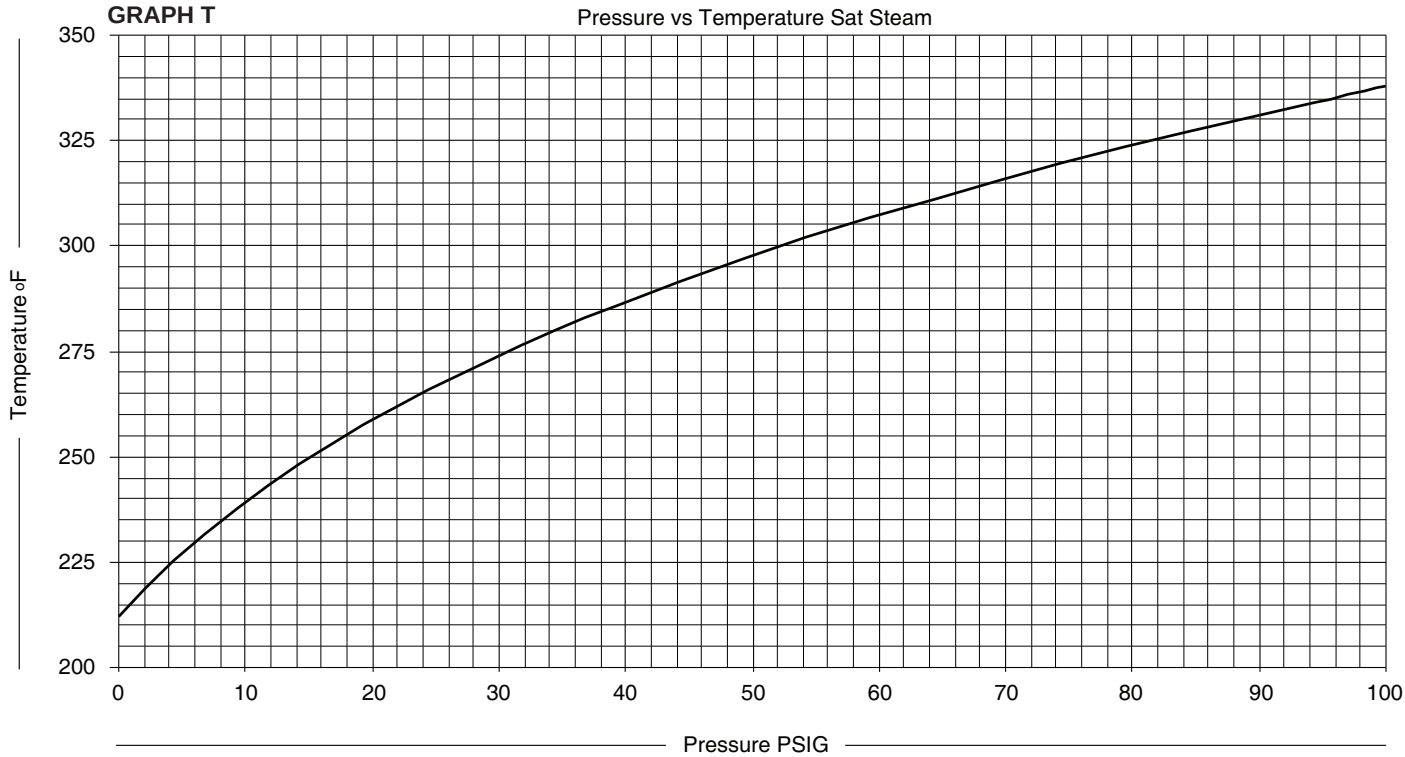
UCN, URCN, UCF & URCF Series *selection*











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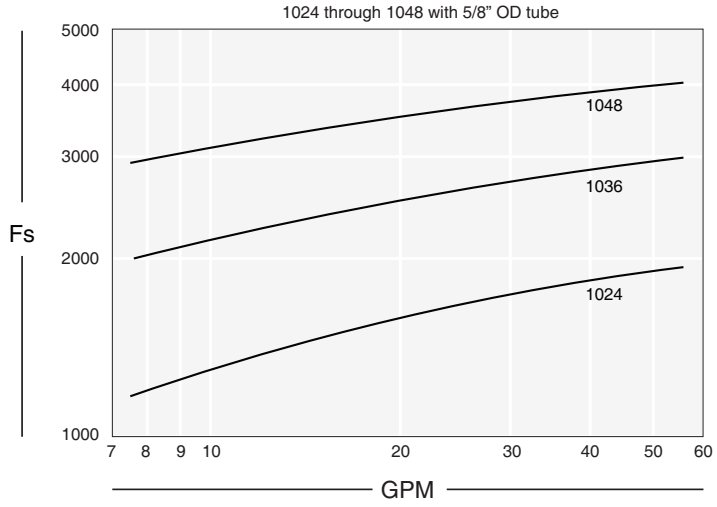
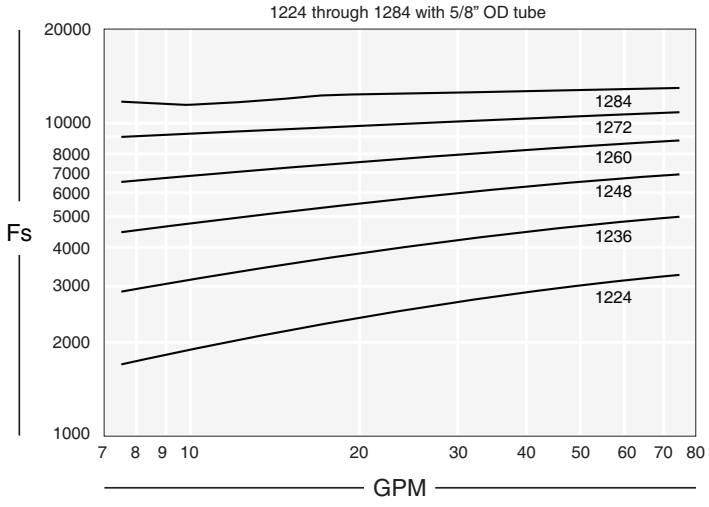
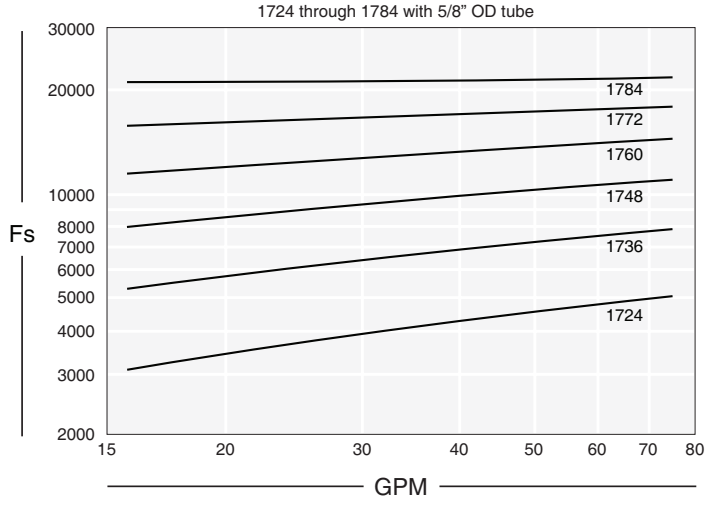
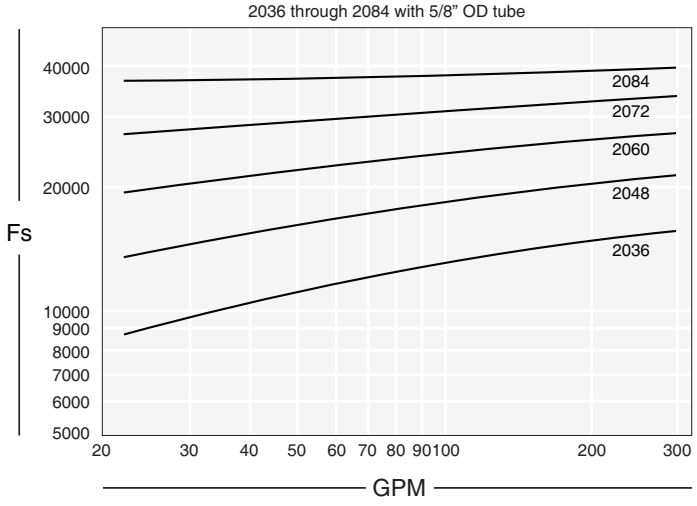
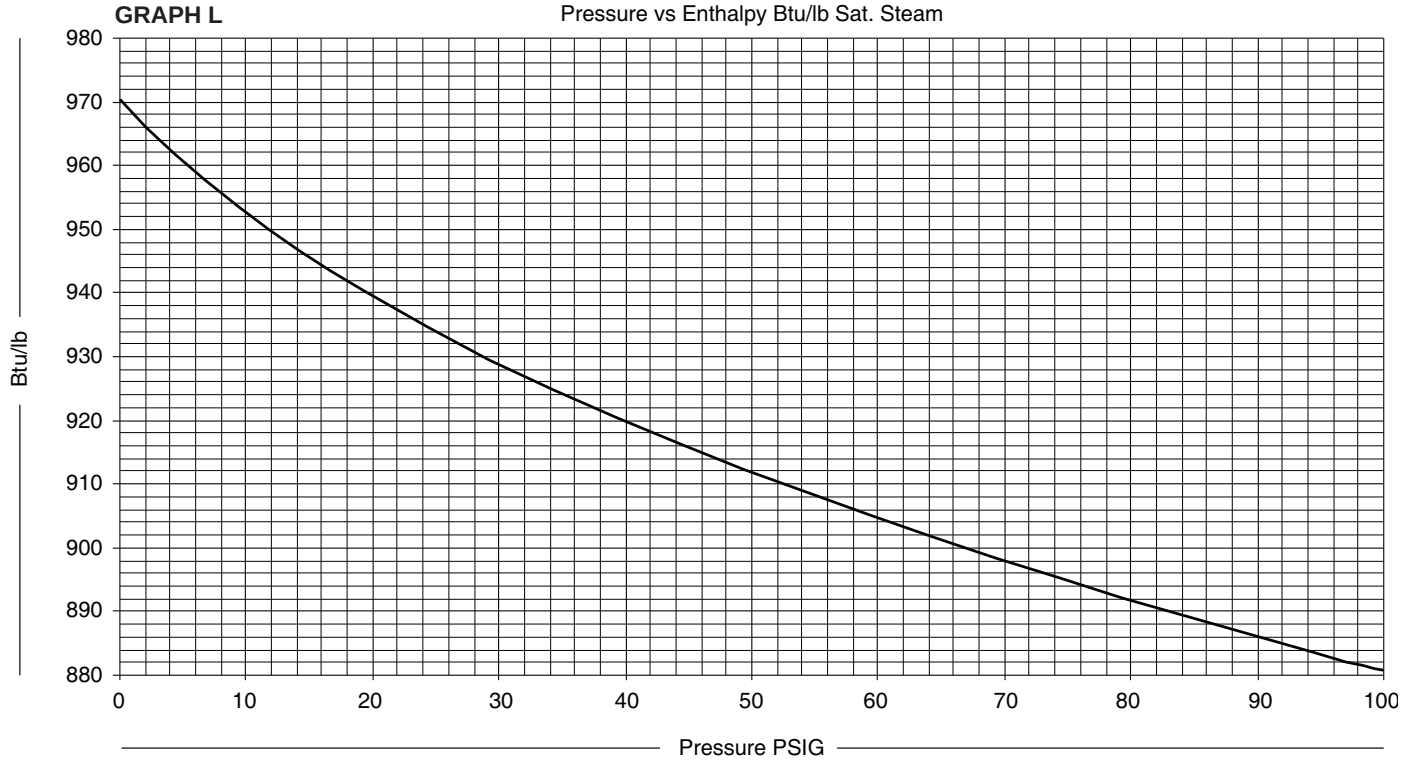


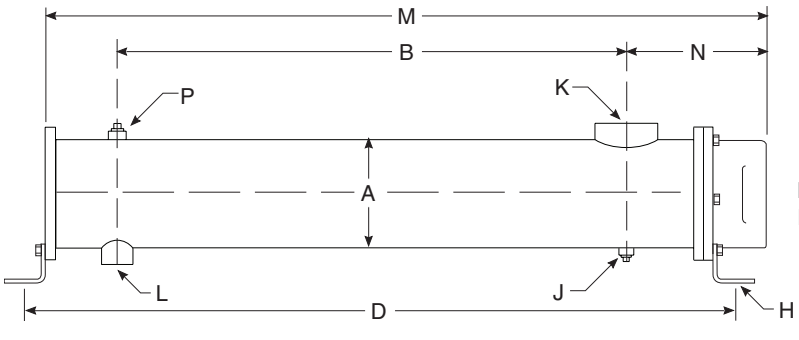


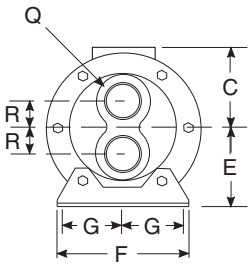






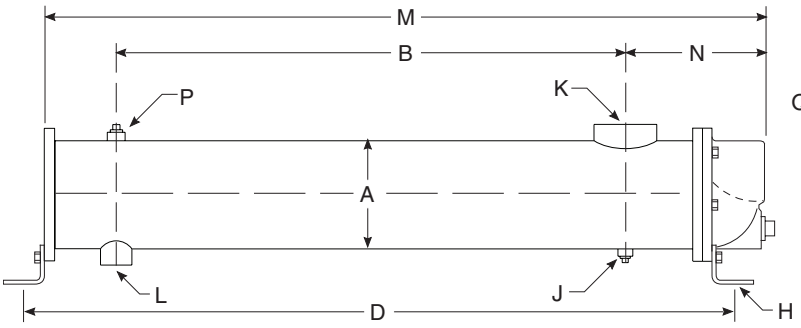
UCN Series

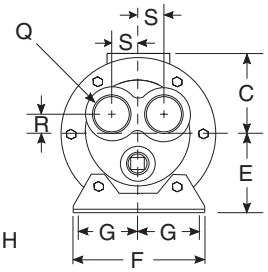




Two Pass (TP)

Model	M	N	Q NPT	R
UCN-1024	28.88	6.00	1.50	1.19
UCN-1036	40.88			
UCN-1048	52.88			
UCN-1224	29.17	6.67	2.00	1.44
UCN-1236	41.17			
UCN-1248	53.17			
UCN-1260	65.17			
UCN-1272	77.17			
UCN-1284	89.17			
UCN-1724	30.13	7.88	2.50	1.88
UCN-1736	42.13			
UCN-1748	54.13			
UCN-1760	66.13			
UCN-1772	78.13			
UCN-1784	90.13			
UCN-2036	43.91	10.16	3.00	2.50
UCN-2048	55.91			
UCN-2060	67.91			
UCN-2072	79.91			
UCN-2084	91.91			





FOUR PASS (FP)

Model	M	N	Q NPT	R	S
UCN-1024	29.21	6.34	1.00	.75	1.19
UCN-1036	41.21				
UCN-1048	53.21				
UCN-1224	29.58	7.08	1.50	1.06	1.44
UCN-1236	41.58				
UCN-1248	53.58				
UCN-1260	65.58				
UCN-1272	77.58				
UCN-1284	84.58				
UCN-1724	29.78	7.53	2.00	1.38	1.88
UCN-1736	41.78				
UCN-1748	53.78				
UCN-1760	65.78				
UCN-1772	77.78				
UCN-1784	89.78				
UCN-2036	44.00	10.26	2.50	1.75	2.50
UCN-2048	56.00				
UCN-2060	68.00				
UCN-2072	80.00				
UCN-2084	92.00				

COMMON DIMENSIONS

Model	A	B	C	D	E	F	G	H	J NPT	K NPT	L NPT	P NPT	Weight	Model
UCN-1024	5.25	20.00	3.69	29.13	4.00	5.25	2.00	.44 x 1.00 thru slot	.375	2.00	1.50	.75	55.00	UCN-1024
UCN-1036		32.00		41.13									70.00	UCN-1036
UCN-1048		44.00		53.13									85.00	UCN-1048
UCN-1224	6.25	19.00	4.19	29.59	4.50	6.25	2.50	.44 x 1.00 thru slot	.375	2.50	2.00	.75	83.00	UCN-1224
UCN-1236		31.00		41.59									108.00	UCN-1236
UCN-1248		43.00		53.59									132.00	UCN-1248
UCN-1260		55.00		65.59									158.00	UCN-1260
UCN-1272		67.00		77.59									182.00	UCN-1272
UCN-1284		79.00		89.59									206.00	UCN-1284
UCN-1724	8.00	19.00	5.06	29.50	5.75	8.25	3.50	.44 x 1.00 thru slot	.375	3.00	2.00	1.00	138.00	UCN-1724
UCN-1736		31.00		41.50									180.00	UCN-1736
UCN-1748		43.00		53.50									219.00	UCN-1748
UCN-1760		55.00		65.50									258.00	UCN-1760
UCN-1772		67.00		77.50									300.00	UCN-1772
UCN-1784		79.00		89.50									342.00	UCN-1784
UCN-2036	10.75	30.00	6.88	42.63	8.00	11.50	5.00	.781 x 1.25 thru slot	.50	4.00	3.00	1.25	620.00	UCN-2036
UCN-2048		42.00		54.63									670.00	UCN-2048
UCN-2060		54.00		66.63									730.00	UCN-2060
UCN-2072		66.00		78.63									820.00	UCN-2072
UCN-2084		78.00		90.63									870.00	UCN-2084

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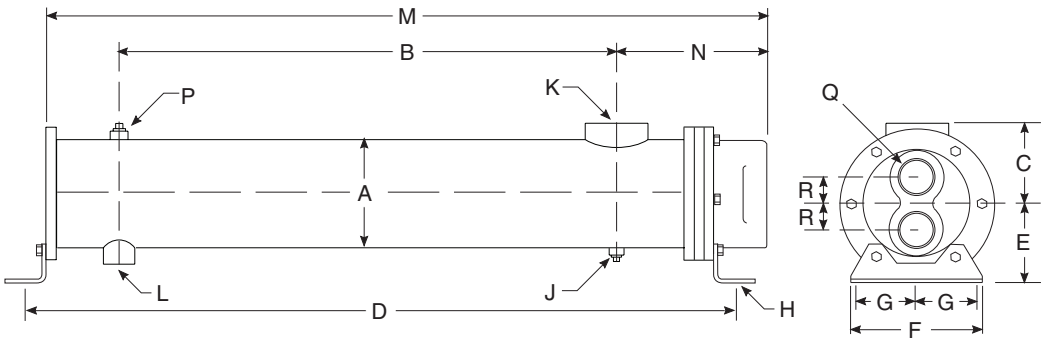
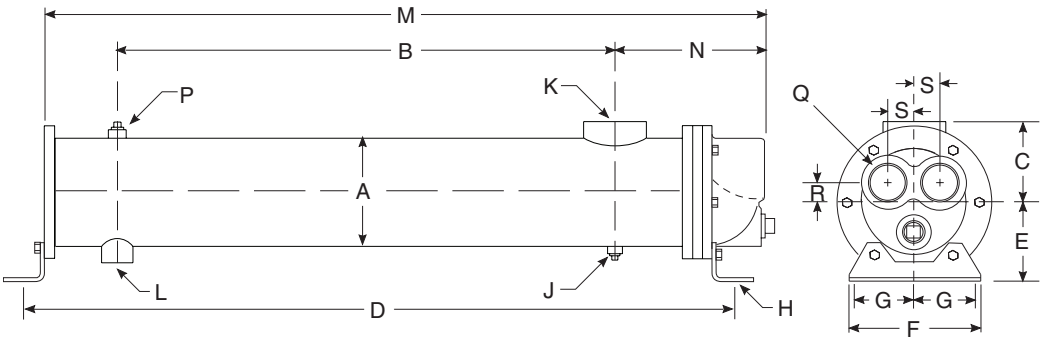


Model	M	N	Q NPT	R
URCN-1024	28.88	6.00	1.50	1.19
URCN-1036	40.88			
URCN-1048	52.88			
URCN-1224	29.17	6.67	2.00	1.44
URCN-1236	41.17			
URCN-1248	53.17			
URCN-1260	65.17			
URCN-1272	77.17			
URCN-1284	89.17			
URCN-1724	30.13	7.88	2.50	1.88
URCN-1736	42.13			
URCN-1748	54.13			
URCN-1760	66.13			
URCN-1772	78.13			
URCN-1784	90.13			
URCN-2036	43.91	10.16	3.00	2.50
URCN-2048	55.91			
URCN-2060	67.91			
URCN-2072	79.91			
URCN-2084	91.91			

Two Pass (TP)



Model	M	N	Q NPT	R	S
URCN-1024	29.21	6.34	1.00	.75	1.19
URCN-1036	41.21				
URCN-1048	53.21				
URCN-1224	29.58	7.08	1.50	1.06	1.44
URCN-1236	41.58				
URCN-1248	53.58				
URCN-1260	65.58				
URCN-1272	77.58				
URCN-1284	84.58				
URCN-1724	29.78	7.53	2.00	1.38	1.88
URCN-1736	41.78				
URCN-1748	53.78				
URCN-1760	65.78				
URCN-1772	77.78				
URCN-1784	89.78				
URCN-2036	44.00	10.26	2.50	1.75	2.50
URCN-2048	56.00				
URCN-2060	68.00				
URCN-2072	80.00				
URCN-2084	92.00				

FOUR PASS (FP)

COMMON DIMENSIONS

Model	A	B	C	D	E	F	G	H	J NPT	K NPT	L NPT	P NPT	Weight	Model
URCN-1024	5.25	20.00	3.69	29.13	4.00	5.25	2.00	.44 x 1.00 thru slot	.375	2.00	1.50	.75	55.00	URCN-1024
URCN-1036		32.00		41.13									70.00	URCN-1036
URCN-1048		44.00		53.13									85.00	URCN-1048
URCN-1224	6.25	19.00	4.19	29.59	4.50	6.25	2.50	.44 x 1.00 thru slot	.375	2.50	2.00	.75	83.00	URCN-1224
URCN-1236		31.00		41.59									108.00	URCN-1236
URCN-1248		43.00		53.59									132.00	URCN-1248
URCN-1260		55.00		65.59									158.00	URCN-1260
URCN-1272		67.00		77.59									182.00	URCN-1272
URCN-1284		79.00		89.59									206.00	URCN-1284
URCN-1724	8.00	19.00	5.06	29.50	5.75	8.25	3.50	.44 x 1.00 thru slot	.375	3.00	2.00	1.00	138.00	URCN-1724
URCN-1736		31.00		41.50									180.00	URCN-1736
URCN-1748		43.00		53.50									219.00	URCN-1748
URCN-1760		55.00		65.50									258.00	URCN-1760
URCN-1772		67.00		77.50									300.00	URCN-1772
URCN-1784		79.00		89.50									342.00	URCN-1784
URCN-2036	10.75	30.00	6.88	42.63	8.00	11.50	5.00	.781 x 1.25 thru slot	.50	4.00	3.00	1.25	620.00	URCN-2036
URCN-2048		42.00		54.63									670.00	URCN-2048
URCN-2060		54.00		66.63									730.00	URCN-2060
URCN-2072		66.00		78.63									820.00	URCN-2072
URCN-2084		78.00		90.63									870.00	URCN-2084

note: AIHTI reserves the right to make reasonable design changes without notice.

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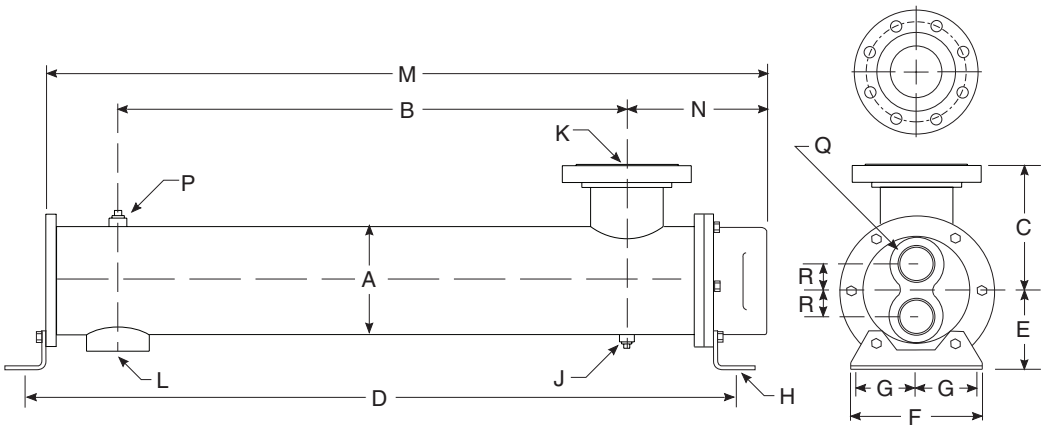
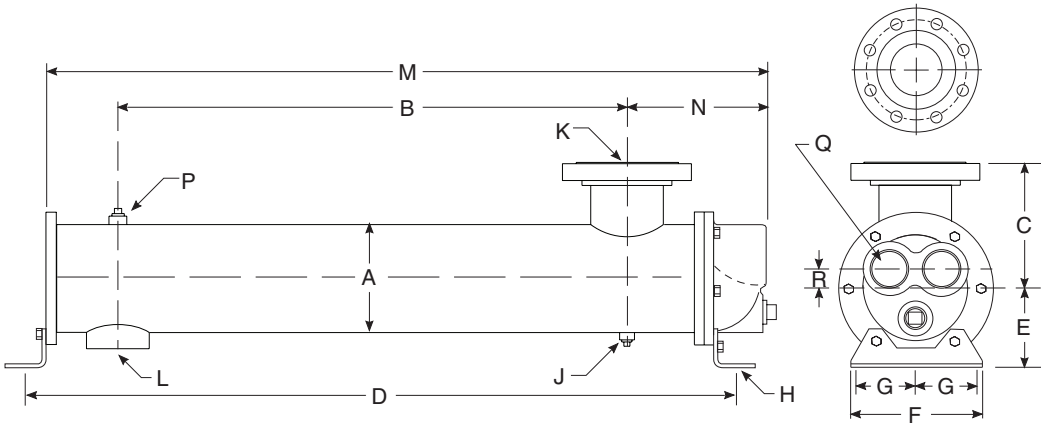
UCF Series *dimensions*

FIXED TUBE BUNDLE *(U-TUBE DESIGN)*



Two Pass (TP)

Model	M	N	Q NPT	R
UCF-1024	28.88	6.43	1.50	1.19
UCF-1036	40.88			
UCF-1048	52.88			
UCF-1224	29.17	7.23	2.00	1.44
UCF-1236	41.17			
UCF-1248	53.17			
UCF-1260	65.17			
UCF-1272	77.17			
UCF-1284	89.17			
UCF-1724	30.13	8.64	2.50	1.88
UCF-1736	42.13			
UCF-1748	54.13			
UCF-1760	66.13			
UCF-1772	78.13			
UCF-1784	90.13			
UCF-2036	43.91	11.07	3.00	2.50
UCF-2048	55.91			
UCF-2060	67.91			
UCF-2072	79.91			
UCF-2084	91.91			



FOUR PASS (FP)

Model	M	N	Q NPT	R	S
UCF-1024	29.21	6.77	1.00	.75	1.19
UCF-1036	41.21				
UCF-1048	53.21				
UCF-1224	29.58	7.64	1.50	1.06	1.44
UCF-1236	41.58				
UCF-1248	53.58				
UCF-1260	65.58				
UCF-1272	77.58				
UCF-1284	84.58				
UCF-1724	29.78	8.29	2.00	1.38	1.88
UCF-1736	41.78				
UCF-1748	53.78				
UCF-1760	65.78				
UCF-1772	77.78				
UCF-1784	89.78				
UCF-2036	44.00	11.16	2.50	1.75	2.50
UCF-2048	56.00				
UCF-2060	68.00				
UCF-2072	80.00				
UCF-2084	92.00				

COMMON DIMENSIONS

Model	A	B	C	D	E	F	G	H	J NPT	K ANSI Flange	L NPT	P NPT	Weight	Model
UCF-1024	5.25	19.75	7.63	29.13	4.00	5.25	2.00	.44 x 1.00 thru slot	.375	3.00	1.50	.75	55.00	UCF-1024
UCF-1036		31.75		41.13									70.00	UCF-1036
UCF-1048		43.75		53.13									85.00	UCF-1048
UCF-1224	6.25	19.00	8.13	29.59	4.50	6.25	2.50	.44 x 1.00 thru slot	.375	4.00	2.00	.75	83.00	UCF-1224
UCF-1236		31.00		41.59									108.00	UCF-1236
UCF-1248		43.00		53.59									132.00	UCF-1248
UCF-1260		55.00		65.59									158.00	UCF-1260
UCF-1272		67.00		77.59									182.00	UCF-1272
UCF-1284		79.00		89.59									206.00	UCF-1284
UCF-1724	8.00	18.25	9.00	29.50	5.75	8.25	3.50	.44 x 1.00 thru slot	.375	5.00	2.00	1.00	138.00	UCF-1724
UCF-1736		30.25		41.50									180.00	UCF-1736
UCF-1748		42.25		53.50									219.00	UCF-1748
UCF-1760		54.25		65.50									258.00	UCF-1760
UCF-1772		66.25		77.50									300.00	UCF-1772
UCF-1784		78.25		89.50									342.00	UCF-1784
UCF-2036	10.75	29.00	10.38	42.63	8.00	11.50	5.00	.781 x 1.25 thru slot	.50	6.00	3.00	1.25	620.00	UCF-2036
UCF-2048		41.00		54.63									670.00	UCF-2048
UCF-2060		53.00		66.63									730.00	UCF-2060
UCF-2072		65.00		78.63									820.00	UCF-2072
UCF-2084		76.00		90.63									870.00	UCF-2084

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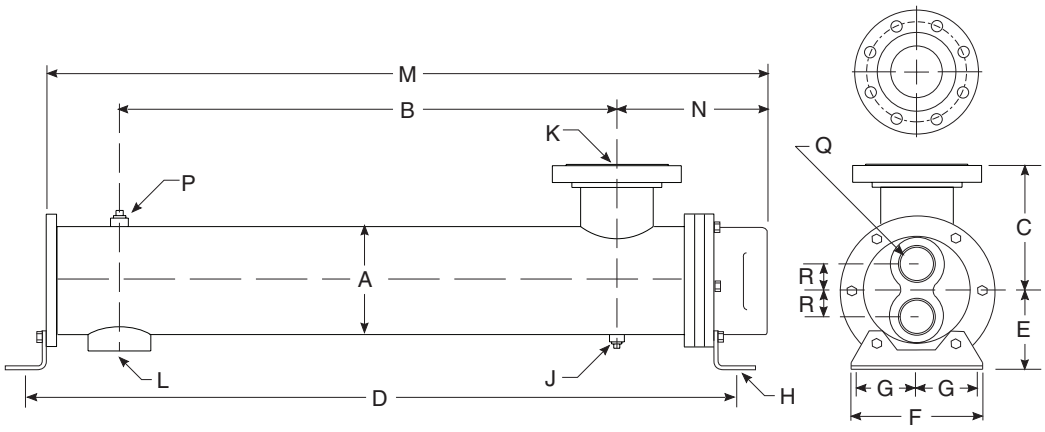
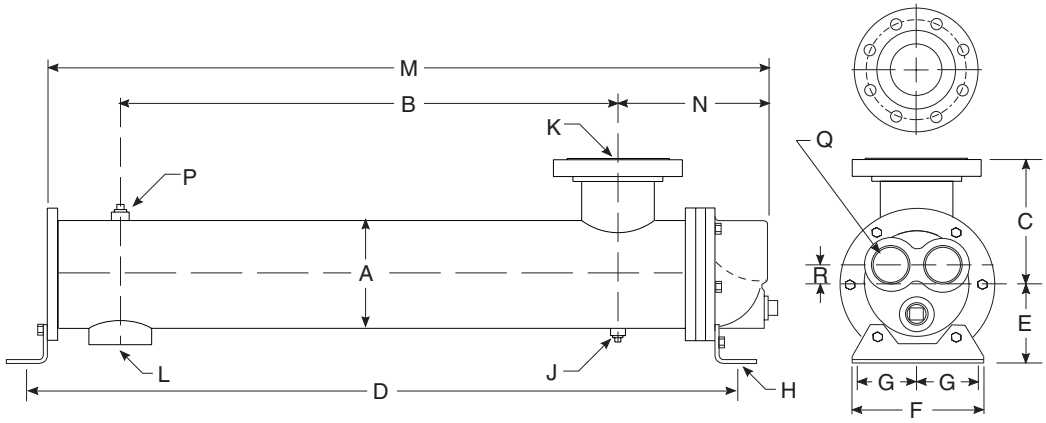
REMOVABLE TUBE BUNDLE *(U-TUBE DESIGN)*



Model	M	N	Q NPT	R
URCF-1024	28.88	6.43	1.50	1.19
URCF-1036	40.88			
URCF-1048	52.88			
URCF-1224	29.17	7.23	2.00	1.44
URCF-1236	41.17			
URCF-1248	53.17			
URCF-1260	65.17			
URCF-1272	77.17			
URCF-1284	89.17			
URCF-1724	30.13	8.64	2.50	1.88
URCF-1736	42.13			
URCF-1748	54.13			
URCF-1760	66.13			
URCF-1772	78.13			
URCF-1784	90.13			
URCF-2036	43.91	11.07	3.00	2.50
URCF-2048	55.91			
URCF-2060	67.91			
URCF-2072	79.91			
URCF-2084	91.91			

Two Pass (TP)



Model	M	N	Q NPT	R	S
URCF-1024	29.21	6.77	1.00	.75	1.19
URCF-1036	41.21				
URCF-1048	53.21				
URCF-1224	29.58	7.64	1.50	1.06	1.44
URCF-1236	41.58				
URCF-1248	53.58				
URCF-1260	65.58				
URCF-1272	77.58				
URCF-1284	84.58				
URCF-1724	29.78	8.29	2.00	1.38	1.88
URCF-1736	41.78				
URCF-1748	53.78				
URCF-1760	65.78				
URCF-1772	77.78				
URCF-1784	89.78				
URCF-2036	44.00	11.16	2.50	1.75	2.50
URCF-2048	56.00				
URCF-2060	68.00				
URCF-2072	80.00				
URCF-2084	92.00				

FOUR PASS (FP)

COMMON DIMENSIONS

Model	A	B	C	D	E	F	G	H	J NPT	K ANSI Flange	L NPT	P NPT	Weight	Model
URCF-1024	5.25	19.75	7.63	29.13	4.00	5.25	2.00	.44 x 1.00 thru slot	.375	3.00	1.50	.75	55.00	URCF-1024
URCF-1036		31.75		41.13									70.00	URCF-1036
URCF-1048		43.75		53.13									85.00	URCF-1048
URCF-1224	6.25	19.00	8.13	29.59	4.50	6.25	2.50	.44 x 1.00 thru slot	.375	4.00	2.00	.75	83.00	URCF-1224
URCF-1236		31.00		41.59									108.00	URCF-1236
URCF-1248		43.00		53.59									132.00	URCF-1248
URCF-1260		55.00		65.59									158.00	URCF-1260
URCF-1272		67.00		77.59									182.00	URCF-1272
URCF-1284		79.00		89.59									206.00	URCF-1284
URCF-1724	8.00	18.25	9.00	29.50	5.75	8.25	3.50	.44 x 1.00 thru slot	.375	5.00	2.00	1.00	138.00	URCF-1724
URCF-1736		30.25		41.50									180.00	URCF-1736
URCF-1748		42.25		53.50									219.00	URCF-1748
URCF-1760		54.25		65.50									258.00	URCF-1760
URCF-1772		66.25		77.50									300.00	URCF-1772
URCF-1784		78.25		89.50									342.00	URCF-1784
URCF-2036	10.75	29.00	10.38	42.63	8.00	11.50	5.00	.781 x 1.25 thru slot	.50	6.00	3.00	1.25	620.00	URCF-2036
URCF-2048		41.00		54.63									670.00	URCF-2048
URCF-2060		53.00		66.63									730.00	URCF-2060
URCF-2072		65.00		78.63									820.00	URCF-2072
URCF-2084		76.00		90.63									870.00	URCF-2084

note: AIHTI reserves the right to make reasonable design changes without notice.

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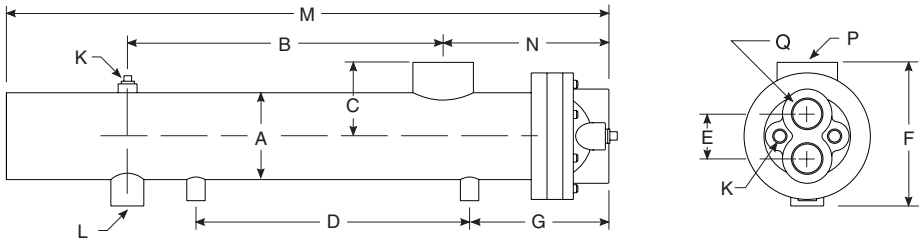
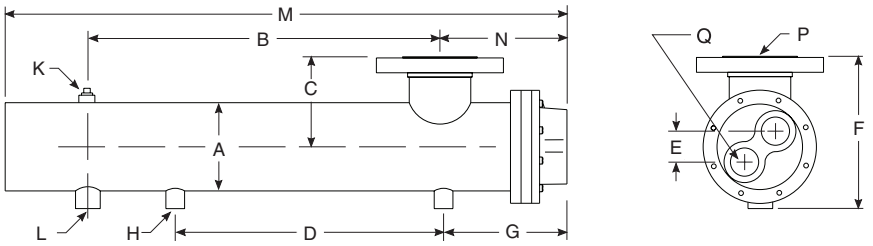
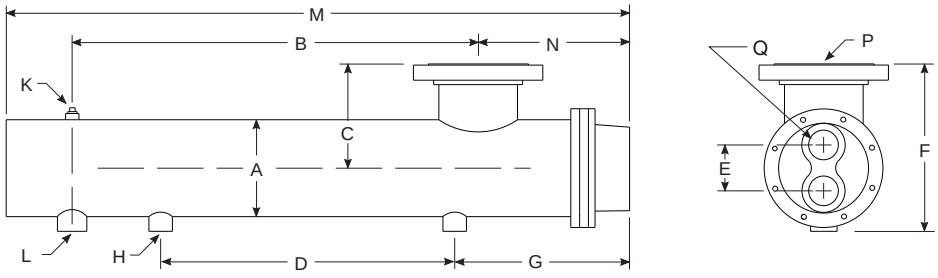
Standard URCS stock unit for steam application



URCS-830



URCS-1230, URCS-1242, URCS-1254



URCS-1754

COMMON DIMENSIONS

MODEL	A	B	C	D	E	F	G	H NPT	K NPT	L NPT	M	N	P	Q NPT	WEIGHT
URCS-830-25180	4.25	15.00	3.56	13.00	2.38	6.81	5.75	1.00	.38	1.25	28.63	7.88	2.5" NPT	1.25	35
URCS-1230-25182	6.25	13.00	6.38	13.00	3.12	10.75	5.75	1.00	—	1.50	27.75	9.00	4" ANSI	2.00	69
URCS-1242-25183	6.25	25.00	6.38	19.00	3.12	10.75	8.75	1.00	—	1.50	39.75	9.00	4" ANSI	2.00	87
URCS-1254-25184	6.25	37.00	6.38	25.00	3.12	10.75	11.75	1.00	—	1.50	51.75	9.00	4" ANSI	2.00	105
URCS-1754-25185	8.00	34.50	8.75	25.00	4.50	14.00	14.88	1.25	—	2.00	53.00	12.88	6" ANSI	2.50	187

STANDARD CONSTRUCTION MATERIALS & RATINGS

Construction Material		Optional Material	Standard Unit Ratings
Shell	Steel	Steel	Operating Pressure Tubes 100 psig Operating Pressure Shell 100 psig Operating Temperature 400 °F
Tubes	Copper	90/10 Cu. Ni. / S. Steel	
Baffle	Brass	Brass	
End Bonnet	Cast Iron	Brass / Stainless Steel	
Gasket	Viton O-Ring		

SURFACE AREA

Model Number	Surface Area in Sq.ft.	
	1 / 4" O.D. Tubing	3 / 8" O.D. Tubing
URCS-830-25180	15.0	—
URCS-1230-25182	—	21.5
URCS-1242-25183	—	30.2
URCS-1254-25184	—	38.8
URCS-1754-25185	—	72.4

note: AIHTI reserves the right to make reasonable design changes without notice.

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Receiving / Installation

a) Inspect unit for any shipping damage before uncrating. Indicate all damages to the trucking firms' delivery person, and mark it on the receiving bill before accepting the freight. Make sure that there is no visible damage to the outside surface of the heat exchanger. The published weight information located in this brochure is approximate. True shipment weights are determined at the time of shipping and may vary. Approximate weight information published herein is for engineering approximation purposes and should not be used for exact shipping weight. Since the warranty is based upon the unit date code located on the model identification tags, removal or manipulation of the identification tags will void the manufacturers warranty.

b) When handling the shell & tube heat exchanger, special care should be taken to avoid dropping the unit since mishandling could cause the heat exchanger to crack and leak externally. Mishandling of the unit is not covered under the manufacturers warranty. All units are shipped with partial wood/corrugated cardboard containers for safe handling.

c) Storage: American Industrial heat exchangers are protected against the elements during shipment. If the heat exchanger cannot be installed and put into operation immediately upon receipt, certain precautions are required to prevent deterioration during storage. The responsibility for integrity of the heat exchanger(s) is assumed by the user. American Industrial will not be responsible for damage, corrosion, or other deterioration of the heat exchanger during transit or storage.

Proper storage practices are important when considering the high costs of repair or replacement, and the possible delays for items which require long lead times for manufacture. The following listed practices are provided solely as a convenience to the user, who shall make their own decision on whether to use all or any of them.

1) Heat exchangers not to be placed in immediate service, require precautionary measures to prevent corrosion or contamination.
2) Heat exchangers made of ferrous materials, may be pressure-tested using compressed air at the factory. Residual oil coating on the inside surfaces of the heat exchanger(s) as a result of flushing does not discount the possibility of internal corrosion. Upon receipt, fill the heat exchanger(s) with the appropriate grade of oil or apply a corrosion preventing inhibitor for storage.
3) Corrosion protection compounds for interior surfaces for long term storage or other applications are applied solely at the request of customers. Upon request, American Industrial can provide a customer approved corrosion preventative if available when included in the original purchase order specifications.
4) Remove all dirt, water, ice, or snow and wipe dry before moving heat exchanger(s) into storage. Heat exchangers are generally shipped empty, open drain plugs to remove any accumulated condensation moisture, then reseal. Accumulation of moisture usually indicates corrosion has already started and remedial action should be taken.
5) Store in a covered, environmentally stable area. The ideal storage environment for heat exchangers is in a dry, low-humidity atmosphere which is sealed to prevent the entry of blowing dust, rain, or snow. Maintain in atmospheric temperatures between 70ºF and 105ºF (Large temperature swings may cause condensation and moisture to form on steel components, threads, shell, etc...) Use thermometers and humidity indicators and maintain the atmosphere at 40% relative humidity, or lower.

d) Standard Enamel Coating: American Industrial provides its standard products with a normal base coat of oil base air cure enamel paint. The enamel paint is applied as a temporary protective and esthetic coating prior to shipment. While the standard enamel coating is durable, American Industrial does not warranty it as a long-term finish coating. It is strongly suggested that a more durable final coating be applied after installation or prior to long-term storage in a corrosive environment to cover any accidental scratches, enhance esthetics, and further prevent corrosion. It is the responsibility of the customer to provide regular maintenance against chips, scratches, etc... and regular touch up maintenance must be provided for long-term benefits and corrosion prevention.

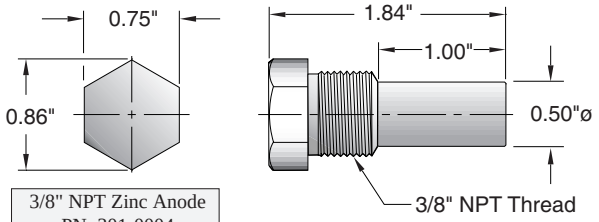
e) Special Coatings: American Industrial offers as customer options, Air-Dry Epoxy, and Heresite (Air-Dry Phenolic) coatings at additional cost. American Industrial offers special coatings upon request, however American Industrial does not warranty coatings to be a permanent solution for any equipment against corrosion. It is the responsibility of the customer to provide regular maintenance against chips, scratches, etc... and regular touch up maintenance must be provided for long-term benefits and corrosion prevention.

f) American Industrial recommends that the equipment supplied should be installed by qualified personnel who have solid understanding of system design, pressure and temperature ratings, and piping assembly. Verify the service conditions of the system prior to applying any shell & tube heat exchanger. If the system pressure or temperature does not fall within the parameters on model rating tag located on the heat exchanger, contact our factory prior to installation or operation.

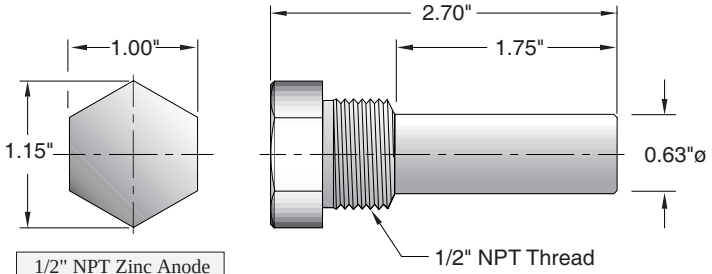
g) Plan the installation to meet the requirements indicated on the piping installation diagram as illustrated above. It is recommended to put the hot fluid to be cooled through the shell side and the cold fluid through the tube side. The indicated port assembly sequence in the installation diagram maximizes the performance, and minimizes the possibility of thermal shock. In instances where the fluids are required to be reversed, hot fluid in the tubes and cold fluid in the shell the heat exchanger will work with reduced performance. Installation may be vertical or horizontal or a combination thereof. However, the installation must allow for complete draining of the heat exchanger regardless of Two Pass or four pass construction. Complete drainage is important to prevent the heat exchanger from freezing, over-heating of a fluid, or mineral deposit buildup.

For removable bundle heat exchangers, provide sufficient clearance at the stationary tube-sheet end to allow for the removal of the tube bundle from the shell. Bonnet can be removed to aid in cleaning the tubes without disassembling the tube bundle. For more information please contact American Industrial.

h) It is recommended to use flexible hose wherever possible to reduce vibration and allow slight movement. However, hoses are not required. Hydraulic carrying lines should be sized to handle the appropriate flow and to meet system pressure drop requirements



3/8" NPT Zinc Anode PN: 301-0004
AB-400 thru AB-1000 AA-400 thru AA-1000 CS-600 thru CS-1000



1/2" NPT Zinc Anode PN: 301-0003
AB-1200 thru AB-2000 AA-1200 thru AA-1600 CS-1200 thru CS-1700

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American Industrial Heat Transfer Inc.
Manufacturer of Quality Heat Exchangers

website : www.aihti.com
general email : sales@aihti.com
technical email : engineering@aihti.com

Shell & Tube Application Request: *(For liquid to liquid heat exchangers)*

For CK & CKS Series

Email form to: sales@aihti.com or engineering@aihti.com or fax to 434-757-1810

Contact Name _____ Telephone _____ Date _____

Company Name _____ Email _____

Address: _____ Fax _____

_____

Hot Side

Fluid Type _____

If available:

Density _____ lb/ft3
Viscosity _____ cP
Conductivity _____ Btu/hr.ft.°F
Specific Heat _____ Btu/lb.°F

1. Flow Rate _____
2. Temperature In _____
3. Desired Temperature Out _____
4. Heat Load _____

Cold Side

Fluid Type _____

If available:

Density _____ lb/ft3
Viscosity _____ cP
Conductivity _____ Btu/hr.ft.°F
Specific Heat _____ Btu/lb.°F

1. Flow Rate _____
2. Temperature In _____

Maximum Allowable Pressure Drop:

Hot Side _____ Cold Side _____

To properly size the heat exchanger we need 3 of the 4 perameter on the Hot Side and 2 on the Cold Side.

Shell Material Construction:

Steel ☐ Stainless Steel ☐

Tube Material Construction:

Copper ☐ 90/10 Copper Nickel ☐ Stainless Steel ☐

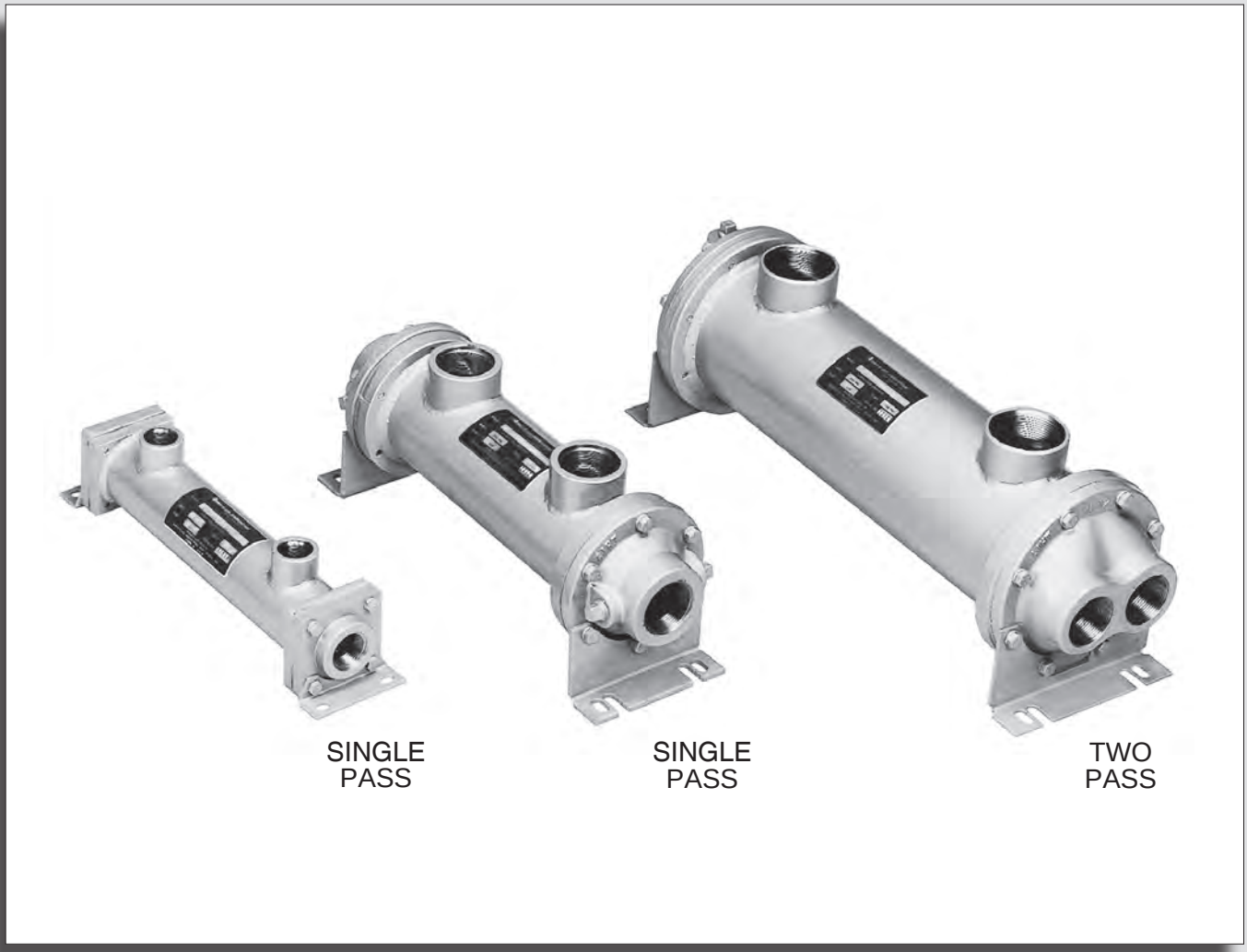
Require All Stainless Steel Heat Exchanger Yes ☐ No ☐

Comment: _____

_____

_____

CK & CKS SERIES

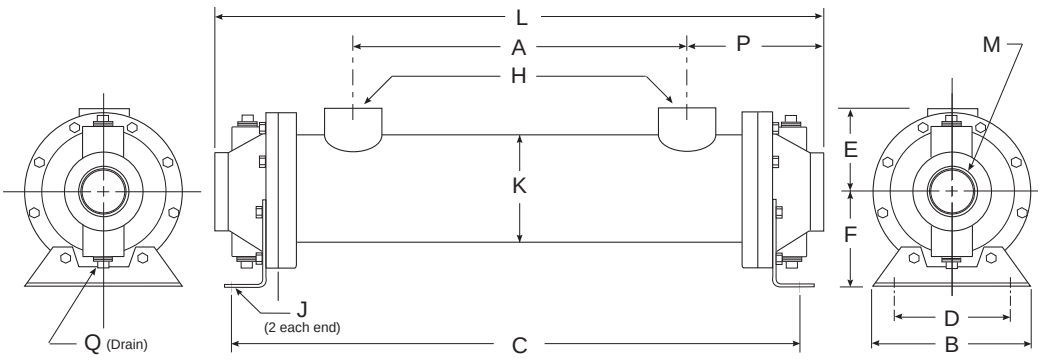


Fixed Tube Bundle / Liquid Cooled

HEAT EXCHANGERS

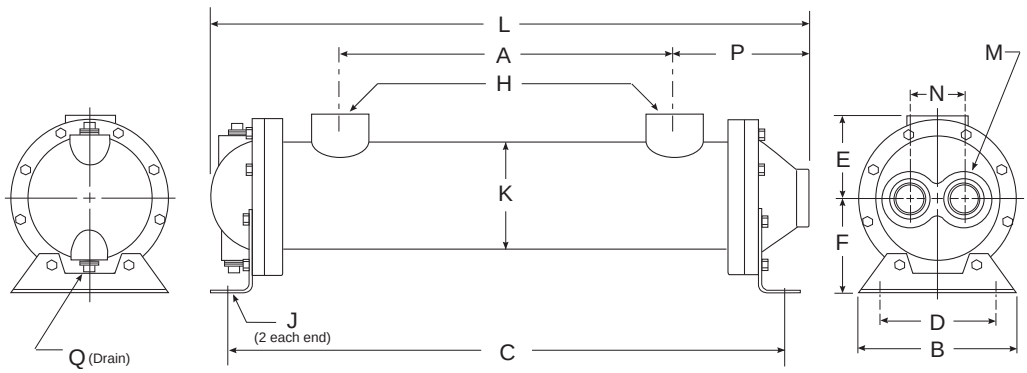
- Operating pressure for tubes 150 PSI.
- Operating pressure for shell 300 PSI.
- Operating temperature 300 °F.
- Can be customized to fit any applications.
- Computer generated data sheet available for any application

CK & CKS Series *dimensions*



Model	L	M NPT	P	S NPT
CK-505	7.38	.75	3.35	---
CK-508	10.38			
CK-510	12.38			
CK-512	14.38			
CK-514	16.38			
CK-518	20.38			
CK-524	26.38			
CK-536	38.38			
CK-708	12.57	1.25	4.78	(2) .38
CK-712	16.57			
CK-714	18.57			
CK-718	22.57			
CK-724	28.57			
CK-736	40.57			
CK-1012	17.02	2.00	5.17	(2) .38
CK-1014	19.02			
CK-1018	23.02			
CK-1024	29.03			
CK-1036	41.02			
CK-1048	53.02			

Single Pass (SP)



Model	L	M NPT	N	P	Q NPT
CK-708	12.44	1.00	1.76	4.85	(2) .38
CK-714	16.44				
CK-718	18.44				
CK-724	22.44				
CK-736	40.44				
CK-1012	16.71	1.50	2.38	5.17	(2) .38
CK-1014	18.71				
CK-1018	22.71				
CK-1024	28.71				
CK-1036	40.71				
CK-1048	52.71				

Two Pass (TP)

COMMON DIMENSIONS & WEIGHTS

Model	A	B	C	D	E	F	H NPT	H SAE	J	K	Approx. Weight	Model
CK-505	2.19	3.50	7.44	2.50	2.28	1.62	.50	#8	.34ϕ x .62	2.55	7.00	CK-505
CK-508	3.85		10.44				.75	#12 1 1/16 -12			7.50	CK-508
CK-510	5.85		12.44								8.00	CK-510
CK-512	7.85		14.44								8.50	CK-512
CK-514	9.85		16.44								9.00	CK-514
CK-518	13.85		20.44								9.50	CK-518
CK-524	19.85		26.44								10.50	CK-524
CK-536	31.85		38.44								11.50	CK-536
CK-708	3.00	5.00	10.71	3.00	2.84	2.69	1.50	#24 1 7/8 -12	.44ϕ x .75	3.75	15.00	CK-708
CK-712	7.00		14.71								17.50	CK-712
CK-714	9.00		16.71								18.50	CK-714
CK-718	13.00		20.71								20.00	CK-718
CK-724	19.00		26.71								22.00	CK-724
CK-736	31.00		38.71								24.50	CK-736
CK-1012	6.18	6.50	15.45	4.00	3.62	4.00	2.00	#32 2 1/2 -12	.44ϕ x 1.00	5.25	38.00	CK-1012
CK-1014	8.18		17.45								40.00	CK-1014
CK-1018	12.18		21.45								44.50	CK-1018
CK-1024	18.18		27.45								51.00	CK-1024
CK-1036	30.18		39.45								57.00	CK-1036
CK-1048	42.18		51.45								64.00	CK-1048

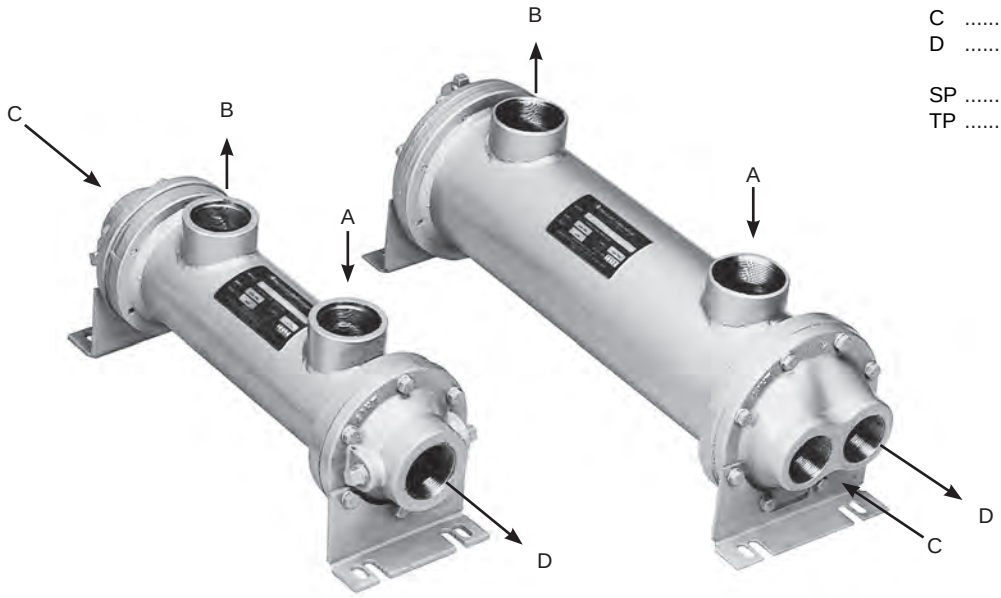
note: AIHTI reserves the right to make reasonable design changes without notice.

355 American Industrial Drive LaCrosse, VA 23950 tel: 434-757-1800 fax: 434-757-1810 email: sales@aihti.com

PIPING HOOK-UP

A ..... Hot fluid to be cooled
B ..... Cooled fluid
C ..... Cooling water in
D ..... Cooling water out

SP ..... Single Pass
TP ..... Two Pass



ONE PASS **Two Pass**

Receiving / Installation

a) Inspect unit for any shipping damage before uncrating. Indicate all damages to the trucking firms' delivery person, and mark it on the receiving bill before accepting the freight. Make sure that there is no visible damage to the outside surface of the heat exchanger. The published weight information located in this brochure is approximate. True shipment weights are determined at the time of shipping and may vary. Approximate weight information published herein is for engineering approximation purposes and should not be used for exact shipping weight. Since the warranty is based upon the unit date code located on the model identification tags, removal or manipulation of the identification tags will void the manufacturers warranty.

b) When handling the shell & tube heat exchanger, special care should be taken to avoid dropping the unit since mishandling could cause the heat exchanger to crack and leak externally. Mishandling of the unit is not covered under the manufacturers warranty. All units are shipped with partial wood/corrugated cardboard containers for safe handling.

c) Storage: American Industrial heat exchangers are protected against the elements during shipment. If the heat exchanger cannot be installed and put into operation immediately upon receipt, certain precautions are required to prevent deterioration during storage. The responsibility for integrity of the heat exchanger(s) is assumed by the user. American Industrial will not be responsible for damage, corrosion, or other deterioration of the heat exchanger during transit or storage.

Proper storage practices are important when considering the high costs of repair or replacement, and the possible delays for items which require long lead times for manufacture. The following listed practices are provided solely as a convenience to the user, who shall make their own decision on whether to use all or any of them.

1) Heat exchangers not to be placed in immediate service, require precautionary measures to prevent corrosion or contamination.
2) Heat exchangers made of ferrous materials, may be pressure-tested using compressed air at the factory. Residual oil coating on the inside surfaces of the heat exchanger(s) as a result of flushing does not discount the possibility of internal corrosion. Upon receipt, fill the heat exchanger(s) with the appropriate grade of oil or apply a corrosion preventing inhibitor for storage.
3) Corrosion protection compounds for interior surfaces for long term storage or other applications are applied solely at the request of customers. Upon request, American Industrial can provide a customer approved corrosion preventative if available when included in the original purchase order specifications.
4) Remove all dirt, water, ice, or snow and wipe dry before moving heat exchanger(s) into storage. Heat exchangers are generally shipped empty, open drain plugs to remove any accumulated condensation moisture, then reseal. Accumulation of moisture usually indicates corrosion has already started and remedial action should be taken.
5) Store in a covered, environmentally stable area. The ideal storage environment for heat exchangers is in a dry, low-humidity atmosphere which is sealed to prevent the entry of blowing dust, rain, or snow. Maintain in atmospheric temperatures between 70ºF and 105ºF (Large temperature swings may cause condensation and moisture to form on steel components, threads, shell, etc...) Use thermometers and humidity indicators and maintain the atmosphere at 40% relative humidity, or lower.

d) Standard Enamel Coating: American Industrial provides its standard products with a normal base coat of oil base air cure enamel paint. The enamel paint is applied as a temporary protective and esthetic coating prior to shipment. While the standard enamel coating is durable, American Industrial does not warranty it as a long-term finish coating. It is strongly suggested that a more durable final coating be applied after installation or prior to long-term storage in a corrosive environment to cover any accidental scratches, enhance esthetics, and further prevent corrosion. It is the responsibility of the customer to provide regular maintenance against chips, scratches, etc... and regular touch up maintenance must be provided for long-term benefits and corrosion prevention.

e) Special Coatings: American Industrial offers as customer options, Air-Dry Epoxy, and Heresite (Air-Dry Phenolic) coatings at additional cost. American Industrial offers special coatings upon request, however American Industrial does not warranty coatings to be a permanent solution for any equipment against corrosion. It is the responsibility of the customer to provide regular maintenance against chips, scratches, etc... and regular touch up maintenance must be provided for long-term benefits and corrosion prevention.

f) American Industrial recommends that the equipment supplied should be installed by qualified personnel who have solid understanding of system design, pressure and temperature ratings, and piping assembly. Verify the service conditions of the system prior to applying any shell & tube heat exchanger. If the system pressure or temperature does not fall within the parameters on model rating tag located on the heat exchanger, contact our factory prior to installation or operation.

g) Plan the installation to meet the requirements indicated on the piping installation diagram as illustrated above. It is recommended to put the

hot fluid to be cooled through the shell side and the cold fluid through the tube side. The indicated port assembly sequence in the diagram maximizes the performance, and minimizes the possibility of thermal shock. In instances where the fluids are required to be reversed, *hot fluid in the tubes and cold fluid in the shell* the heat exchanger will work with reduced performance. Installation may be vertical or horizontal or a combination thereof. However, the installation must allow for complete draining of the heat exchanger regardless of Single Pass, Two Pass, or four pass construction. Complete drainage is important to prevent the heat exchanger from freezing, over-heating of a fluid, or mineral deposit buildup.
For fixed bundle heat exchangers, provide sufficient clearance at one end to allow for the removal or replacement of tubes. On the opposite end, provide enough space to allow removal of the bonnet to provide sufficient clearance to permit tube rolling and cleaning. Allow accessible room for scheduled cleaning as needed. Include thermometer wells and pressure gauge pipe ports in piping to and from the heat exchanger located as close to the heat exchanger as possible. For more information please contact American Industrial.

h) It is recommended to use flexible hose wherever possible to reduce vibration and allow slight movement. However, hoses are not required. Hydraulic carrying lines should be sized to handle the appropriate flow and to meet system pressure drop requirements based upon the systems parameters, and not based upon the units supply and return connection size. We recommend that a low cracking pressure direct acting relief valve be installed at the heat exchanger inlet to protect it from pressure spikes by bypassing oil in the event the system experiences a high flow surge. If preventative filtration is used it should be located ahead of the cooler on both shell and tube side to catch any scale or sludge from the system before it enters the cooler. Failure to install filters ahead of the heat exchanger could lead to possible heat exchanger failure due to high pressure if the system filters plug.

i) Standard shell & tube coolers are built with a rolled tube-sheet construction. However, the differential operating temperature between the entering shell side fluid and the entering tube side fluid should not exceed 150°F. If this condition exists, a severe thermal shock could occur leading to product failure and mixing of the fluids. For applications with a differential temperatures of 150°F or more, we recommend using a series with a floating tube-sheet, u-tube, or expansion joint to reduce the potential for the effects of thermal shock.

j) Water requirements vary from location to location. If the source of cooling water is from other than a municipal water supply, it is recommended that a water strainer be installed ahead of the heat exchanger to prevent dirt and debris from entering and clogging the flow passages. If a water modulating valve is used it is recommended to be installed at the inlet to the cooler to regulate the water flow.

k) For steam service, or other related applications, please consult our engineering department for additional information.

Maintenance
a) Inspect the heat exchanger for loosened bolts, connections, rust spots, corrosion, and for internal or external fluid leakage. Any corroded surfaces should be cleaned and recoated with paint.

b) Shell side: In many cases with clean hydraulic system oils it will not be necessary to flush the interior of the shell side of the cooler. In circumstances where the quality of hydraulic fluid is in question, the shell side should be disconnected and flushed on a yearly basis with a clean flushing oil/solvent to remove any sludge that has been deposited. For severe cases where the unit is plugged and cannot be flushed clean with solvent, the heat exchanger should be replaced to maintain the proper cooling performance.

c) Tube side: In many cases it will be necessary to clean the tube side of the heat exchanger due to poor fluid quality, debris, calcium deposits, corrosion, mud, sludge, seaweed, etc.... To clean the tube side, flush with clean water or any good quality commercial cleaner that does not attack the particular material of construction. With straight tube heat exchangers you can use a rod to carefully push any debris out of the tubes.

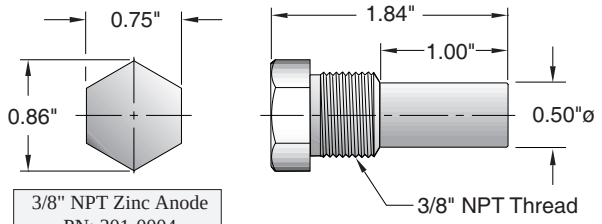
d) Zinc anodes are normally used to reduce the risk of failure due to electrolysis. Zinc anodes are a sacrificial component designed to wear and dissolve through normal use. Normally, zinc anodes are applied to the water supply side of the heat exchanger. Depending upon the amount of corrosive action, one, two, three, or more anodes can be applied to help further reduce the risk of failure. American Industrial Heat Transfer, Inc. offers zinc anodes as an option, to be specified and installed at the request our customers. It is the responsibility of the customer to periodically check and verify the condition of the zinc anode and replace it as needed.

Applications vary due to water chemical makeup and quality, material differences, temperature, flow rate, piping arrangements, and machine grounding. For those reasons, zinc anodes do not follow any scheduled factory predetermined maintenance plan moreover they must be checked routinely by the customer, and a maintenance plan developed based upon the actual wear rate.

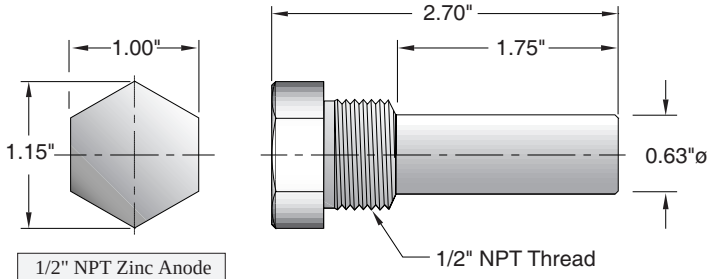
If substantial wear occurs or zinc dissolves without replacement, premature failure or permanent damage may occur to the heat exchanger. American Industrial does not warranty customer applications. It is the responsibility of the customer to verify and apply the proper system materials of construction and overall system requirements. Failures resulting from properly applied or misapplied use of zinc anode(s) into non-specified or specified applications will be the sole responsibility of the customer.

e) A routine maintenance schedule should be developed and adjusted to meet your systems requirements based upon water quality, etc….Failure to regularly maintain and clean your heat exchanger can result in a reduction in operational performance and life expectancy.

Note: *Since applications can vary substantially, the installation and maintenance information contained in this catalog should be used as a basic guideline. The safe installation, maintenance, and use of any American Industrial Heat Transfer, Inc. heat exchanger are solely the responsibility of the user.*



3/8" NPT Zinc Anode PN: 301-0004
AB-400 thru AB-1000 AA-400 thru AA-1000 CS-600 thru CS-1000



1/2" NPT Zinc Anode PN: 301-0003
AB-1200 thru AB-2000 AA-1200 thru AA-1600 CS-1200 thru CS-1700

website : www.aihti.com
general email : sales@aihti.com
technical email : engineering@aihti.com

Notes:

American Industrial Heat Transfer Inc.
Manufacturer of Quality Heat Exchangers

website : www.aihti.com
general email : sales@aihti.com
technical email : engineering@aihti.com

Shell & Tube Application Request: *(For air / gas to liquid heat exchangers)*

For ABR Series

Email form to: sales@aihti.com or engineering@aihti.com or fax to 434-757-1810

Contact Name _____ Telephone _____ Date _____

Company Name _____ Email _____

Address: _____ Fax _____

_____

Hot Side

Fluid Type _____

If available:

Density _____ lb/ft3
Viscosity _____ cP
Conductivity _____ Btu/hr.ft.°F
Specific Heat _____ Btu/lb.°F

1. Flow Rate _____
2. Temperature In _____
3. Desired Temperature Out _____
4. Heat Load _____

Cold Side

Fluid Type _____

If available:

Density _____ lb/ft3
Viscosity _____ cP
Conductivity _____ Btu/hr.ft.°F
Specific Heat _____ Btu/lb.°F

1. Flow Rate _____
2. Temperature In _____

Maximum Allowable Pressure Drop:

Hot Side _____ Cold Side _____

To properly size the heat exchanger we need 3 of the 4 perameter on the Hot Side and 2 on the Cold Side.

Shell Material Construction:

Brass ☐ Steel ☐ Stainless Steel ☐

Tube Material Construction:

Copper ☐ 90/10 Copper Nickel ☐ Stainless Steel ☐

ASME Code and Certified Yes ☐ No ☐

Require All Stainless Steel Heat Exchanger Yes ☐ No ☐

Comment: _____

_____

_____

ABR SERIES

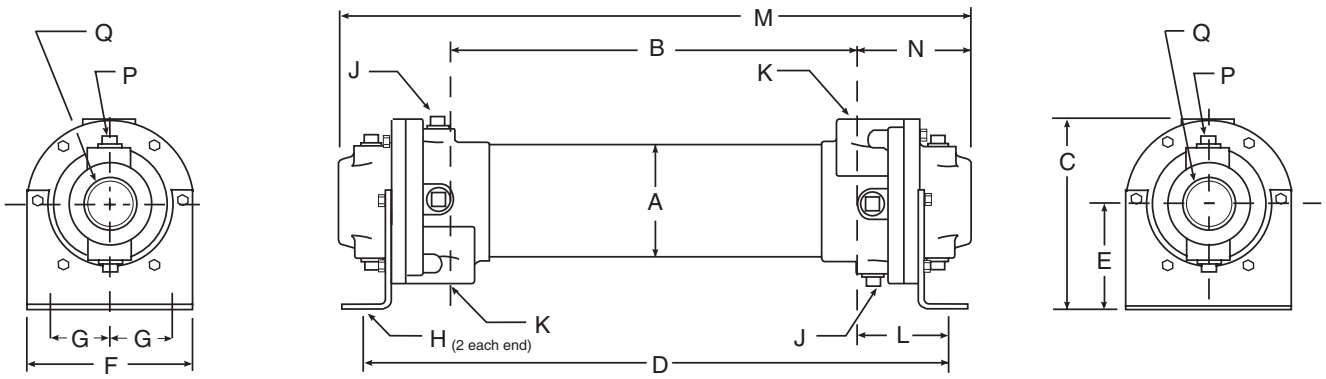
FIXED TUBE BUNDLE / LIQUID COOLED

AFTER COOLERS

FOR COMPRESSED AIR AND GAS APPLICATIONS

- Copper, 90/10 Copper/Nickel, or Stainless Steel Tubing.
- Optional Bronze Bonnets.
- Operating Pressure for Tubes 150 PSI.
- Operating Pressure for Shell 300 PSI.
- Operating Temperatures of 300° F.
- Computer generated data sheet available for any application
- Can be customized to fit any applications.

ABR Series *performance*



COMMON DIMENSIONS

Model	A	B	C	D	E	F	G	H	J NPT	K NPT	L	M	N	P NPT	Q NPT	Weights (lbs.)
ABR-403-A4-SP	2.13	25.62	3.50	29.06	1.94	2.62	0.88	0.41 DIA.	N/A	0.50	1.72	33.36	3.87	N/A	1.50	13
ABR-404-A4-SP	2.13	34.62	3.50	38.06	1.94	2.62	0.88			0.50	1.72	42.36	3.87		1.50	16
ABR-405-B4-SP	2.13	43.62	3.50	47.06	1.94	2.62	0.88			0.50	1.72	51.36	3.87		1.50	18
ABR-705-B4-SP	3.66	43.00	6.25	48.38	3.62	5.25	1.50	0.44x 1.00	(2) 0.38	1.00	2.89	50.40	3.70		2.50	40
ABR-1006-B6-SP	5.13	51.50	7.38	57.62	4.00	6.75	2.00		(6) 0.38	1.50	3.06	59.60	4.05		2.50	80
ABR-1206-C6-SP	6.13	50.50	8.81	57.38	4.75	7.50	2.50	0.44x .88		2.00	3.44	60.25	4.88	(4) 0.50	3.00	130
ABR-1207-C6-SP	6.13	59.60	8.81	66.38	4.75	7.50	2.50			2.00	3.44	69.25	4.88		3.00	150
ABR-1606-C6-SP	8.00	49.60	12.13	58.38	6.50	8.62	3.50	0.44x 1.00		3.00	4.39	62.62	6.52		5.00	259
ABR-1607-D6-SP	8.00	58.60	12.13	67.38	6.50	8.62	3.50			3.00	4.39	71.62	6.52		5.00	270
ABR-1608-D6-SP	8.00	67.60	12.13	76.38	6.50	8.62	3.50			3.00	4.39	80.62	6.52		5.00	315

CAPACITY SELECTION CHART

MODEL	2-Stage 250 ^{0}F Inlet Air		Rotary 200 ^{0}F Inlet Air	
	SCFM Capacity In Tubes	△P, PSI, In Rated Capacity	SCFM Capacity In Tubes	△P, PSI, In Rated Capacity
ABR-403-A4-SP	45	0.15	56	0.15
ABR-404-A4-SP	85	0.35	115	0.65
ABR-405-B4-SP	155	1.25	200	2.01
ABR-705-B4-SP	315	1.10	435	1.65
ABR-1006-B6-SP	445	0.35	650	0.55
ABR-1206-C6-SP	645	0.35	950	0.65
ABR-1207-C6-SP	1245	1.15	1680	1.95
ABR-1606-C6-SP	1605	0.60	2270	0.95
ABR-1607-D6-SP	2105	1.10	3075	1.75
ABR-1608-D6-SP	2810	1.65	3165	2.10

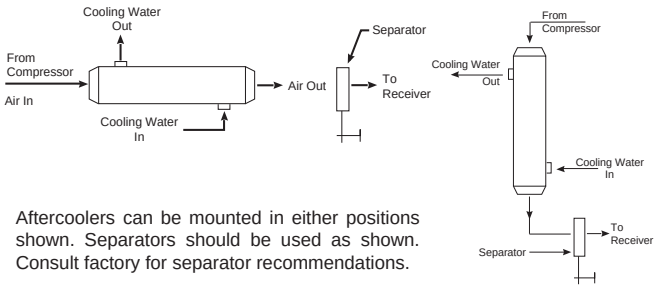
EXAMPLE

A two stage compressor with a 340 SCFM air delivery at 100psi and a 250^o F discharge temperature. Two psi is the maximum allowable pressure loss. Rate of water flow, to be determined.

SELECTION

To find a solution, select ABR-1006-B6-SP from the 2-stage column in the above chart. It has a capacity of 445 SCFM.
Next, identify the value for △P by reading the sub-column within the 2-stage column. The information in that column should be △P= 0.35 psi.
Data for water flow is 340 SCFM x .035 = 11.9 gpm.

PIPING HOOK-UP DIAGRAMS



Aftercoolers can be mounted in either positions shown. Separators should be used as shown. Consult factory for separator recommendations.

PIPING HOOK-UP

Receiving / Installation

a) Inspect unit for any shipping damage before uncrating. Indicate all damages to the trucking firms' delivery person, and mark it on the receiving bill before accepting the freight. Make sure that there is no visible damage to the outside surface of the heat exchanger. The published weight information located in this brochure is approximate. True shipment weights are determined at the time of shipping and may vary. Approximate weight information published herein is for engineering approximation purposes and should not be used for exact shipping weight. Since the warranty is based upon the unit date code located on the model identification tags, removal or manipulation of the identification tags will void the manufacturers warranty.

b) When handling the shell & tube heat exchanger, special care should be taken to avoid dropping the unit since mishandling could cause the heat exchanger to crack and leak externally. Mishandling of the unit is not covered under the manufacturers warranty. All units are shipped with partial wood/corrugated cardboard containers for safe handling.

c) Storage: American Industrial heat exchangers are protected against the elements during shipment. If the heat exchanger cannot be installed and put into operation immediately upon receipt, certain precautions are required to prevent deterioration during storage. The responsibility for integrity of the heat exchanger(s) is assumed by the user. American Industrial will not be responsible for damage, corrosion, or other deterioration of the heat exchanger during transit or storage.

Proper storage practices are important when considering the high costs of repair or replacement, and the possible delays for items which require long lead times for manufacture. The following listed practices are provided solely as a convenience to the user, who shall make their own decision on whether to use all or any of them.

1) Heat exchangers not to be placed in immediate service, require precautionary measures to prevent corrosion or contamination.
2) Heat exchangers made of ferrous materials, may be pressure-tested using compressed air at the factory. Residual oil coating on the inside surfaces of the heat exchanger(s) as a result of flushing does not discount the possibility of internal corrosion. Upon receipt, fill the heat exchanger(s) with the appropriate corrosion preventing inhibitor for storage.
3) Corrosion protection compounds for interior surfaces for long term storage or other applications are applied solely at the request of customers. Upon request, American Industrial can provide a customer approved corrosion preventative if available when included in the original purchase order specifications.
4) Remove all dirt, water, ice, or snow and wipe dry before moving heat exchanger(s) into storage. Heat exchangers are generally shipped empty, open drain plugs to remove any accumulated condensation moisture, then reseal. Accumulation of moisture usually indicates corrosion has already started and remedial action should be taken.
5) Store in a covered, environmentally stable area. The ideal storage environment for heat exchangers is in a dry, low-humidity atmosphere which is sealed to prevent the entry of blowing dust, rain, or snow. Maintain in atmospheric temperatures between 70°F and 105°F (Large temperature swings may cause condensation and moisture to form on steel components, threads, shell, etc...) Use thermometers and humidity indicators and maintain the atmosphere at 40% relative humidity, or lower.

d) Standard Enamel Coating: American Industrial provides its standard products with a normal base coat of oil base air cure enamel paint. The enamel paint is applied as a temporary protective and esthetic coating prior to shipment. While the standard enamel coating is durable, American Industrial does not warranty it as a long-term finish coating. It is strongly suggested that a more durable final coating be applied after installation or prior to long-term storage in a corrosive environment to cover any accidental scratches, enhance esthetics, and further prevent corrosion. It is the responsibility of the customer to provide regular maintenance against chips, scratches, etc... and regular touch up maintenance must be provided for long-term benefits and corrosion prevention.

e) Special Coatings: American Industrial offers as customer options, Air-Dry Epoxy, and Heresite (Air-Dry Phenolic) coatings at additional cost. American Industrial offers special coatings upon request, however American Industrial does not warranty coatings to be a permanent solution for any equipment against corrosion. It is the responsibility of the customer to provide regular maintenance against chips, scratches, etc... and regular touch up maintenance must be provided for long-term benefits and corrosion prevention.

f) American Industrial recommends that the equipment supplied should be installed by qualified personnel who have solid understanding of system design, pressure and temperature ratings, and piping assembly. Verify the service conditions of the system prior to applying any shell & tube heat exchanger. If the system pressure or temperature does not fall within the parameters on model rating tag located on the heat exchanger, contact our factory prior to installation or operation.

g) Plan the installation to meet the requirements indicated on the piping installation diagram as illustrated above. It is recommended to put the

compressed air to be cooled through the tube side and the cold fluid through the shell side. The indicated port assembly sequence in the diagram maximizes the performance, and minimizes the possibility of thermal shock. In instances where the fluids are required to be reversed, *compressed air in the shell side and cold fluid in the tube side* the heat exchanger will work, however it may not meet the performance requirements of the application. Installations may be vertical or horizontal or a combination thereof. However, the installation must allow for complete draining of the heat exchanger regardless of orientation. Complete drainage is important to prevent the heat exchanger from freezing, over-heating of a fluid, or mineral deposit buildup.

h) For fixed bundle heat exchangers, provide sufficient clearance at one end to allow for the removal or replacement of tubes. On the opposite end, provide enough space to allow removal of the bonnet to provide sufficient clearance to permit tube rolling and cleaning. Allow accessible room for scheduled cleaning as needed. Include thermometer wells and pressure gauge pipe ports in piping to and from the heat exchanger located as close to the heat exchanger as possible. For more information please contact American Industrial.

i) Standard shell & tube coolers are built with a rolled tube-sheet construction. However, the differential operating temperature between the entering shell side fluid and the entering tube side fluid should not exceed 150°F. If this condition exists, a severe thermal shock could occur leading to product failure and mixing of the fluids. For applications with a differential temperatures of 150°F or more, we recommend using a series with a floating tube-sheet, u-tube, or expansion joint to reduce the potential for the effects of thermal shock.

j) Water requirements vary from location to location. If the source of cooling water is from other than a municipal water supply, it is recommended that a water strainer be installed ahead of the heat exchanger to prevent dirt and debris from entering and clogging the flow passages. If a water modulating valve is used it is recommended to be installed at the inlet to the cooler to regulate the water flow.

k) For steam service, or other related applications, please consult our engineering department for additional information.

Maintenance

a) Inspect the heat exchanger for loosened bolts, connections, rust spots, corrosion, and for internal or external fluid leakage. Any corroded surfaces should be cleaned and recoated with paint.

b) Shell side: In many cases with clean hydraulic system oils it will not be necessary to flush the interior of the shell side of the cooler. In circumstances where the quality of hydraulic fluid is in question, the shell side should be disconnected and flushed on a yearly basis with a clean flushing oil/solvent to remove any sludge that has been deposited. For severe cases where the unit is plugged and cannot be flushed clean with solvent, the heat exchanger should be replaced to maintain the proper cooling performance.

c) Tube side: In many cases it will be necessary to clean the tube side of the heat exchanger due to poor fluid quality, debris, calcium deposits, corrosion, mud, sludge, seaweed, etc.... To clean the tube side, flush with clean water or any good quality commercial cleaner that does not attack the particular material of construction. With straight tube heat exchangers you can use a rod to carefully push any debris out of the tubes.

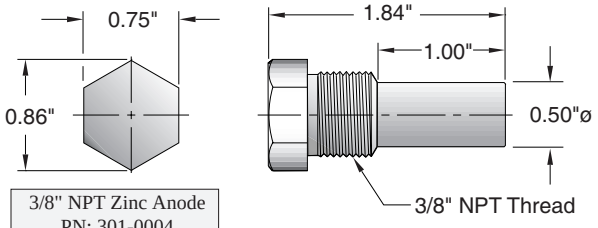
d) Zinc anodes are normally used to reduce the risk of failure due to electrolysis. Zinc anodes are a sacrificial component designed to wear and dissolve through normal use. Normally, zinc anodes are applied to the water supply side of the heat exchanger. Depending upon the amount of corrosive action, one, two, three, or more anodes can be applied to help further reduce the risk of failure. American Industrial Heat Transfer, Inc. offers zinc anodes as an option, to be specified and installed at the request our customers. It is the responsibility of the customer to periodically check and verify the condition of the zinc anode and replace it as needed.

Applications vary due to water chemical makeup and quality, material differences, temperature, flow rate, piping arrangements, and machine grounding. For those reasons, zinc anodes do not follow any scheduled factory predetermined maintenance plan moreover they must be checked routinely by the customer, and a maintenance plan developed based upon the actual wear rate.

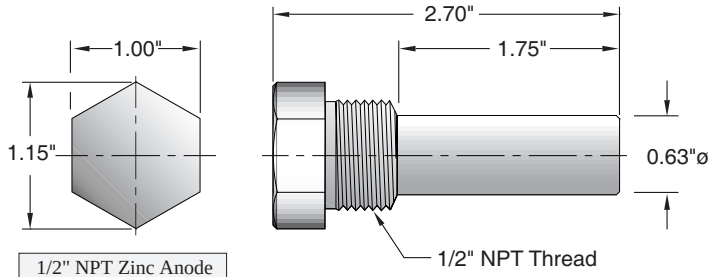
If substantial wear occurs or zinc dissolves without replacement, premature failure or permanent damage may occur to the heat exchanger. American Industrial does not warranty customer applications. It is the responsibility of the customer to verify and apply the proper system materials of construction and overall system requirements. Failures resulting from properly applied or misapplied use of zinc anode(s) into non-specified or specified applications will be the sole responsibility of the customer.

e) A routine maintenance schedule should be developed and adjusted to meet your systems requirements based upon water quality, etc….Failure to regularly maintain and clean your heat exchanger can result in a reduction in operational performance and life expectancy.

Note: *Since applications can vary substantially, the installation and maintenance information contained in this catalog should be used as a basic guideline. The safe installation, maintenance, and use of any American Industrial Heat Transfer, Inc. heat exchanger are solely the responsibility of the user.*



3/8" NPT Zinc Anode PN: 301-0004
AB-400 thru AB-1000 AA-400 thru AA-1000 CS-600 thru CS-1000



1/2" NPT Zinc Anode PN: 301-0003
AB-1200 thru AB-2000 AA-1200 thru AA-1600 CS-1200 thru CS-1700

AIR COOLED HEAT EXCHANGERS

AC, ACF & ACHM Series
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AOCH & AOCHM Series
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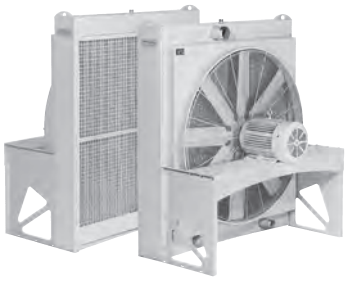
AOCHL Series
Page (182-185)



AOCS Series
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ACOC Combi Cooler Series
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AOCSH Series
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ASME Air / LiquidSeries
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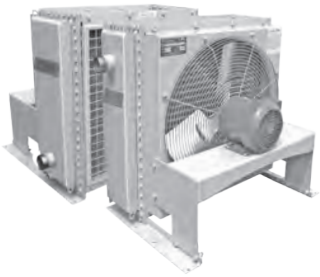

ACL Series
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EOC & EOCF Series
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ACA Series
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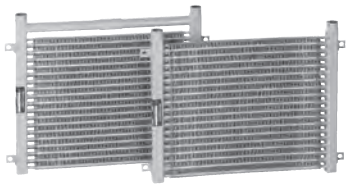

AOM & AOMR Series
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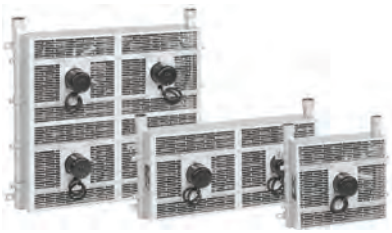

AOMF Series
Page (245-249)

LP Series
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M & ME Series
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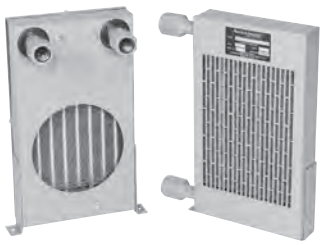
BME Series
Page (263-266)



BM Series
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Accessories
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American Industrial Heat Transfer Inc.
Manufacturer of Quality Heat Exchangers

website : www.aihti.com
general email : sales@aihti.com
technical email : engineering@aihti.com

Air Cooled Liquid Cooler Application Request:

For AC - ACF - ACHM Series

Email form to: sales@aihti.com or engineering@aihti.com or fax to 434-757-1810

Contact Name _____ Telephone _____ Date _____

Company Name _____ Email _____

Address: _____ Fax _____

_____

Hot Side

Fluid Type _____

If available:
Density _____ lb/ft3
Viscosity _____ cP
Thermal Conductivity _____ Btu/hr.ft.°F
Specific Heat _____ Btu/lb.°F

1. Flow Rate _____
2. Temperature In _____
3. Desired Temperature Out _____
4. Heat Load _____

Cold Side

Ambient Air _____

Altitude _____

1. Operating Pressure _____
2. Allowable Pressure Drop _____

ASME Code and Certified Yes ☐ No ☐

To properly size the heat exchanger we need 3 of the 4 perameters on the Hot Side.

Cabinet Material:

Standard : Steel ☐

Options:
Galvanized Steel ☐
Stainless Steel ☐

Tubing Material:

Standard : Copper ☐
90/10 Copper Nickel ☐
Stainless Steel ☐

Motor

60Hz:
230/460 Volt, 3 Phase ☐
115/230 Volt, 1 Phase ☐
575 Volt, 3 Phase ☐

50Hz
230/400 Volt, 3 Phase ☐
110/220 Volt, 1 Phase ☐

Hydraulic Motor ☐

Coating

Standard Enamaled Gray Paint ☐

Options:
Epoxy Paint ☐

Fins

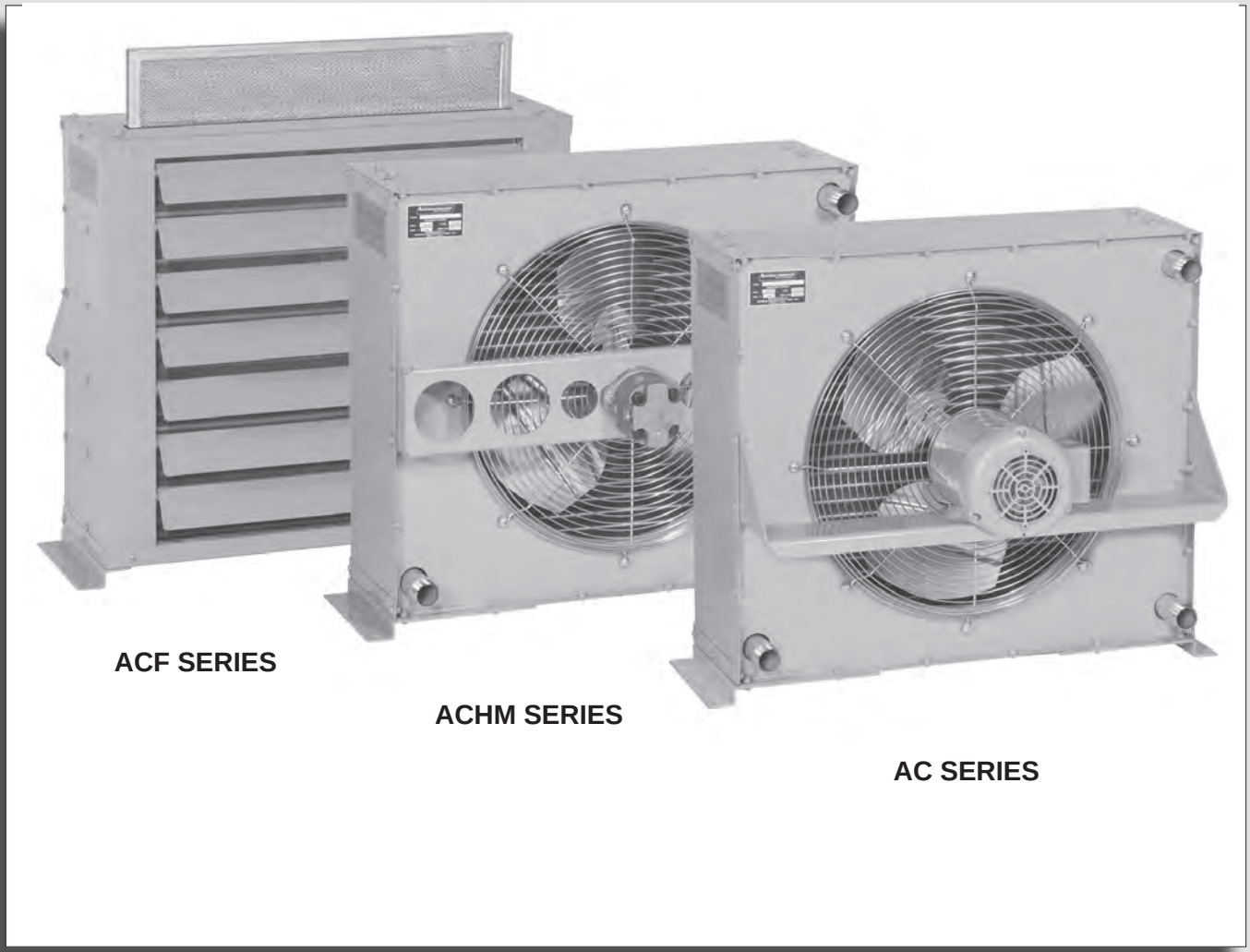
Standared Aluminum ☐

Options:
Copper ☐
Optional Coating:
Heresite ☐

Comment: _____

_____

AC - ACF - ACHM SERIES



ACF SERIES

ACHM SERIES

AC SERIES

Air Cooled

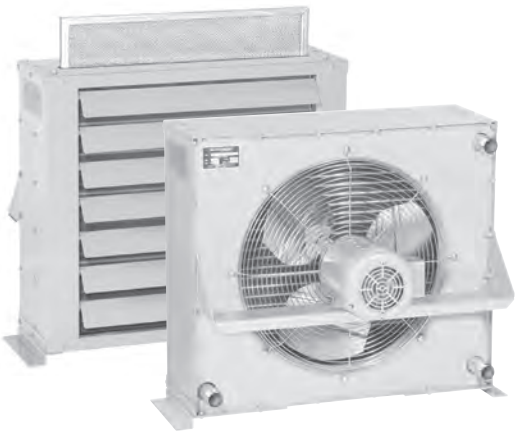
LIQUID COOLERS

- Thermal capacity to 100 hp (75 Kw).
- Computerized selection program.
- Standard ports NPT, optional SAE straight thread or flange connections.
- Optional: built-in bypass relief valve.
- Operating temperature of 300° F and pressure of 300PSI.
- Computer generated data sheet available for any application
- Custom designs to fit your needs.
- Cools: Fluid Power Systems, Lubrication Systems, Hydraulic Presses, Gear Drives, Torque Convertors, Machine Tools, Etc...

AC, ACF & ACHM Series *overview*

AC SERIES with electric drive

Industrial air-cooled liquid coolers, three row rolled tube servicable core heat exchangers with direct electric drive cooling fan, OSHA guard, and air directing louvers.Rated operating temperature of 300ºF at 300 PSIG. Services standard flow rates from 2 to 120 GPM. Thermal capacity up to 100 hp (75Kw). NPT, flange, or SAE straight thread port connections. Optional built-in bypass relief valve 30 PSI or 65 PSI. Can be modified to meet your requirements. Suitable for most hydraulic oils, lubrications oils, synthetic compressor oils, phosphate ester, ethylene glycol, and many other fluids compatible with listed material.



ACF SERIES with electric drive

Industrial air-cooled liquid coolers, three row rolled tube heat exchangers with washable internal filter located between the fan and core, direct electric drive cooling fan, OSHA guard, and air directing louvers. Washable filter helps prevent airborne dust and debris from collecting on the core fins for continued optimum performance. Filter can be easily removed within minutes from the filter track, cleaned or replaced for continued service. Rated operating temperature of 300ºF at 300 PSIG. Thermal capacity up to 100 hp (75Kw). Optional built-in bypass relief valve 30 PSI or 65 PSI. Can be modified to meet your requirements. The ACF series can be used in environments such as Sawmills or foundries, etc...where excessive airborne dust or debris may be present.

ACHM SERIES with hydraulic drive

Industrial air-cooled liquid coolers, three row rolled tube heat exchangers with hydraulic drive cooling fan, OSHA guard, and air directing louvers. Rated operating temperature of 300ºF at 300 PSIG. Services standard flow rates from 2 to 120 GPM. Thermal capacity up to 100 hp (75Kw). NPT, flange, or SAE straight thread port connections. Optional built-in bypass relief valve 30 PSI or 65 PSI. Can be modified to meet your requirements. Suitable for most hydraulic oils, lubrications oils, synthetic compressor oils, phosphate ester, ethylene glycol, and many other fluids compatible with listed material.

AOCH SERIES

Industrial air-cooled liquid coolers, dimensionally similar to AC & ACHM Series with higher capacity and performance. Six row rolled tube heat exchangers with direct electric drive cooling fan, OSHA guard, air directing louvers and Servicable Core ®. Rated operating temperature of 300ºF at 300 PSIG. Can be modified to meet your requirements. Suitable for most hydraulic oils, lubrications oils, synthetic compressor oils, phosphate ester, ethylene glycol, and many other fluids compatible with listed material.

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HIGH PERFORMANCE TURBULATOR

Exclusive American Industrial Turbulators (installed in every flow tube) increase heat transfer by more than 100%.

American Industrial Turbulators eliminate the laminar flow condition normally associated with other smooth tube heat exchangers. High viscosity hydraulic and lubricating oils are easily cooled by this new state-of-the-art turbulator.

SUPERIOR COOLING FINS

Seamless copper tubes are mechanically bonded to highly efficient aluminum cooling fins. Die-formed fin collars provide a durable precision fit for maximum heat transfer.

Custom fin design forces air to become turbulent and carry heat away more efficiently than old flat fin designs.

CONSTRUCTION MATERIALS & RATINGS

Standard Construction Materials		Optional Construction Materials	Standard Unit Ratings	
Tubes	Copper	Carbon Steel	Operating Pressure	300 psig
Fins	Aluminum	Copper	Operating Temperature	300 °F
Turbulators	Steel	Brass	Max. Flow Internal Relief	38 gpm
Manifold	Steel	Stainless Steel	Max. Fan Over-speed	10 %
Connection pipes	Steel	Stainless Steel	Max. Ambient Conditions	104 °F
Cabinet & frame	Steel	Galvanized Steel, 316L Stainless Steel	Altitude	0-3300 ft.
Fan Blade	Aluminum with steel hub	Plastic, Non-sparking		
Fan Guard	Zinc plated steel			

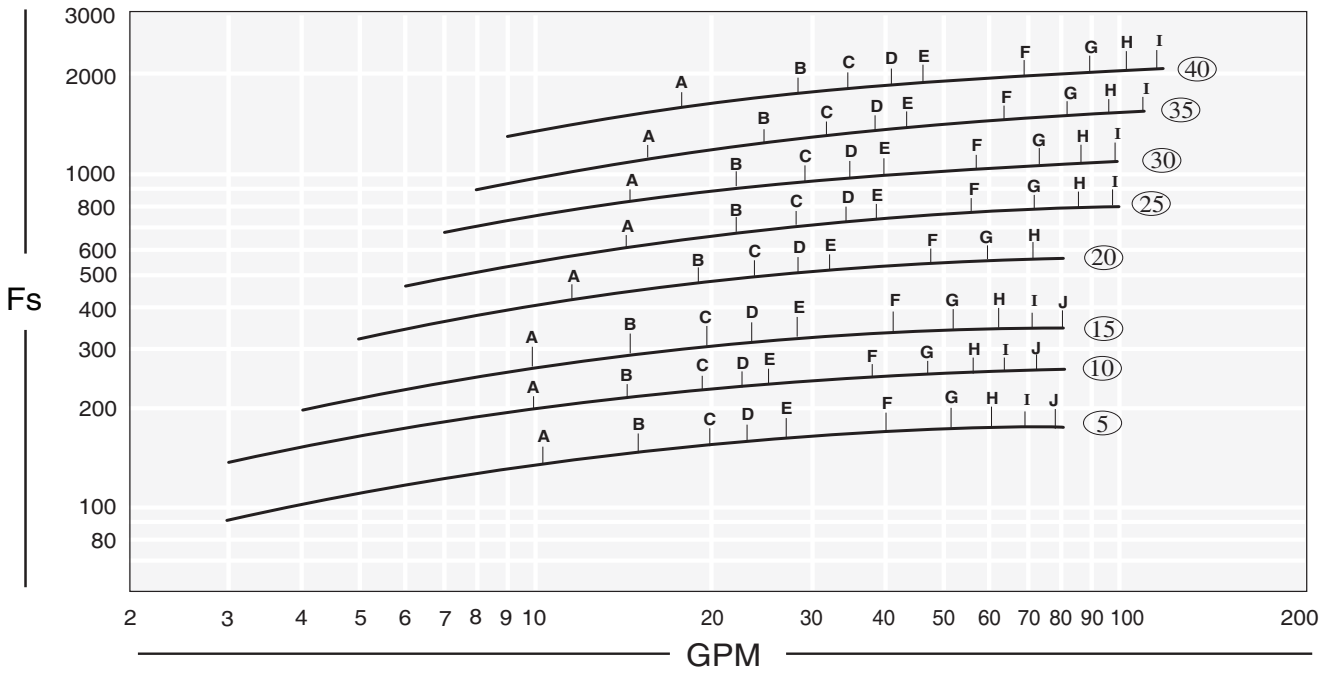
Accessories

Electrical Temperature controller with
Bulb Well Assembly (for Air / Liquid Coolers)

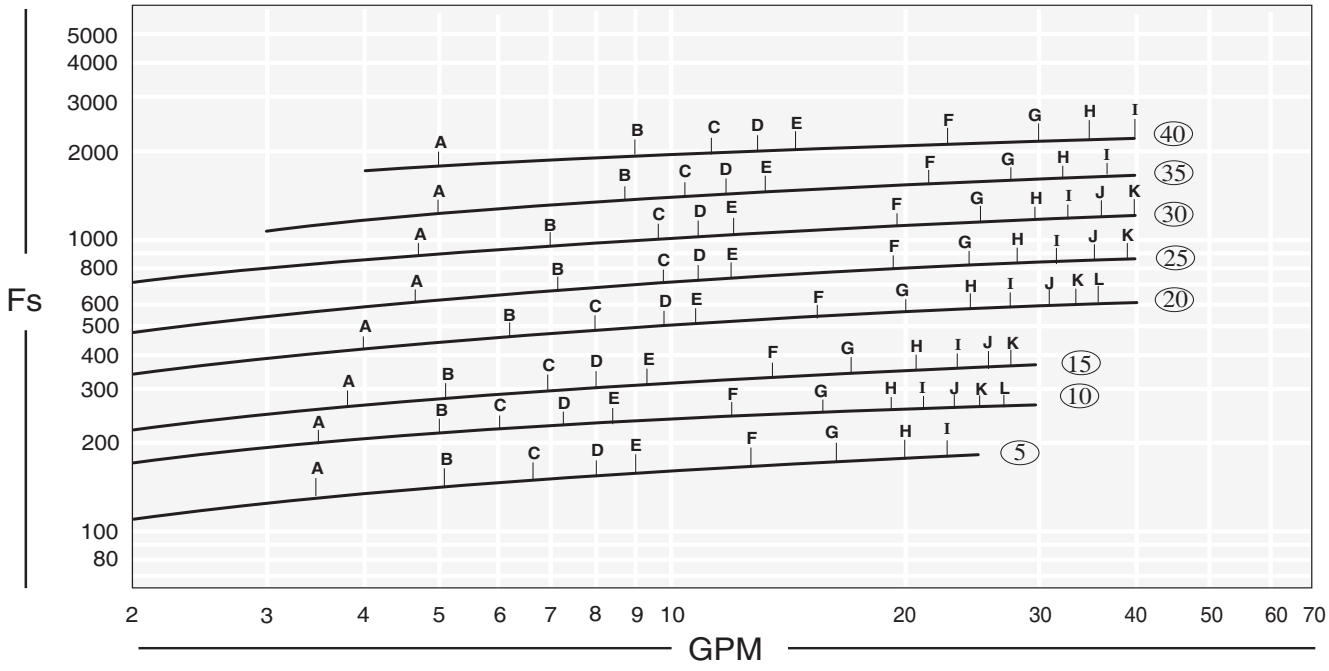
Part Number	Description
310-4011	TC-511 with 6-Foot Capallary Tube & Bulb Well
310-4002	TC-511 with 20-Foot Capallary Tube & Bulb Well
310-2025	Replacement Bulb Well TC-511

AC, ACF & ACHM Series *performance*

ONE PASS



TWO PASS



PERFORMANCE CALCULATION	OIL PRESSURE DROP (PSI) CODE
$F_s = \frac{\text{Horsepower to be removed (HP) x 2545 x Cv}}{\text{°F (Oil Leaving* - Ambient Air Entering)}} = \frac{\text{BTU}}{\text{hr °F}}$	A = 1 PSI D = 4 PSI G = 15 PSI J = 30 PSI B = 2 PSI E = 5 PSI H = 20 PSI K = 35 PSI C = 3 PSI F = 10 PSI I = 25 PSI L = 40 PSI

*Represents desired fluid leaving the cooler.

Note: When a model selection has been made, record whether the selection was from the one pass curve or the Two Pass curve so that the unit can be properly plumbed. Incorrect installation can seriously affect the performance.

Sizing
The performance curves provided are for petroleum oil at 50 ssu viscosity. However, fluids with characteristics other than the above mentioned may be used by applying a correction factor.

Heat Load
If the heat load is unknown, a horsepower value can be calculated by first determining the systems total potential. For a basic hydraulic system, it is helpful to know whether the system is open loop (with a large reservoir) or closed loop (normally on mobile equipment, with a very small reservoir). System potentials may be calculated quickly by using one of the two methods below.

There are some system parameters that will be required to properly accomplish the sizing calculations. Without system parameters, it is difficult to determine the optimal heat exchanger size. Normally many of the system parameters can be found on hydraulic schematics or on tags located on the actual equipment. Following are some basic parameters that you should try to acquire before attempting the sizing calculations. However, it is not necessary to have every parameter listed below.

- Main system flow rate (gpm) & operating pressure (psi).
- Electric motor HP driving hydraulic pump (if more than one add up the Hp for all).
- Desired temperature (°F).
- Fluid type (SAE 10, 20, 30, etc....).
- Ambient air temperature (warmest day).
- Desired fan drive (hydraulic, electric, 12-24V DC, etc...).
- BTU's or HP to be cooled (normally given for lubrication systems).
- Maximum pressure drop allowed through the heat exchanger.
- Space available for heat exchanger (LxWxH).
- External air condition (dirty, papers,etc…).

Method 1
Normally used for open loop circuits. Multiply the main hydraulic systems Electric Motor Name plate Horsepower by a heat removal factor (normally 30-50%).

Example: 50 HP motor x 0.3 = 15 HP heat load

Method 2
Normally used when the HP input potential is unknown or for mobile applications where diesel engines operate the entire system.

Multiply system pressure by the flow rate of the main system divided by 1714 equals system potential (HP). Multiply the system HP by a heat removal factor (Normally 25-35%). Note: In some closed loop systems only a portion of the total system flow is directed through the heat exchanger. This may affect the cooler selection process substantially. You may contact our factory for additional technical assistance.

Example: $\frac{(2000 \text{ psi} \times 30 \text{ gpm})}{1714} = [35 \text{ HP} \times .25] = 8.75 \text{ HP heat load}$

Determining Fs value
To determine the proper size heat exchanger for your application, use the following equation to first determine the (Fs) factor:

$$Fs = \frac{\{\text{heat load (HP)} \times 2545 \times Cv\}}{\{\text{°F (oil leaving - air entering)}\}}$$

Example:
Heat load = 8.75 HP
Cv = 1.14 (SAE 20) determined from chart. [Located on page 5.]
Desired operating temperature = 120 ºF
Ambient air temp. = 100 ºF

$$Fs = \frac{\{8.75 \times 2545 \times 1.14\}}{\{120\ °F - 100\ °F\}} = 1269$$

Selection
To select a model, locate the flow rate (GPM) at the bottom of the flow vs Fs graph (on page 4). Proceed upward until the GPM flow rate intersects with the calculated Fs. The curve closest above the intersection point will meet these conditions.

Example: Fs = 1269 = Model = AC,ACHM,ACF - 35
GPM = 40
PASSES = 1

Pressure differentials
Determine the oil pressure drop from the curves as indicated. For viscosities other than 50 ssu, multiply the actual indicated pressure drop for your GPM flow by the value shown in the pressure differential curve for your viscosity value.

Example: Model 35 @ 40 gpm & 50 ssu -1 pass curve-
Indicated pressure drop 4.2 psi (Approx)
{ 4.2 psi x 2.8Cp (for SAE-20 oil) } = 11.76 corrected psi

Average Liquid Temperature	Cv VISCOSITY CORRECTION FACTORS																
	SAE 5	SAE 10	SAE 20	SAE 30	SAE 40	ISO 22	ISO 32	ISO 46	ISO 68	ISO 100	ISO 150	ISO 220	ISO 320	MIL-L-7808	POLYGLYCOL	PHOSPHATE ESTER	50% ETHYLENE GLYCOL & WATER
100	1.11	1.15	1.25	1.38	1.45	1.08	1.14	1.18	1.26	1.37	1.43	1.56	1.84	1.19	0.92	0.83	0.85
110	1.09	1.12	1.20	1.32	1.40	1.06	1.13	1.16	1.25	1.31	1.39	1.48	1.67	1.14	0.89	0.80	0.84
120	1.06	1.10	1.17	1.27	1.35	1.04	1.11	1.14	1.20	1.27	1.35	1.40	1.53	1.09	0.88	0.79	0.84
130	1.04	1.08	1.13	1.24	1.29	1.03	1.09	1.13	1.17	1.24	1.30	1.34	1.44	1.05	0.85	0.77	0.83
140	1.03	1.05	1.11	1.19	1.25	1.02	1.08	1.10	1.16	1.20	1.26	1.30	1.39	1.03	0.84	0.76	0.82
150	1.01	1.04	1.09	1.16	1.22	1.02	1.06	1.09	1.13	1.17	1.22	1.27	1.33	1.01	0.83	0.74	0.82
200	0.98	0.99	1.01	1.04	1.07	0.98	0.99	1.00	1.01	1.02	1.08	1.09	1.14	0.98	0.79	0.71	0.80
250	0.95	0.96	0.97	0.98	0.99	0.95	0.96	0.96	0.96	0.97	0.99	1.01	1.02	0.97	0.76	0.69	0.79

Average Liquid Temperature	Cp PRESSURE DROP CORRECTION FACTORS																
	SAE 5	SAE 10	SAE 20	SAE 30	SAE 40	ISO 22	ISO 32	ISO 46	ISO 68	ISO 100	ISO 150	ISO 220	ISO 320	MIL-L-7808	POLYGLYCOL	PHOSPHATE ESTER	50% ETHYLENE GLYCOL & WATER
100	2.00	2.40	4.40	6.40	8.80	1.07	1.53	1.82	2.54	4.19	6.44	9.38	13.56	1.26	3.00	3.50	0.730
110	1.70	2.10	3.60	5.10	6.70	1.04	1.45	1.72	2.35	3.73	5.70	8.33	11.63	1.20	2.40	2.90	0.720
120	1.50	1.80	3.00	4.20	5.60	1.02	1.38	1.60	2.15	3.26	4.91	7.23	9.73	1.14	2.10	2.50	0.709
130	1.40	1.60	2.60	3.40	4.50	0.99	1.30	1.49	1.94	2.80	4.14	6.19	7.80	1.08	1.90	2.20	0.698
140	1.30	1.50	2.23	2.90	3.70	0.97	1.23	1.38	1.75	2.38	3.47	5.20	6.11	1.03	1.90	2.00	0.686
150	1.20	1.30	1.90	2.50	3.10	0.95	1.17	1.30	1.61	2.04	2.90	4.35	4.77	0.98	1.70	1.90	0.676
200	0.93	0.96	1.20	1.40	1.60	0.89	0.99	1.08	1.18	1.33	1.59	1.74	1.95	0.90	1.20	1.30	0.635
250	0.81	0.82	0.92	0.97	1.05	0.85	0.93	0.96	1.03	1.11	1.21	1.22	1.23	0.83	1.00	1.05	0.556

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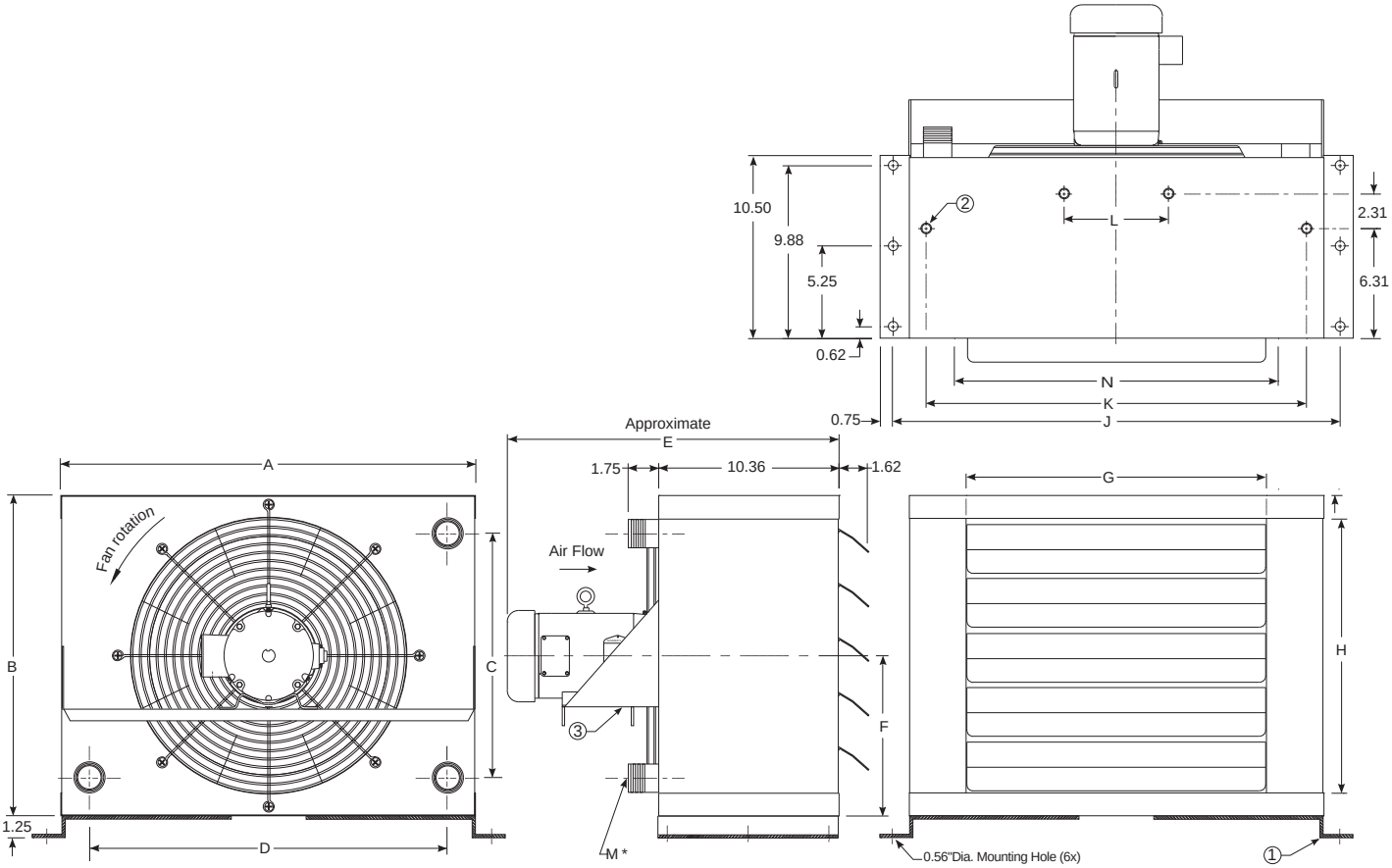
AC Series *dimensions*



DIMENSIONS (inches)													
Model	A	B	C	D	E	F	G	H	J	K	L	M NPT	M SAE
AC - 5 - ✱	14.81	11.81	7.69	11.69	17.56	5.90	8.31	9.19	16.81	12.94	—	1.00	16 SAE 1 5/16 - 12UN-2B Thread
AC - 10 - ✱	19.00	13.13	8.88	15.88	17.13	6.56	12.50	10.50	21.00	17.13	—	1.00	
AC - 15 - ✱	20.38	15.75	11.50	17.25	17.44	7.88	13.88	13.12	22.38	18.50	—	1.00	
AC - 20 - ✱	23.81	18.38	14.00	20.56	17.56	9.19	17.19	15.75	25.81	21.81	—	1.25	20 SAE 1 5/8 - 12UN-2B Thread
AC - 25 - ✱	26.68	23.63	19.25	23.56	17.56	11.81	20.19	21.00	28.68	24.81	—	1.25	
AC - 30 - ✱	31.63	27.56	23.19	28.50	17.63	13.78	25.13	24.94	33.63	29.75	11.00	1.25	
AC - 35 - ✱	33.81	30.19	25.81	30.69	20.75	15.09	27.31	27.56	35.81	31.94	11.00	1.25	
AC - 40 - ✱	41.63	36.75	32.38	38.50	19.63	18.38	35.13	34.12	43.63	39.75	13.25	1.25	

✱ Represents options.

Notes:

1) Removable base mounting brackets are supplied with unit at no additional charge.
2) 1/2-12 UNC-2B Tabs, 4 points, 8 points on models AC - 30,35 & 40 (top & bottom) for optional mounting purposes.
3) Motor mounting bracket is rotated 90 degrees on AC - 5 & 10 units.
4) Louvers are manually adjustable. However, all units are available with a screen front as an option (specify when ordering).
5) All units are available with an optional preset 30 or 65-psi pressure bypass valve. (see note "i" in maintenance on page 143)
6) All units can be connected in one or Two Pass configuration. Refer to piping instructions for detailed operating and maintenance information.

Example of a model:

AC - 35 - 3 - S - R65 - 2P - ____ - ____

Model

Size

Drive Type
N = no motor
1 = single phase
3 = three phase
1EXP = single phase
3EXP = three phase
5 = 575 Volt

Connections
Blank = NPT
S = SAE O-Ring
F = 4 Bolt Flange
A = ANSI 150#RF Flange

Bypass
R30 = 30psi
R65 = 65psi

Number of Passes
1P = 1 pass
2P = 2 pass

Tubing
Blank = Copper
C = Carbon Steel
U = 90/10 CN
SS = Stainless Steel

Coating
Blank = Enamel (standard)
G = Galvanize (cabinet)
T = Heresite (core)
X = Epoxy (cabinet)
STS = Stainless Steel (cabinet)

note: AIHTI reserves the right to make reasonable design changes without notice.

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AC ELECTRIC MOTOR @ 60 Hz. DATA

Model	Horse Power	Phase	Hz	Volts	RPM	NEMA Frame	Type	Full Load Amperes	Service Factor	Thermal Overload
AC-5, AC-10, AC-15, AC-20	1/4	1	60	115/230	1800	48	TEFC	2.6/1.3	1.15	No
AC-5, AC-10, AC-15, AC-20	1/4	3	60	208-230/460	1800	48	TEFC	1.4/0.7	1.0	No
AC-5, AC-10, AC-15, AC-20	1/3	3	60	575	1800	56	TEFC	0.6	1.15	No
AC-25 , AC-30	1/4	1	60	115/208-230	1200	48	TEFC	6.4/3.2	1.0	No
AC-25 , AC-30	1/4	3	60	208-230/460	1200	48	TEFC	1.4/0.7	1.0	No
AC-25 , AC-30	1/2	3	60	575	1200	56	TEFC	1.0	1.15	No
AC-35 , AC-40	1/2	1	60	115/208-230	1200	56	TEFC	8.0/4.0	1.0	No
AC-35 , AC-40	1/2	3	60	208-230/460	1200	56	TEFC	2.4/1.2	1.0	No
AC-35 , AC-40	1/2	3	60	575	1200	56	TEFC	1.0	1.15	No

AC ELECTRIC MOTOR @ 50 Hz. DATA

Model	Horse Power	Phase	Hz	Volts	RPM	NEMA Frame	Type	Full Load Amperes	Service Factor	Thermal Overload
AC-5,10,15,20	1/3	1	50	110/220	1500	56	TEFC	6.4/3.2	1.15	No
AC-5,10,15,20	1/4	3	50	220/380	1500	48	TEFC	1.7/1.0	1.15	No
AC-25 , AC-30	1/3	1	50	110/220	1500	56	TEFC	6.4/3.2	1.15	No
AC-25 , AC-30	1/4	3	50	220/380	1500	48	TEFC	1.7/1.0	1.15	No
AC-35 , AC-40	1/2	1	50	110/220	1500	56	TEFC	6.4/3.6	1.0	No
AC-35 , AC-40	1/2	3	50	220/380	1500	56	TEFC	2.0/1.15	1.15	No

CLASS I,DIV.1, GROUP D or CLASS II,DIV.2, GROUP F & G EXPLOSION PROOF MOTOR DATA

Model	Horse Power	Phase	Hz	Volts	RPM	NEMA Frame	Enclosure Type	Full Load Amperes	Service Factor	Thermal Overload
AC-5,10,15-EXP	1/4	1	60	115-208/230	1800	48	X-PROOF	5.0/2.5	1.0	Yes
AC-5,10,15-EXP	1/4	3	60	208-230/460	1800	48	X-PROOF	1.4/0.7	1.0	Yes
AC-20-EXP	1/2	1	60	115-208/230	1800	48	X-PROOF	7.4/3.7	1.0	Yes
AC-20-EXP	1/2	3	60	208-230/460	1800	48	X-PROOF	2.0/1.0	1.0	Yse
AC-25,30-EXP	1/2	1	60	115/230	1200	56	X-PROOF	8.0/4.0	1.0	Yes
AC-25,30-EXP	1/2	3	60	208-230/460	1200	56	X-PROOF	2.4/1.2	1.0	Yes
AC-35,40-EXP	1.0	1	60	115-208/230	1200	184	X-PROOF	14.0/7.0	1.0	No
AC-35,40-EXP	1.0	3	60	230/460	1200	56	X-PROOF	3.8/1.9	1.0	No

NOTE: All of the AC Series explosion proof motors are available in 50hz upon request as a special

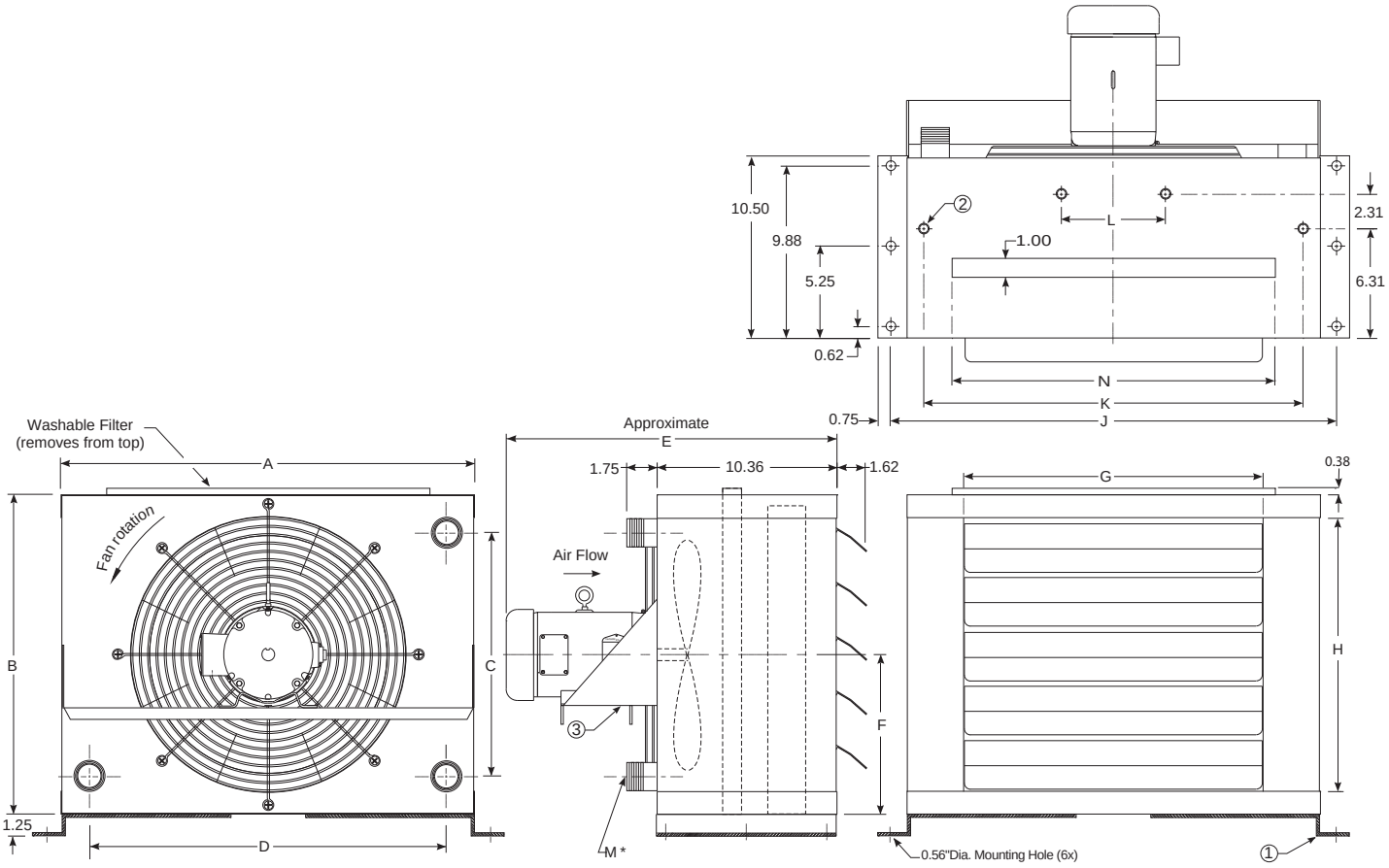
ELECTRIC MOTOR NOTES:

1) All motors are NEMA, high efficiency
2) Motor electrical ratings are an approximate guide and may vary between motor manufacturers. Consult ratings on motor data plate prior to installation and operation.
3) High temperature, severe duty, chemical, IEC, Canadian Standards Association, and Underwriters Laboratory recognized motors are available upon request.
4) American Industrial reserves the right to enact changes to motor brand, type and ratings regarding horsepower, RPM,FLA,and service factor for standard products without notice. All specific requirements will be honored without change.
5) Fan rotation is clockwise when facing the motor shaft.
6) The above motors contain factory lubricated shielded ball bearings (no additional lubrication is required).

7) Abbreviation Index

TEFC.....Totally Enclosed, Fan Cooled
X-PROOF.....Explosion Proof

ACF Series *dimensions*



DIMENSIONS (inches)													
Model	A	B	C	D	E	F	G	H	J	K	L	M NPT	M SAE
ACF - 5 - ✱	14.81	11.81	7.69	11.69	17.56	5.90	8.31	9.19	16.81	12.94	—	1.00	16 SAE 1 5/16 - 12UN-2B Thread
ACF - 10 - ✱	19.00	13.13	8.88	15.88	17.13	6.56	12.50	10.50	21.00	17.13	—	1.00	
ACF - 15 - ✱	20.38	15.75	11.50	17.25	17.44	7.88	13.88	13.12	22.38	18.50	—	1.00	
ACF - 20 - ✱	23.81	18.38	14.00	20.56	17.56	9.19	17.19	15.75	25.81	21.81	—	1.25	20 SAE 1 5/8 - 12UN-2B Thread
ACF - 25 - ✱	26.68	23.63	19.25	23.56	17.56	11.81	20.19	21.00	28.68	24.81	—	1.25	
ACF - 30 - ✱	31.63	27.56	23.19	28.50	17.63	13.78	25.13	24.94	33.63	29.75	11.00	1.25	
ACF - 35 - ✱	33.81	30.19	25.81	30.69	20.75	15.09	27.31	27.56	35.81	31.94	11.00	1.25	
ACF - 40 - ✱	41.63	36.75	32.38	38.50	19.63	18.38	35.13	34.12	43.63	39.75	13.25	1.25	

✱ Represents options.

Notes:

1) Removable base mounting brackets are supplied with unit at no additional charge.
2) 1/2-12 UNC-2B Tabs, 4 points, 8 points on models ACF - 30,35 & 40 (top & bottom) for optional mounting purposes.
3) Motor mounting bracket is rotated 90 degrees on ACF - 5 & 10 units.
4) Louvers are manually adjustable. However, all units are available with a screen front as an option (specify when ordering).
5) All units are available with an optional preset 30 or 65-psi pressure bypass valve. (see note "i" in maintenance on page 143)
6) All units can be connected in one or Two Pass configuration. Refer to piping instructions for detailed operating and maintenance information.
7) Filters are flame retardant, washable, and reusable woven synthetic with polyglass.

Example of a model:

ACF - 35 - 3 - S - R65 - 2P - ____ - ____

Model

Size

Drive Type
N = no motor
1 = single phase
3 = three phase
1EXP = single phase
3EXP = three phase
5 = 575 Volt

Connections
Blank = NPT
S = SAE O-Ring
F = 4 Bolt Flange
A = ANSI 150#RF Flange

Bypass
R30 = 30psi
R65 = 65psi

Number of Passes
1P = 1 pass
2P = 2 pass

Tubing
Blank = Copper
C = Carbon Steel
U = 90/10 CN
SS = Stainless Steel

Coating
Blank = Enamel (standard)
G = Galvanize (cabinet)
T = Heresite (core)
X = Epoxy (cabinet)
STS = Stainless Steel (cabinet)

note: AIHTI reserves the right to make reasonable design changes without notice.

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ACF ELECTRIC MOTOR @ 60 Hz. DATA

Model	Horse Power	Phase	Hz	Volts	RPM	NEMA Frame	Type	Full Load Amperes	Service Factor	Thermal Overload
ACF-5,10,15	1/4	1	60	115/230	1800	48	TEFC	2.6/1.3	1.15	No
ACF-5,10,15	1/4	3	60	208-230/460	1800	48	TEFC	1.4/0.7	1.0	No
ACF-5,10,15	1/3	3	60	575	1800	56	TEFC	0.6	1.15	No
ACF-20	1/2	1	60	115/208-230	1800	48	TEFC	7.4/3.7	1.0	No
ACF-20	1/2	3	60	208/230-460	1800	48	TEFC	2.0/1.0	1.0	No
ACF-20	1/3	3	60	575	1800	56	TEFC	0.6	1.15	No
ACF-25 , ACF-30	1/2	1	60	115/208-230	1200	56	TEFC	8.0/4.0	1.0	No
ACF-25 , ACF-30	1/2	3	60	208-230/460	1200	56	TEFC	2.4/1.2	1.0	No
ACF-25 , ACF-30	1/2	3	60	575	1200	56	TEFC	1.0	1.15	No
ACF-35 , ACF-40	1.0	1	60	115/208-230	1200	184	TEFC	14.0/7.0	1.0	No
ACF-35 , ACF-40	1.0	3	60	208-230/460	1200	56	TEFC	3.6/1.8	1.15	No
ACF-35 , ACF-40	1/2	3	60	575	1200	56	TEFC	1.0	1.15	No

ACF ELECTRIC MOTOR @ 50 Hz. DATA

Model	Horse Power	Phase	Hz	Volts	RPM	NEMA Frame	Type	Full Load Amperes	Service Factor	Thermal Overload
ACF-5,10,15	1/3	1	50	110/220	1500	56	TEFC	6.4/3.2	1.15	No
ACF-5,10,15	1/2	3	50	220/380	1500	56	TEFC	2.0/1.15	1.0	No
ACF-20	1/2	1	50	110/220	1500	56	TEFC	7.2/3.6	1.0	No
ACF-20	1/2	3	50	220/380	1500	56	TEFC	2.0/1.15	1.0	No
ACF-25,30	1/2	1	50	110/220	1500	48	TEFC	7.2/3.6	1.0	No
ACF-25,30	1/2	3	50	220/380	1500	56	TEFC	2.0/1.15	1.0	No
ACF-35,40	1.0	1	50	110/220	1500	56	TEFC	12.4/6.2	1.0	No
ACF-35,40	1.0	3	50	220/380	1500	143T	TEFC	3.5/2.0	1.0	No

CLASS I,DIV.1, GROUP D or CLASS II,DIV.2, GROUP F & G EXPLOSION PROOF MOTOR DATA

Model	Horse Power	Phase	Hz	Volts	RPM	NEMA Frame	Enclosure Type	Full Load Amperes	Service Factor	Thermal Overload
ACF - 5,10,15 - 1 - EXP	1 / 4	1	60	115-208 / 230	1800	48	X-PROOF	5.0/2.5	1 . 0	Yes
ACF - 5,10,15 - 3 - EXP	1 / 4	3	60	208-230 / 460	1800	48	X-PROOF	1.4/0.7	1 . 0	Yes
ACF - 20 - 1 - EXP	1 / 2	1	60	115-208 / 230	1800	48	X-PROOF	7.4/3.7	1 . 0	Yes
ACF - 20 - 3 - EXP	1 / 2	3	60	208-230 / 460	1800	48	X-PROOF	2.0/1.0	1 . 0	Yes
ACF - 25,30 - 1 - EXP	1 / 2	1	60	115 / 230	1200	56	X-PROOF	8.0/4.0	1 . 0	Yes
ACF - 25,30 - 3 - EXP	1 / 2	3	60	208-230 / 460	1200	56	X-PROOF	2.4/1.2	1 . 0	Yes
ACF - 35,40 - 1 - EXP	1 . 0	1	60	115-208/230	1200	184	X-PROOF	14.0/7.0	1 . 0	No
ACF - 35,40 - 3 - EXP	1 . 0	3	60	230/460	1200	56	X-PROOF	3.8/1.9	1 . 0	No

NOTE: All of the ACF Series explosion proof motors are available in 50hz upon request as a special

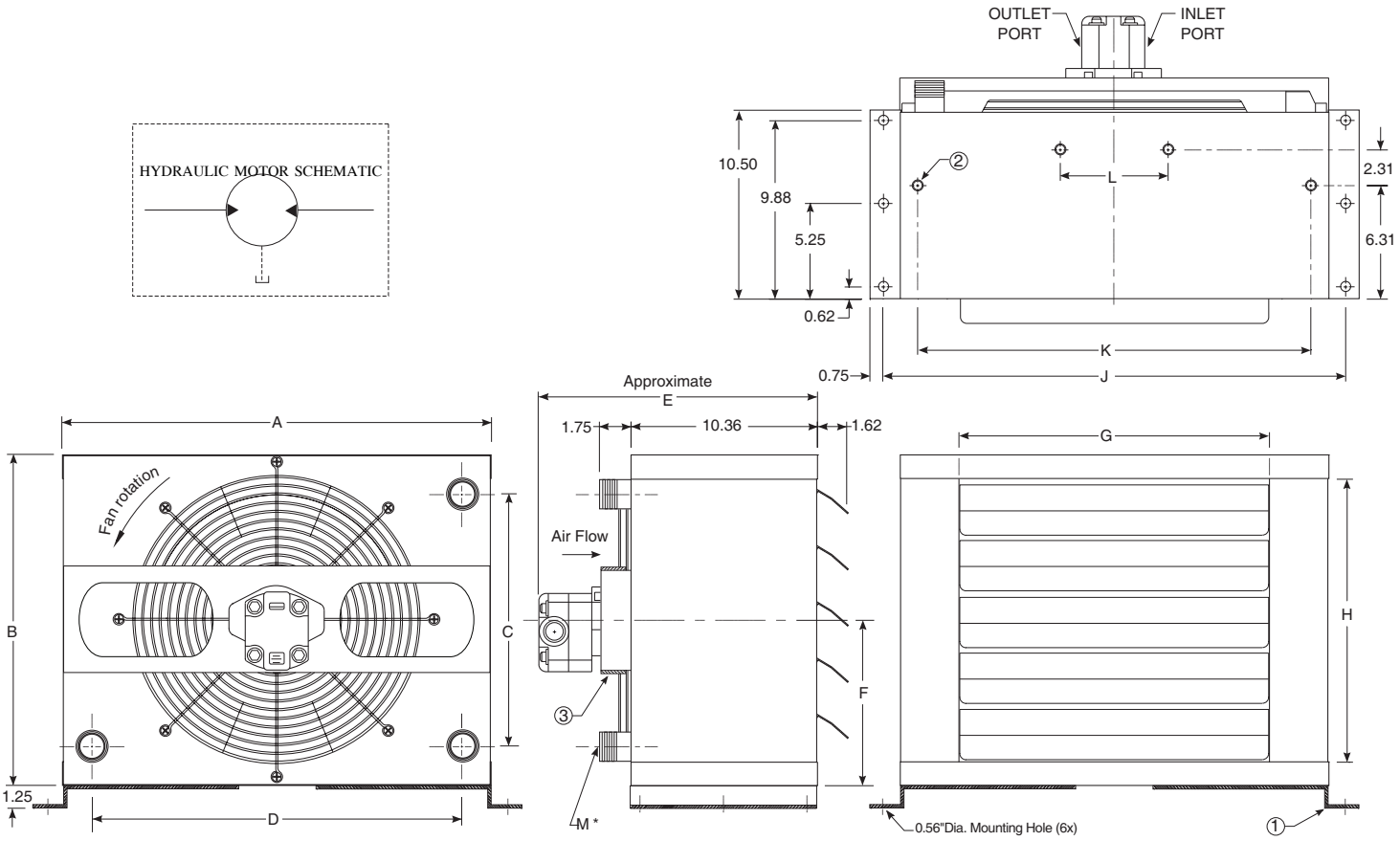
ELECTRIC MOTOR NOTES:

1) All motors are NEMA, high efficiency
2) Motor electrical ratings are an approximate guide and may vary between motor manufacturers. Consult ratings on motor data plate prior to installation and operation.
3) High temperature, severe duty, chemical, IEC, Canadian Standards Association, and Underwriters Laboratory recognized motors are available upon request.
4) American Industrial reserves the right to enact changes to motor brand, type and ratings regarding horsepower, RPM,FLA,and service factor for standard products without notice. All specific requirements will be honored without change.
5) Fan rotation is clockwise when facing the motor shaft.
6) The above motors contain factory lubricated shielded ball bearings (no additional lubrication is required).
7) **Abbreviation Index**

TEFC.....Totally Enclosed, Fan Cooled

X-PROOF.....Explosion Proof

ACHM SERIES *DIMENSIONS*



DIMENSIONS (inches)													
Model	A	B	C	D	E	F	G	H	J	K	L	M NPT	M SAE
ACHM - 5 - ✱	14.81	11.81	7.69	11.69	15.21	5.90	8.31	9.19	16.81	12.94	—	1.00	16 SAE 1 5/16 - 12UN-2B Thread
ACHM - 10 - ✱	19.00	13.13	8.88	15.88	15.21	6.56	12.50	10.50	21.00	17.13	—	1.00	
ACHM - 15 - ✱	20.38	15.75	11.50	17.25	15.21	7.88	13.88	13.12	22.38	18.50	—	1.00	
ACHM - 20 - ✱	23.81	18.38	14.00	20.56	15.21	9.19	17.19	15.75	25.81	21.81	—	1.25	20 SAE 1 5/8 - 12UN-2B Thread
ACHM - 25 - ✱	26.68	23.63	19.25	23.56	15.21	11.81	20.19	21.00	28.68	24.81	—	1.25	
ACHM - 30 - ✱	31.63	27.56	23.19	28.50	15.21	13.78	25.13	24.94	33.63	29.75	11.00	1.25	
ACHM - 35 - ✱	33.81	30.19	25.81	30.69	15.21	15.09	27.31	27.56	35.81	31.94	11.00	1.25	
ACHM - 40 - ✱	41.63	36.75	32.38	38.50	15.21	18.38	35.13	34.12	43.63	39.75	13.25	1.25	

✱ Represents options.

Notes:

1) Removable base mounting brackets are supplied with unit at no additional charge.
2) 1/2-12 UNC-2B Tabs, 4 points, 8 points on models ACHM - 30,35 & 40 (top & bottom) for optional mounting purposes.
3) Motor mounting bracket is rotated 90 degrees on ACHM - 5 & 10 units.
4) Louvers are manually adjustable. However, all units are available with a screen front as an option (specify when ordering).
5) All units are available with a preset 30 or 65-psi pressure bypass valve. (see note "i" in maintenance page 143)
6) All units can be connected in one or Two Pass configuration. Refer to piping instructions for detailed operating and maintenance information.

Example of a model:

ACHM - 35 - 9 - S - R65 - 2P - ____ - ____

- **Model**: ACHM = std. unit with hydraulic motor
- **Size**: 35
- **Drive Type**: N = no motor; 9 = hydraulic motor
- **Connections**: Blank = NPT; S = SAE O-Ring; F = 4 Bolt Flange; A = ANSI 150#RF Flange
- **Bypass**: R30 = 30psi; R65 = 65psi
- **Number of Passes**: 1P = 1 pass; 2P = 2 pass
- **Tubing**: Blank = Copper; C = Carbon Steel; U = 90/10 CN; SS = Stainless Steel
- **Coating**: Blank = Enamel (standard); G = Galvanize (cabinet); T = Heresite (core); X = Epoxy (cabinet); STS = Stainless Steel (cabinet)

note: AIHTI reserves the right to make reasonable design changes without notice.

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HYDRAULIC MOTOR DATA

Model	Motor RPM	Displacement		Required Flow		Min. pressure start / run PSIG	Case Drain SAE O-Ring	SAE Size	Side Port SAE O-Ring	Max. Continuous Pressure PSIG
		in^3/rev	ccm/rev	GPM	LPM					
ACHM - 5 - ✱	1725	0.43	7.0	3.75	14.2	500 / 300	#6 9/16 -18	A	#10 7/8 -14	3000
ACHM - 10 - ✱	1725	0.43	7.0	3.75	14.2	500 / 300	#6 9/16 -18	A	#10 7/8 -14	3000
ACHM - 15 - ✱	1725	0.43	7.0	3.75	14.2	500 / 300	#6 9/16 -18	A	#10 7/8 -14	3000
ACHM - 20 - ✱	1725	0.43	7.0	3.75	14.2	500 / 300	#6 9/16 -18	A	#10 7/8 -14	3000
ACHM - 25 - ✱	1140	0.43	7.0	2.50	9.5	500 / 300	#6 9/16 -18	A	#10 7/8 -14	3000
ACHM - 30 - ✱	1140	0.43	7.0	2.50	9.5	500 / 300	#6 9/16 -18	A	#10 7/8 -14	3000
ACHM - 35 - ✱	1140	0.43	7.0	2.50	9.5	600 / 400	#6 9/16 -18	A	#10 7/8 -14	3000
ACHM - 40 - ✱	1140	0.43	7.0	2.50	9.5	600 / 400	#6 9/16 -18	A	#10 7/8 -14	3000

HYDRAULIC MOTOR NOTES:

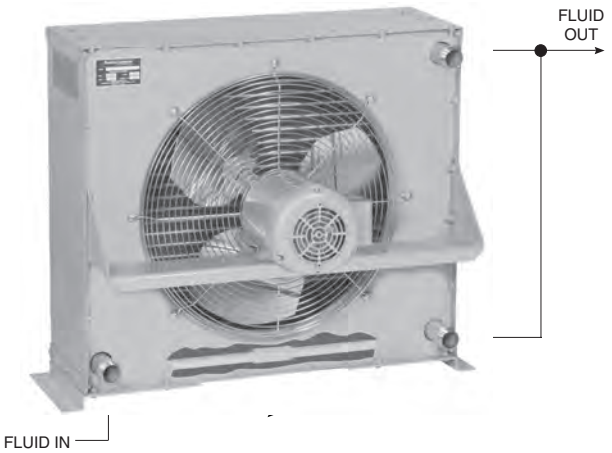
1) Standard ACHM units are supplied with a hydraulic gear motor for the fan drive. The gear motor requires an external case drain be used during operation. The external case drain should be connected directly to hydraulic reservoir or a return line with not greater than 10PSIG back pressure. (NOTE: *Failure to properly connect and use the external case drain during motor operation could result in motor failure and external leakage of hydraulic fluid.*
2) Hydraulic motor flow requirements are provided with an efficiency rating of approximately 85%. Pressure requirements are calculated theoretical minimum operating requirements.
3) Shaft adapters are used to bridge the differences in length between the fan and hydraulic motor.
4) Maximum degree of fluid contamination, class 18/15 according to ISO 4406. Therefore, it is recommended to use a filter with retention rating of B20>. For longer life, it is recommeded to use class 17/14 achievable with filter B10>-100.
5) Fan rotation is clockwise when facing the motor shaft.
6) Optional displacement motors available upon request.
7) American industrial reserves the right to enact changes to hydraulic motor, brand, type, ratings, port sizes, or any additional non-specified attribute for standard products without notice.

COMMON DATA

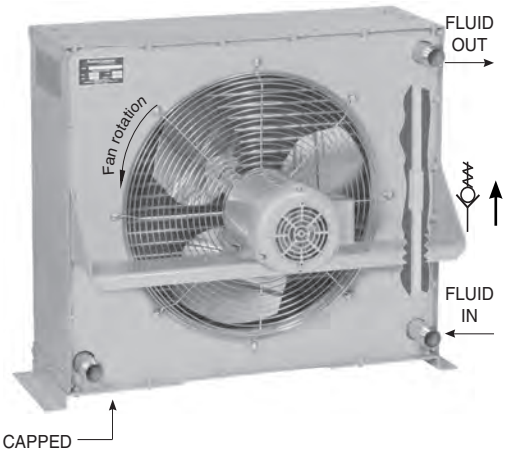
Model	Air Flow		Sound Level dB(A) @ 7ft	Liquid Volume		Approx. Weight Electric		Approx. Weight Hydraulic		Serviceable Core
	CFM	m^3/s		gal.	cm^3	lb	kg	lb	kg	
Model - 5 - ✱	494	.233	68	.59	2233	65	30	55	25	No
Model - 10 - ✱	710	.335	70	.72	2725	85	39	75	34	No
Model - 15 - ✱	1015	.479	70	.85	3218	95	43	85	39	No
Model - 20 - ✱	1555	.733	71	1.15	4352	130	59	110	50	No
Model - 25 - ✱	2240	1.05	72	1.52	5753	165	75	150	68	No
Model - 30 - ✱	3100	1.46	75	1.88	7116	190	86	175	79	No
Model - 35 - ✱	4370	2.06	76	2.26	8554	235	107	220	100	No
Model - 40 - ✱	5450	2.51	78	2.95	11166	275	125	260	118	No

NOTES: a) ✱ Represents the options for motor drive.
b) To estimate the sound level at distances other than 13 feet (4 meters) from the cooler, add 6 db for each halving of distance, or substract 6 db for each doubling of the distance.

PIPING HOOK UP *shown with relief valve*



ONE PASS



Two Pass

note: AIHTI reserves the right to make reasonable design changes without notice.

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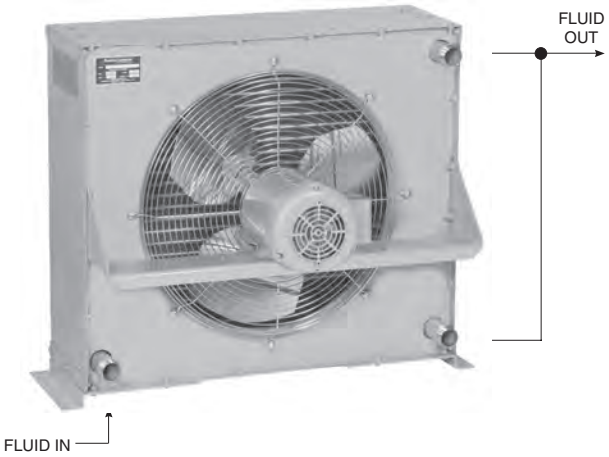
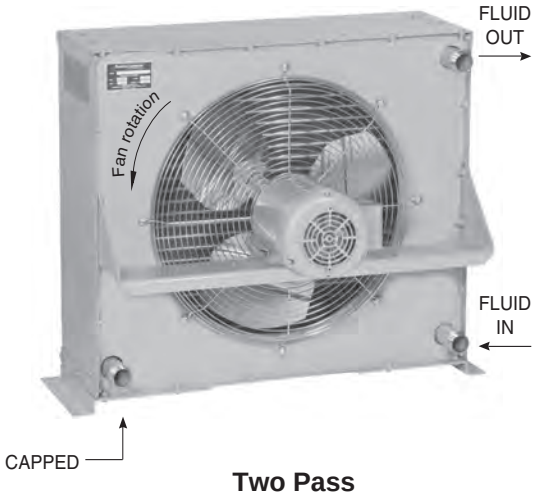
PIPING HOOK UP



ONE PASS



Two Pass

Receiving / Installation

a) Inspect unit for any shipping damage before uncrating. Indicate all damages to the trucking firms' delivery person and mark it on the receiving bill before accepting the freight. Make sure that the core and fan are not damaged. Rotate the fan blade to make sure that it moves freely. The published weight information located in this brochure is approximate. True shipment weights are determined at the time of shipping and may vary. Approximate weight information published herein is for engineering approximation purposes and should not be used for exact shipping weight. *Since the warranty is based upon the unit date code located on the model identification tag, removal or manipulation of the identification tag will void the manufacturers warranty.*

b) When handling the heat exchanger, special care should be taken to avoid damage to the core and fan. All units are shipped with wood skids for easy forklift handling

c) Standard Enamel Coating: American Industrial provides its standard products with a normal base coat of oil base air cure enamel paint. The enamel paint is applied as a temporary protective and esthetic coating prior to shipment. While the standard enamel coating is durable, American Industrial does not warranty it as a long-term finish coating. It is strongly suggested that a more durable final coating be applied after installation or prior to long-term storage in a corrosive environment to cover any accidental scratches, enhance esthetics, and further prevent corrosion. It is the responsibility of the customer to provide regular maintenance against chips, scratches, etc... and regular touch up maintenance must be provided for long-term benefits and corrosion prevention.

d) Special Coatings: American Industrial offers as customer options, Air-Dry Epoxy, and Heresite (Air-Dry Phenolic) coatings at additional cost. American Industrial offers special coatings upon request, however American Industrial does not warrantee coatings to be a permanent solution for any equipment against corrosion. It is the responsibility of the customer to provide regular maintenance against chips, scratches, etc... and regular touch up maintenance must be provided for long-term benefits and corrosion prevention.

e) American Industrial recommends that the equipment supplied should be installed by qualified personnel who have solid understanding of system design, pressure and temperature ratings, and piping assembly. Verify the service conditions of the system prior to applying any air cooled heat exchanger series cooler. If the system pressure or temperature does not fall within the parameters on model rating tag located on the heat exchanger, contact our factory prior to installation or operation.

g) Heat exchanger should be securely fastened using the mounting foot brackets (included). All mounting holes should be used to secure unit into place. Optional horizontal mounting with vertical airflow is allowable by removing the foot brackets and using the (4 or 8) 1/2"-13 screw hard points located on the top and bottom panel for fastening. Heat exchanger unit must be set into a fabricated channel type frame with provision for additional motor support for heavy motors in conjunction with 1/2" frame fastening bolt points. Since the units are normally operated in the vertical position (horizontal airflow) reinforced motor support is suggested.

h) Connections should be made in "one pass" or "Two Pass" configurations exactly as indicated in the "piping hook up" illustration above. The process flow entering the "Fluid IN" port and exiting the "Fluid OUT" port eliminates air pockets and assures that the unit will stay completely flooded. Flexible hose can be applied to reduce the risk of core failure due to thermal expansion or system vibration. Piping alignment and support is required for hoses longer than four feet in length and for piping exerting more than 20 lbs of dynamic force. It is recommended that filtration be

located ahead of the heat exchanger to prevent excessive backpressure and clogging.

i) With respect to the heat exchangers nozzle size, flow line sizes should be sized to handle the appropriate flow rate and system pressure drop requirements, normally flow line rates of about 8-12 feet per second and inlet pressure less than 100psig are experienced. If the flow line size is larger than the heat exchanger nozzle size, additional pressure loss beyond the published pressure loss data may occur.

j) Electric motors should be connected only to supply source of the same characteristics as indicated on the electric motor information plate. Prior to starting, verify that the motor and fan spin freely without obstruction. Check carefully that the fan turns in the correct rotation direction (normally counter clockwise) from the motor side (fan direction arrow). Failure to operate the fan in the proper direction could reduce performance or cause serious damage to the heat exchanger or other components. Fan blades should be rechecked for tightness after the first 100 hours of operation.

k) It is important to apply the catalog recommended flow rate for the hydraulic motor that corresponds with the specific model being used. A case drain is required for hydraulic motor installation. Failure to connect case drain can result in motor failure. The proper flow rate and direction to the hydraulic motor are critical to ensure fan direction and RPM. Exceeding the recommended RPM could result in fan failure and cause severe damage to the heat exchanger. See fan rotation on installation diagram

Maintenance

Regular maintenance intervals based upon the surrounding and operational conditions should be maintained to verify equipment performance and to prevent premature component failure. Since some of the components such as, motors, fans, load adapters, etc... are not manufactured by American Industrial, maintenance requirements provided by the manufacture must be followed.

a) Inspect the entire heat exchanger and motor/fan assembly for loosened bolts, loose connections, broken components, rust spots, corrosion, fin/coil clogging, or external leakage. Make immediate repairs to all affected areas prior to restarting and operating the heat exchanger or its components.

b) Heat exchangers operating in oily or dusty environments will often need to have the coil cooling fins cleaned. Oily or clogged fins should be cleaned by carefully brushing the fins and tubes with water or a non-aggressive degreasing agent mixture *(Note: Cleaning agents that are not compatible with copper, brass, aluminum, steel or stainless steel should not be used)*. A compressed air or a water stream can be used to dislodge dirt and clean the coil further. Any external dirt or oil on the electric motor and fan assembly should be removed. *Caution: Be sure to disconnect the electric motor from its power source prior to doing any maintenance.*

c) In most cases it is not necessary to internally flush the coil. In circumstances where the coil has become plugged or has a substantial buildup of material, flushing the coil with water or a solvent may be done. Flushing solvents should be non-aggressive suitable for the materials of construction. Serviceable Core® models can be disassembled and inspected or cleaned if required.

d) Most low horsepower electric motors do not require any additional lubrication. However, larger motors must be lubricated with good quality grease as specified by the manufacture at least once every 6-9 months or as directed by the manufacture. T.E.F.C. air ventilation slots should be inspected and cleaned regularly to prevent clogging and starving the motor of cooling air. To maintain the electric motor properly see the manufactures requirements and specifications.

e) Fan blades should be cleaned and inspected for tightness during the regular maintenance schedule when handling a fan blade care must be given to avoid bending or striking any of the blades. Fan blades are factory balanced and will not operate properly if damaged or unbalanced. Damaged fan blades can cause excessive vibration and severe damage to the heat exchanger or drive motor. Replace any damaged fan with an American industrial suggested replacement.

f) Air cooled exchanger cabinets are constructed using 7ga. through 18ga. steel that may be bent back into position if damaged. Parts that are not repairable can be purchased through American Industrial.

g) Coil fins that become flattened can be combed back into position. This process may require removal of the coil from the cabinet.

h) It is not advisable to attempt repairs to brazed joints of a brazed construction coil unless it will be done by an expert in silver solder brazing. Brazed coils are heated uniformly during the original manufacturing process to prevent weak zones from occurring. Uncontrolled reheating of the coil may result in weakening of the tube joints surrounding the repair area. In many instances brazed units that are repaired will not hold up as well to the rigors of the system as will a new coil. American Industrial will not warranty or be responsible for any repairs done by unauthorized sources. Manipulation in any way other than normal application will void the manufactures warranty.

i) Solely at the request of customers, American Industrial provides direct acting internal inlet port to outlet port bypass relief valves as an additional safe guard against surge flow and over pressurization of the heat exchanger. However, American Industrial does not specify, recommend, suggest, guarantee, or warrantee the internal relief valve or its performance to safe guard the heat exchanger from damage or prevent failure due to excessive flow or over pressurization. It is the ultimately the sole responsibility of the customer/user to verify with the original equipment manufacture all conditions associated with applying an additional system relief valve prior to application.

American Industrial Heat Transfer Inc.
Manufacturer of Quality Heat Exchangers

website : www.aihti.com
general email : sales@aihti.com
technical email : engineering@aihti.com

Air Cooled Liquid Cooler Application Request:

For AOCH - AOCHM Series

Email form to: sales@aihti.com or engineering@aihti.com or fax to 434-757-1810

Contact Name _____ Telephone _____ Date _____

Company Name _____ Email _____

Address: _____ Fax _____

_____

Hot Side

Fluid Type _____

If available:

Density _____ lb/ft3
Viscosity _____ cP
Thermal Conductivity _____ Btu/hr.ft.°F
Specific Heat _____ Btu/lb.°F

1. Flow Rate _____
2. Temperature In _____
3. Desired Temperature Out _____
4. Heat Load _____

Cold Side

Ambient Air _____

Altitude _____

1. Operating Pressure _____
2. Allowable Pressure Drop _____

To properly size the heat exchanger we need 3 of the 4 perameters on the Hot Side.

Cabinet Material:

Standard : Steel ☐

Options:
Galvanized Steel ☐
Stainless Steel ☐

Tubing Material:

Standard : Copper ☐

Options:
90/10 Copper Nickel ☐
Stainless Steel ☐

Motor

60Hz:
230/460 Volt, 3 Phase ☐
115/230 Volt, 1 Phase ☐
575 Volt, 3 Phase ☐

50Hz
230/400 Volt, 3 Phase ☐
110/220 Volt, 1 Phase ☐

Hydraulic Motor ☐

Coating

Standard Enamaled Gray Paint ☐

Options:
Epoxy Paint ☐

Fins

Standared Aluminum ☐

Options:
Copper ☐
Optional Coating:
Heresite ☐

Comment: _____

_____

AOCHM SERIES
with hydraulic motor

AOCH SERIES
with electric motor

AIR COOLED

LIQUID COOLERS

- Thermal capacity to 210hp (157Kw).
- Severe duty construction with OSHA guard.
- Serviceable Core®.
- Operating temperature of 300°F at 300 PSI.
- Electric or hydraulic drive.
- Optional: internal built-in bypass relief valve.
- Computer generated data sheet available for any application
- Can be customized to fit any applications.
- Cools: Fluid power systems, rock crushers, presses, shears, lubrication equipment for paper machinery, gear drives, marine transmissions, etc.

AOCH & AOCHM Series *overview*

AOCH SERIES with electric drive

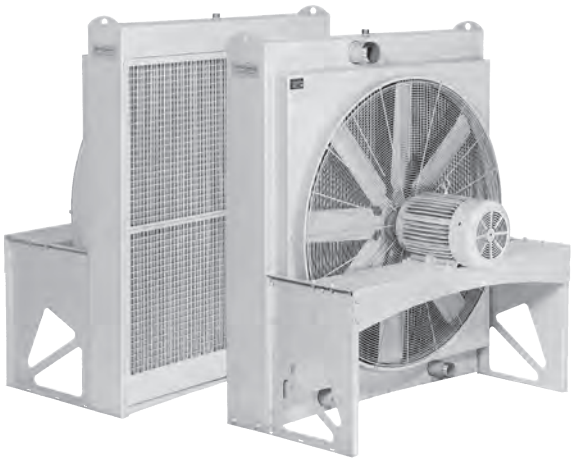
Industrial air-cooled liquid coolers, high performance six row rolled tube heat exchangers with direct electric drive cooling fan, OSHA guard, and air directing louvers. Rated operating temperature of 300°F at 300 PSIG. Services standard flow rates from 4 to 250 GPM. Thermal capacity up to 210 hp (157Kw). NPT, flange, or SAE straight thread port connections. Optional built-in bypass relief valve 30 PSI or 65 PSI. Can be modified to meet your requirements. Suitable for most hydraulic oils, lubrications oils, synthetic compressor oils, ethylene glycol, and many other fluids compatible with listed material.

AOCHM SERIES with hydraulic drive

Industrial air-cooled liquid coolers with hydraulic fan drive, high performance six row rolled tube heat exchangers with direct electric drive cooling fan, OSHA guard, and air directing louvers. Rated operating temperature of 300°F at 300 PSIG. Services standard flow rates from 4 to 250 GPM. Thermal capacity up to 210 hp (157Kw). NPT, flange, or SAE straight thread port connections. Optional built-in bypass relief valve 30 PSI or 65 PSI. Can be modified to meet your requirements. Suitable for most hydraulic oils, lubrications oils, synthetic compressor oils, ethylene glycol, and many other fluids compatible with listed material.

AOCH & AOCHM SERIES with optional screen

Same rugged features as standard AOCH & AOCHM Series with fabricated steel front screen in place of louvers.



AOCS Series *WITH ELECTRIC DRIVE*

Severe duty air-cooled liquid coolers, super capacity, rolled tube heat exchangers with direct electric drive cooling fan, OSHA guard, and heavy duty front screen. Rated operating temperature of 300°F at 200 PSIG. Standard flrow rates from 10 to 600 GPM. NPT, ANSI flange, or SAE code 61 four bolt flange port connections. Optional built-in bypass relief valve 30 PSI or 65 PSI. Can be modified to meet your requirements. Suitable for most hydraulic oils, lubrications oils, synthetic compressor oils, ethylene glycol, and many other fluids compatible with listed material.

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HIGH PERFORMANCE TURBULATOR

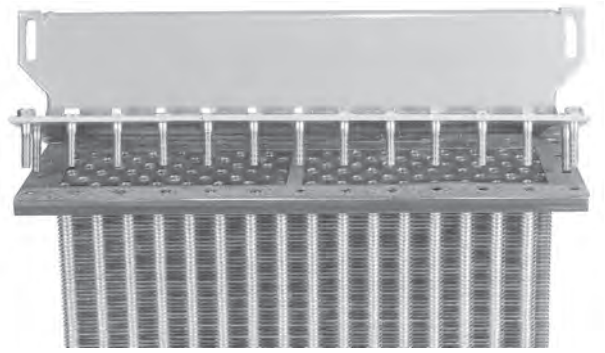
Exclusive American Industrial Turbulators (installed in every flow tube) increase heat transfer by more than 100%.

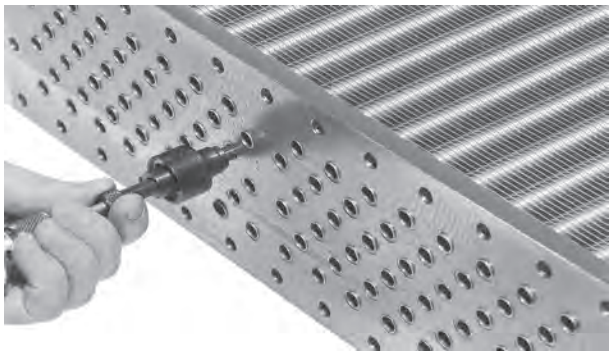
American Industrial Turbulators eliminate the laminar flow condition normally associated with other smooth tube heat exchangers. High viscosity hydraulic and lubricating oils are easily cooled by this new state-of-the-art turbulator.

SERVICEABLE CORE ®

Core covers disassemble for easy access and cleaning. Repairable design for applications that require limited down time. Roller expanded tube to tube-sheet joint.

100% mechanical bond. No braze or solder joint to fatigue fail, corrode, crack, etc.. No rubber grommets to replace. Positive gasket seal is field replaceable for field maintenance or repair.





SUPERIOR COOLING FINS

Copper tubes are mechanically bonded to highly efficient aluminum cooling fins. Die-formed fin collars provide a durable precision fit for maximum heat transfer.

Custom fin design forces air to become turbulent and carry heat away more efficiently than old flat fin designs.

CONSTRUCTION MATERIALS & RATINGS

Standard Construction Materials		Optional Construction Materials
Tubes	Copper	Carbon Steel, 90/10 Cu.Ni, 316L Stainless Steel
Fins	Aluminum	Copper
Turbulators	Steel	Brass
Tube sheet	Steel	316L Stainless Steel
Removable Tanks	Steel	316L Stainless Steel
Connection pipes	Steel	316L Stainless Steel
Cabinet & frame	Steel	316L Stainless Steel, Galvanized Steel
Fan Blade	Aluminum	Plastic, Non-sparking, Steel
Fan Guard	Zinc Plated	
Gasket	Hypalon Composite	Viton, Nitrile, Composites

Standard Unit Ratings	
Operating Pressure	300 psig
Operating Temperature	300 °F
Max. Fan Over-speed	10 %
Max. Ambient Conditions	104 °F
Altitude	0-3300 ft.

note: AIHTI reserves the right to make reasonable design changes without notice.

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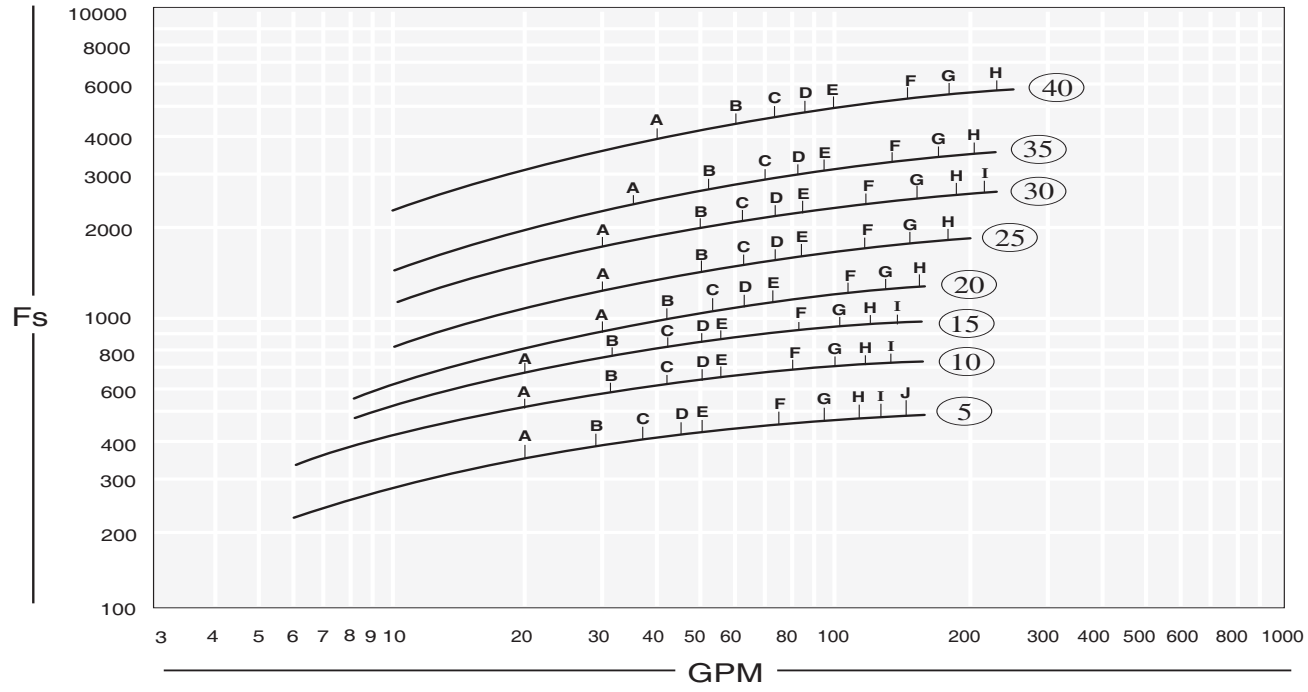
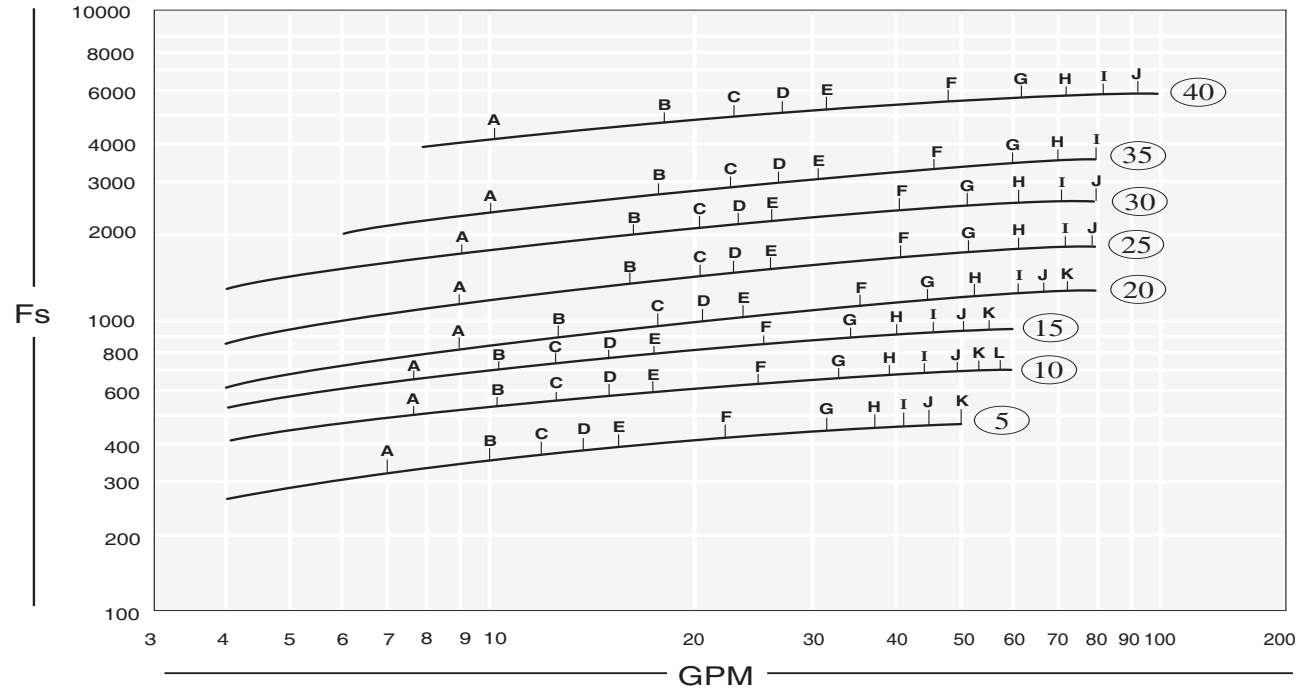
AOCH & AOCHM Series *performance*

ONE PASS



TWO PASS



PERFORMANCE CALCULATION	OIL PRESSURE DROP (PSI) CODE
$F_s = \frac{\text{Horsepower to be removed (HP) x 2545 x Cv}}{\text{°F (Oil Leaving* - Ambient Air Entering)}} = \frac{\text{BTU}}{\text{hr °F}}$	A = 1 PSI D = 4 PSI G = 15 PSI J = 30 PSI B = 2 PSI E = 5 PSI H = 20 PSI K = 35 PSI C = 3 PSI F = 10 PSI I = 25 PSI L = 40 PSI

*Represents desired fluid leaving the cooler.

Note: When a model selection has been made, record whether the selection was from the one pass curve or the Two Pass curve so that the unit can be properly plumbed. Incorrect installation can seriously affect the performance.

Sizing
The performance curves provided are for petroleum oil at 50 ssu viscosity. However, fluids with characteristics other than the above mentioned may be used by applying a correction factor.

Heat Load
If the heat load is unknown, a horsepower value can be calculated by first determining the systems total potential. For a basic hydraulic system, it is helpful to know whether the system is open loop (with a large reservoir) or closed loop (normally on mobile equipment, with a very small reservoir). System potentials may be calculated quickly by using one of the two methods below.

There are some system parameters that will be required to properly accomplish the sizing calculations. Without system parameters, it is difficult to determine the optimal heat exchanger size. Normally many of the system parameters can be found on hydraulic schematics or on tags located on the actual equipment. Following are some basic parameters that you should try to acquire before attempting the sizing calculations. However, it is not necessary to have every parameter listed below.

- Main system flow rate (gpm) & operating pressure (psi).
- Electric motor HP driving hydraulic pump (if more than one add up the Hp for all).
- Desired temperature (°F).
- Fluid type (SAE 10, 20, 30, etc....).
- Ambient air temperature (warmest day).
- Desired fan drive (hydraulic, electric, 12-24V DC, etc...).
- BTU's or HP to be cooled (normally given for lubrication systems).
- Maximum pressure drop allowed through the heat exchanger.
- Space available for heat exchanger (LxWxH).
- External air condition (dirty, papers,etc).

Method 1
Normally used for open loop circuits. Multiply the main hydraulic systems Electric Motor Name plate Horsepower by a heat removal factor (normally 30-50%).

Example: 50 HP motor x 0.3 = 15 HP heat load

Method 2
Normally used when the HP input potential is unknown or for mobile applications where diesel engines operate the entire system.

Multiply system pressure by the flow rate of the main system divided by 1714 equals system potential (HP). Multiply the system HP by a heat removal factor (Normally 25-35%). Note: In some closed loop systems only a portion of the total system flow is directed through the heat exchanger. This may affect the cooler selection process substantially. You may contact our factory for additional technical assistance.

Example: $\frac{(2000 \text{ psi} \times 60 \text{ gpm})}{1714} = [70 \text{ HP} \times .25] = 17.5 \text{ HP heat load}$

Determining Fs value
To determine the proper size heat exchanger for your application, use the following equation to first determine the (Fs) factor:

$$Fs = \frac{\{ \text{heat load (HP)} \times 2545 \times Cv \}}{\{ \text{°F (oil leaving - air entering)} \}}$$

Example:
Heat load = 17.5 HP
Cv = 1.14 (SAE 20) determined from chart. [Located on page 5.]
Desired operating temperature = 120 °F
Ambient air temp. = 100 °F

$$Fs = \frac{\{ 17.5 \times 2545 \times 1.14 \}}{\{ 120 \text{ °F} - 100 \text{ °F} \}} = 2539$$

Selection
To select a model, locate the flow rate (GPM) at the bottom of the flow vs Fs graph. Proceed upward until the GPM flow rate intersects with the calculated Fs. The curve closest above the intersection point will meet these conditions.

Example: Fs = 2539 = Model = AOCH,AOCHM - 35
GPM = 60
PASSES = 1

Pressure differentials
Determine the oil pressure drop from the curves as indicated. For viscosities other than 50 ssu, multiply the actual indicated pressure drop for your GPM flow by the value shown in the pressure differential curve for your viscosity value.

Example: Model 35 @ 60 gpm & 50 ssu -1 pass curve-
Indicated pressure drop 2.4 psi (Approx)
{ 2.4 psi x 2.8Cp (for SAE-20 oil) } = 6.72 corrected psi

Average Liquid Temperature	Cv VISCOSITY CORRECTION FACTORS																
	SAE 5	SAE 10	SAE 20	SAE 30	SAE 40	ISO 22	ISO 32	ISO 46	ISO 68	ISO 100	ISO 150	ISO 220	ISO 320	MIL-L-7808	POLYGLYCOL	PHOSPHATE ESTER	50% ETHYLENE GLYCOL & WATER
100	1.11	1.15	1.25	1.38	1.45	1.08	1.14	1.18	1.26	1.37	1.43	1.56	1.84	1.19	0.92	0.83	0.85
110	1.09	1.12	1.20	1.32	1.40	1.06	1.13	1.16	1.25	1.31	1.39	1.48	1.67	1.14	0.89	0.80	0.84
120	1.06	1.10	1.17	1.27	1.35	1.04	1.11	1.14	1.20	1.27	1.35	1.40	1.53	1.09	0.88	0.79	0.84
130	1.04	1.08	1.13	1.24	1.29	1.03	1.09	1.13	1.17	1.24	1.30	1.34	1.44	1.05	0.85	0.77	0.83
140	1.03	1.05	1.11	1.19	1.25	1.02	1.08	1.10	1.16	1.20	1.26	1.30	1.39	1.03	0.84	0.76	0.82
150	1.01	1.04	1.09	1.16	1.22	1.02	1.06	1.09	1.13	1.17	1.22	1.27	1.33	1.01	0.83	0.74	0.82
200	0.98	0.99	1.01	1.04	1.07	0.98	0.99	1.00	1.01	1.02	1.08	1.09	1.14	0.98	0.79	0.71	0.80
250	0.95	0.96	0.97	0.98	0.99	0.95	0.96	0.96	0.96	0.97	0.99	1.01	1.02	0.97	0.76	0.69	0.79

Average Liquid Temperature	Cp PRESSURE DROP CORRECTION FACTORS																
	SAE 5	SAE 10	SAE 20	SAE 30	SAE 40	ISO 22	ISO 32	ISO 46	ISO 68	ISO 100	ISO 150	ISO 220	ISO 320	MIL-L-7808	POLYGLYCOL	PHOSPHATE ESTER	50% ETHYLENE GLYCOL & WATER
100	2.00	2.40	4.40	6.40	8.80	1.07	1.53	1.82	2.54	4.19	6.44	9.38	13.56	1.26	3.00	3.50	0.730
110	1.70	2.10	3.60	5.10	6.70	1.04	1.45	1.72	2.35	3.73	5.70	8.33	11.63	1.20	2.40	2.90	0.720
120	1.50	1.80	3.00	4.20	5.60	1.02	1.38	1.60	2.15	3.26	4.91	7.23	9.73	1.14	2.10	2.50	0.709
130	1.40	1.60	2.60	3.40	4.50	0.99	1.30	1.49	1.94	2.80	4.14	6.19	7.80	1.08	1.90	2.20	0.698
140	1.30	1.50	2.23	2.90	3.70	0.97	1.23	1.38	1.75	2.38	3.47	5.20	6.11	1.03	1.90	2.00	0.686
150	1.20	1.30	1.90	2.50	3.10	0.95	1.17	1.30	1.61	2.04	2.90	4.35	4.77	0.98	1.70	1.90	0.676
200	0.93	0.96	1.20	1.40	1.60	0.89	0.99	1.08	1.18	1.33	1.59	1.74	1.95	0.90	1.20	1.30	0.635
250	0.81	0.82	0.92	0.97	1.05	0.85	0.93	0.96	1.03	1.11	1.21	1.22	1.23	0.83	1.00	1.05	0.556

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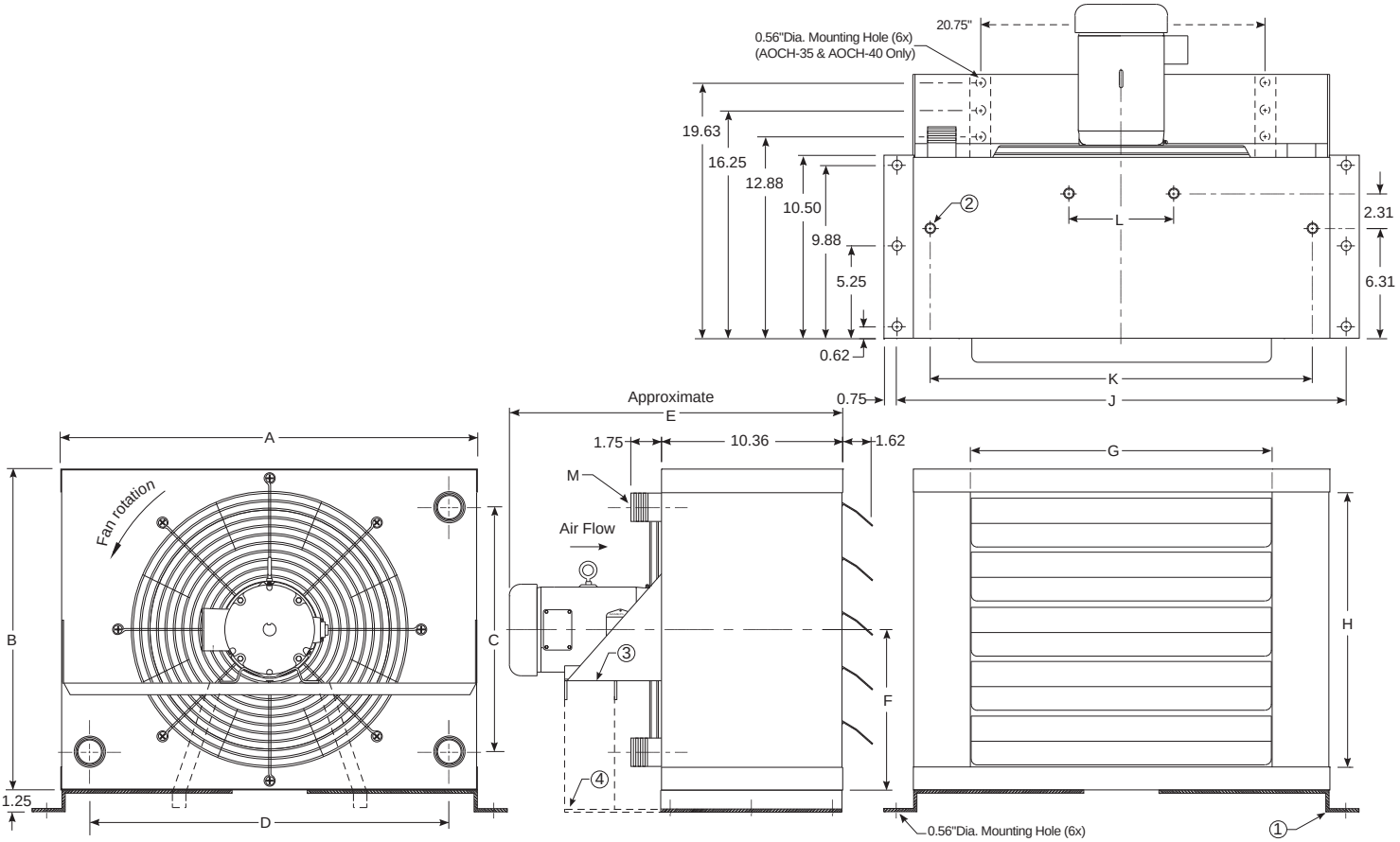
AOCH Series *dimensions*



DIMENSIONS (inches)													
Model	A	B	C	D	E	F	G	H	J	K	L	M NPT	M SAE
AOCH - 5 - ✱	14.81	11.81	7.69	11.69	19.39	5.90	8.31	9.19	16.81	12.94	—	1.50	24 SAE 1 7/8 -12UN-2B Thread
AOCH - 10 - ✱	19.00	13.13	8.88	15.88	19.48	6.56	12.50	10.50	21.00	17.13	—	1.50	
AOCH - 15 - ✱	20.38	15.75	11.50	17.25	19.48	7.88	13.88	13.12	22.38	18.50	—	1.50	
AOCH - 20 - ✱	23.81	18.38	14.00	20.56	19.48	9.19	17.19	15.75	25.81	21.81	—	2.00	32 SAE 2 1/2 -12UN-2B Thread
AOCH - 25 - ✱	26.68	23.63	19.25	23.56	23.58	11.81	20.19	21.00	28.68	24.81	—	2.00	
AOCH - 30 - ✱	31.63	27.56	23.19	28.50	23.33	13.78	25.13	24.94	33.63	29.75	11.00	2.00	
AOCH - 35 - ✱	33.81	30.19	25.81	30.69	23.06	15.09	27.31	27.56	35.81	31.94	11.00	2.00	
AOCH - 40 - ✱	41.63	36.75	32.38	38.50	23.06	18.38	35.13	34.12	43.63	39.75	13.25	2.00	

✱ Represents options.

Notes:

1) Removable foot mounting brackets are supplied with unit at no additional charge.
2) 1/2-12 UNC-2B Tabs, 4 points, 8 points on models AOCH - 30,35 & 40 (top & bottom) for optional mounting purposes.
3) Motor mounting bracket is rotated 90 degrees on AOCH - 5 & 10 units.
4) Dotted line represents motor mounting bracket on AOCH-35 & 40.
5) Louvers are manually adjustable. However, all units are available with a screen front as an option (specify when ordering).
6) All units are available with an optional preset 30 or 65-psi pressure internal bypass valve. (see note "i" on page 155)
7) All units can be connected in one or Two Pass configuration. Refer to piping instructions for detailed operating and maintenance information.

Example of a model:

AOCH - 35 - 3 - S - R65 - 2P - ____ - ____

Model

Size

Drive Type
N = no motor
1 = single phase
3 = three phase
1EXP = single phase
3EXP = three phase
5 = 575 Volt

Connections
Blank = NPT
S = SAE O-Ring
F = 4 Bolt Flange
A = ANSI 150#RF Flange

Bypass
R30 = 30psi
R65 = 65psi

Number of Passes
1P = 1 pass
2P = 2 pass

Tubing
Blank = Copper
U = 90/10 Cu Ni
C = Carbon Steel
SS = Stainless Steel

Coating
Blank = Enamel (standard)
G = Galvanize (cabinet)
T = Heresite (core)
X = Epoxy (cabinet)
STS = Stainless Steel (cabinet)

note: AIHTI reserves the right to make reasonable design changes without notice.
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AOCH ELECTRIC MOTOR @ 60 Hz. DATA

Model	Horse Power	Phase	Hz	Volts	RPM	NEMA Frame	Enclosure Type	Full Load Amperes	Service Factor	Thermal Overload
AOCH-5,10,15,20	1/2	1	60	115/230	1800	56	TEFC	4.6/2.3	1.15	NO
AOCH-5,10,15,20	1/2	3	60	208-230/460	1800	56	TEFC	1.6/0.8	1.15	NO
AOCH-5,10,15,20	1/2	3	60	575	1800	56	TEFC	.8	1.15	NO
AOCH-25, AOCH-30	1	1	60	115/230	1800	56	TEFC	8.6/4.3	1.15	NO
AOCH-25, AOCH-30	1	3	60	208-230/460	1800	56	TEFC	3.4/1.7	1.15	NO
AOCH-25, AOCH-30	1	3	60	575	1800	56	TEFC	1.5	1.0	NO
AOCH-35, AOCH-40	3	1	60	115/230	1800	184T	TEFC	28.0/14.0	1.0	NO
AOCH-35, AOCH-40	3	3	60	208-230/460	1800	182T	TEFC	7.6/3.8	1.15	NO
AOCH-35, AOCH-40	3	3	60	575	1800	182T	TEFC	3.3	1.15	NO

AOCH ELECTRIC MOTOR @ 50 Hz. DATA

Model	Horse Power	Phase	Hz	Volts	RPM	NEMA Frame	Enclosure Type	Full Load Amperes	Service Factor	Thermal Overload
AOCH-5,10,15,20	1/2	1	50	110/220	1500	56	TEFC	7.2/3.6	1.0	NO
AOCH-5,10,15,20	1/2	3	50	230/400	1500	56	TEFC	1.6/1.0	1.0	NO
AOCH-25, AOCH-30	1	1	50	110/220	1500	56	TEFC	12.4/6.2	1.0	NO
AOCH-25, AOCH-30	1	3	50	230/400	1500	56	TEFC	3.4/1.8	1.0	NO
AOCH-35,AOCH-40	3	1	50	110/220	1500	184T	TEFC	25.0/12.5	1.0	NO
AOCH-35, AOCH-40	3	3	50	230/400	1500	182T	TEFC	7.6/4.9	1.0	NO

ELECTRIC MOTOR NOTES:

1) All motors are NEMA, high efficiency
2) TEFC motors are available for all models.
3) Motor electrical ratings are an approximate guide and may vary between motor manufacturers. Consult ratings on motor data plate prior to installation and operation.
4) Explosion proof, high temperature, severe duty, chemical, IEC, Canadian Standards Association, and Underwriters Laboratory recognized motors are available upon request.
5) American Industrial reserves the right to enact changes to motor brand, type and ratings regarding horsepower, RPM,FLA,and service factor for standard products without notice. All specific requirements will be honored without change.
6) Fan rotation is clockwise when facing the motor shaft.
7) The above motors contain factory lubricated shielded ball bearings; no additional lubrication is required.
8) **Abbreviation Index**

TEFC ..... Totally Enclosed, Fan Cooled

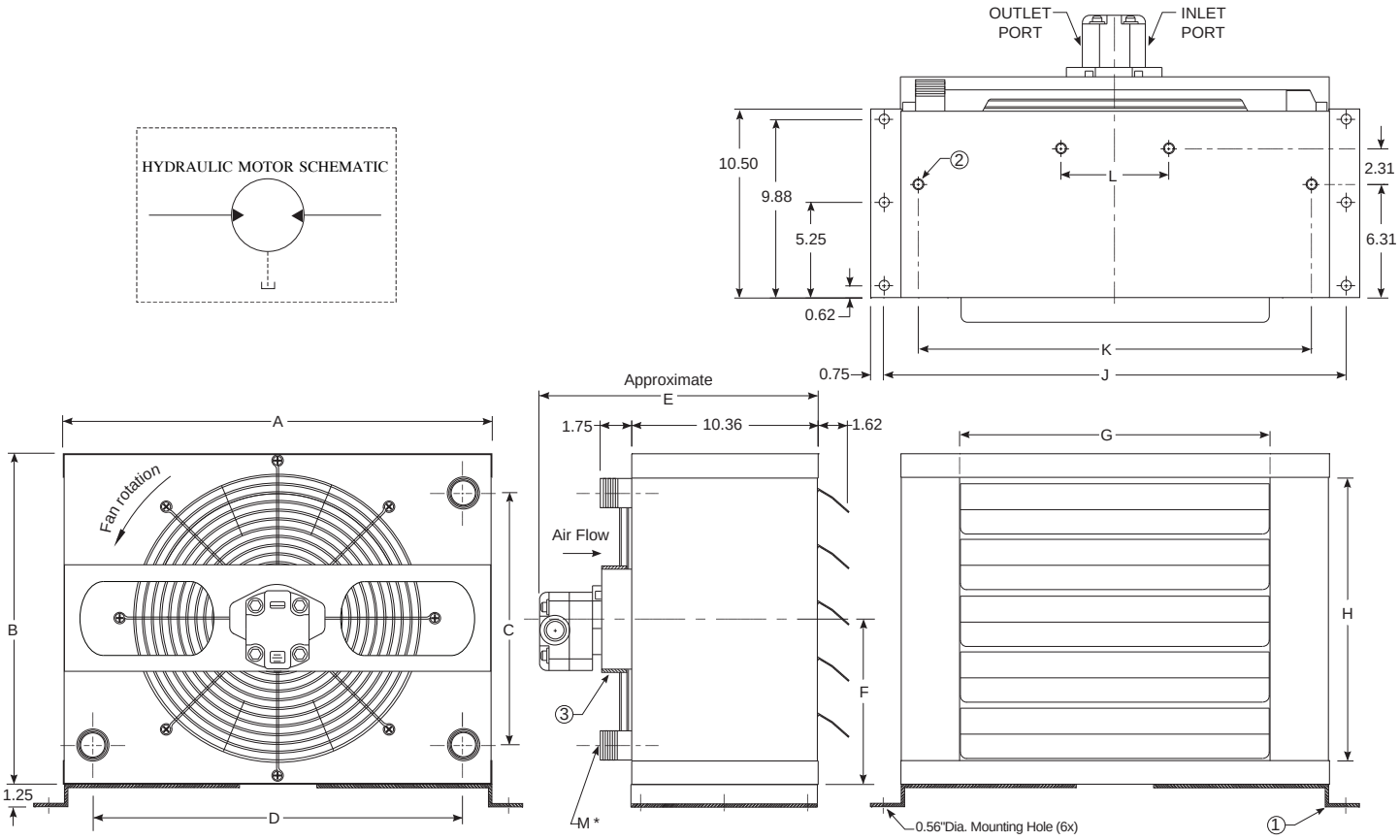
X-PROOF ..... Explosion Proof

CLASS I,DIV.1, GROUP D or CLASS II,DIV.2, GROUP F & G EXPLOSION PROOF MOTOR DATA

Model	Horse Power	Phase	Hz	Volts	RPM	NEMA Frame	Enclosure Type	Full Load Amperes	Service Factor	Thermal Overload
AOCH-5,10,15,20	1/2	1	60	115-208/230	1800	56	X-PROOF	7.4/3.7	1.0	YES
AOCH-5,10,15,20	1/2	3	60	208-230/460	1800	56	X-PROOF	2.0/1.0	1.0	YES
AOCH-25, AOCH-30	1	1	60	115/230	1800	56	X-PROOF	13.0/6.5	1.0	YES
AOCH-25, AOCH-30	1	3	60	208-230/460	1800	56	X-PROOF	3.6/1.8	1.0	YES
AOCH-35, AOCH-40	3	1	60	115/230	1800	215	X-PROOF	30.0/15.0	1.0	YES
AOCH-35, AOCH-40	3	3	60	208-230/460	1800	182	X-PROOF	8.4/4.2	1.0	YES

NOTE: All of the AOCH Series explosion proof motors are available in 50hz upon request as a special

AOCHM Series *dimensions*



DIMENSIONS (inches)													
Model	A	B	C	D	E	F	G	H	J	K	L	M NPT	M SAE
AOCHM - 5 - ∗	14.81	11.81	7.69	11.69	15.21	5.90	8.31	9.19	16.81	12.94	—	1.50	24 SAE 1 7/8 -12UN-2B Thread
AOCHM - 10 - ∗	19.00	13.13	8.88	15.88	15.21	6.56	12.50	10.50	21.00	17.13	—	1.50	
AOCHM - 15 - ∗	20.38	15.75	11.50	17.25	15.21	7.88	13.88	13.12	22.38	18.50	—	1.50	
AOCHM - 20 - ∗	23.81	18.38	14.00	20.56	15.21	9.19	17.19	15.75	25.81	21.81	—	2.00	32 SAE 2 1/2 -12UN-2B Thread
AOCHM - 25 - ∗	26.68	23.63	19.25	23.56	15.21	11.81	20.19	21.00	28.68	24.81	—	2.00	
AOCHM - 30 - ∗	31.63	27.56	23.19	28.50	15.21	13.78	25.13	24.94	33.63	29.75	11.00	2.00	
AOCHM - 35 - ∗	33.81	30.19	25.81	30.69	15.21	15.09	27.31	27.56	35.81	31.94	11.00	2.00	
AOCHM - 40 - ∗	41.63	36.75	32.38	38.50	15.21	18.38	35.13	34.12	43.63	39.75	13.25	2.00	

∗ Represents options.

Notes :

1) Removable foot mounting brackets are supplied with unit at no additional charge.
2) 1/2-12 UNC-2B Tabs, 4 points, 8 points on models AOCHM - 30,35 & 40 (top & bottom) for optional mounting purposes.
3) Motor mounting bracket is rotated 90 degrees on AOCHM - 5 & 10 units.
4) Louvers are manually adjustable. However, all units are available with a screen front as an option (specify when ordering).
5) All units are available with an optional preset 30 or 65-psi pressure bypass valve. (see note "i" on page 155)
6) All units can be connected in one or Two Pass configuration. Refer to piping instructions for detailed operating and maintenance information.

Example of a model:

AOCHM - 40 - 9 - S - R65 - 2P - ____ - ____

Model

Size

Drive Type
N = No motor
9 = Hydraulic motor

Connections
Blank = NPT
S = SAE O-Ring
F = 4 Bolt Flange
A = ANSI 150#RF Flange

Bypass
R30 = 30psi
R65 = 65psi

Number of Passes
1P = 1 pass
2P = 2 pass

Tubing
Blank = Copper
U = 90/10 Cu Ni
C = Carbon Steel
SS - Stainless Steel

Coating
Blank = Enamel (standard)
G = Galvanize (cabinet)
T = Heresite (core)
X = Epoxy (cabinet)
STS = Stainless Steel (cabinet)

note: AIHTI reserves the right to make reasonable design changes without notice.

355 American Industrial Drive LaCrosse, VA 23950 tel: 434-757-1800 fax: 434-757-1810 email: sales@aihti.com

HYDRAULIC MOTOR DATA

Model	Motor RPM	Displacement in³/Rev	Required Flow		Min. pressure start / run PSIG	Case Drain	SAE Size	Side Port SAE O-Ring	Max. Continuous Pressure PSIG
			GPM	LPM					
AOCHM - 5 - ✱	1725	0.43	6.5	24.6	300	#6 9/16 -18	A	#12; 11/16-12	3000
AOCHM - 10 - ✱	1725	0.43	6.5	24.6	300	#6 9/16 -18	A	#12; 11/16-12	3000
AOCHM - 15 - ✱	1725	0.68	6.0	22.7	400	#6 9/16 -18	A	#12; 11/16-12	3000
AOCHM - 20 - ✱	1725	0.68	6.0	22.7	400	#6 9/16 -18	A	#12; 11/16-12	3000
AOCHM - 25 - ✱	1725	0.68	6.0	22.7	400	#6 9/16 -18	A	#12; 11/16-12	3000
AOCHM - 30 - ✱	1725	0.68	6.0	22.7	400	#6 9/16 -18	A	#12; 11/16-12	3000
AOCHM - 35 - ✱	1725	0.68	6.0	22.7	1000	#6 9/16 -18	A	#12; 11/16-12	3000
AOCHM - 40 - ✱	1725	0.68	6.0	22.7	1000	#6 9/16 -18	A	#12; 11/16-12	3000

NOTES: ✱ Represents options.

HYDRAULIC MOTOR NOTES:

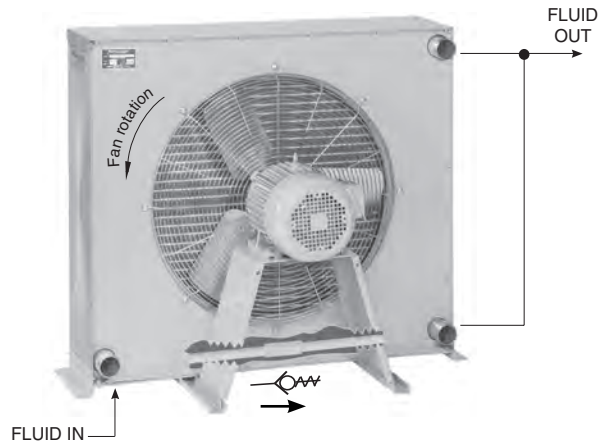
1) Standard units are supplied with a bi-directional hydraulic gear motor for the fan drive. The gear motor requires an external case drain be used during operation. The external case drain should be connected directly to hydraulic reservoir or a return line with not greater than 10PSIG back pressure. (NOTE: *Failure to properly connect and use the external case drain during motor operation could result in motor failure and external leakage of hydraulic fluid.*
2) Hydraulic motor flow requirements are provided with an efficiency rating of approximately 85%. Pressure requirements are calculated theoretical minimum operating requirements.
3) Shaft adapters are used to bridge the differences in length between the fan and hydraulic motor.
4) Maximum degree of fluid contamination, class 18/15 according to ISO 4406. Therefore, it is recommended to use a filter with retention rating of B20>. For longer life, it is recommended to use class 17/14 achievable with filter B10>-100.
5) Fan rotation is clockwise when facing the motor shaft.
6) Optional displacement motors available upon request.
7) American industrial reserves the right to enact changes to hydraulic motor, brand, type, ratings, port sizes, or any additional non-specified attribute for standard products without notice. All specific requirements will be honored without change pending availability.

COMMON DATA

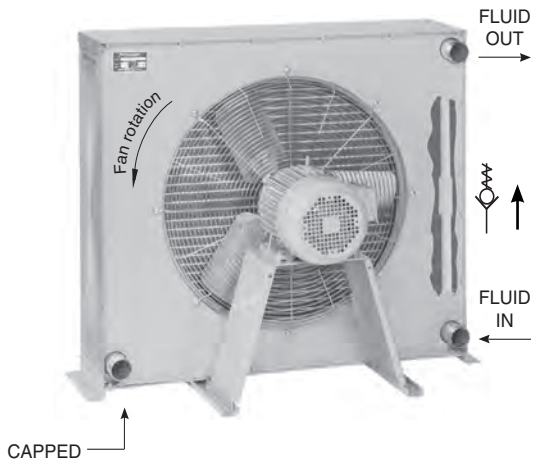
Model	Air Flow		Sound Level dB(A) @ 7ft	Liquid Volume		Weight Electric		Weight Hydraulic		Serviceable Core
	CFM	m³/s		gal.	cm³	lb	kg	lb	kg	
Model - 5 - ✱	780	.368	85	.88	3331	82	37	64	29	NO
Model - 10 - ✱	1110	.523	85	1.09	4126	91	41	73	34	NO
Model - 15 - ✱	1590	.750	80	1.29	4883	103	47	85	39	NO
Model - 20 - ✱	2168	1.023	80	1.70	6735	152	69	134	61	Yes
Model - 25 - ✱	3000	1.42	81	2.27	8592	175	79	157	71	Yes
Model - 30 - ✱	4095	1.93	84	2.86	10826	218	99	200	91	Yes
Model - 35 - ✱	5921	2.79	89	3.46	13097	351	159	233	106	Yes
Model - 40 - ✱	9609	4.54	91	4.72	17865	432	196	314	142	Yes

NOTES: a) ✱ Represents the options for motor drive.
b) To estimate the sound level at distances other than 13 feet (4 meters) from the cooler, add 6 db for each halving of distance, or substract 6 db for each doubling of the distance.

PIPING HOOK UP *shown with relief valve*

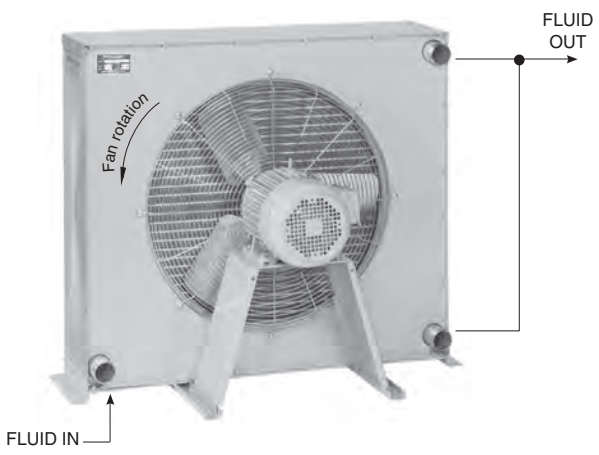


ONE PASS

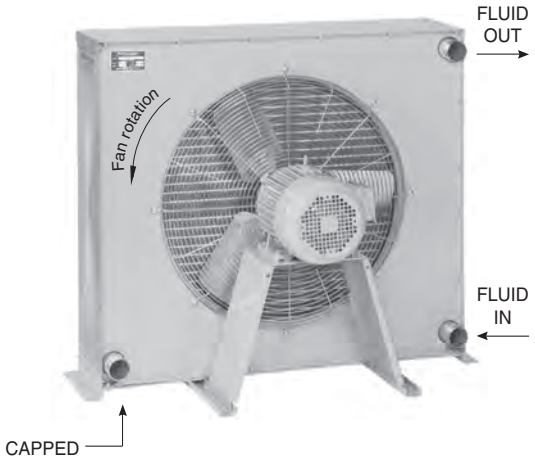


TWO Pass

PIPING HOOK UP



ONE PASS



Two Pass

Receiving / Installation

a) Inspect unit for any shipping damage before uncrating. Indicate all damages to the trucking firms' delivery person and mark it on the receiving bill before accepting the freight. Make sure that the core and fan are not damaged. Rotate the fan blade to make sure that it moves freely. The published weight information located in this brochure is approximate. True shipment weights are determined at the time of shipping and may vary. Approximate weight information published herein is for engineering approximation purposes and should not be used for exact shipping weight. *Since the warranty is based upon the unit date code located on the model identification tag, removal or manipulation of the identification tag will void the manufacturers warranty.*

b) When handling the heat exchanger, special care should be taken to avoid damage to the core and fan. All units are shipped with wood skids for easy forklift handling

c) Standard Enamel Coating: American Industrial provides its standard products with a normal base coat of oil base air cure enamel paint. The enamel paint is applied as a temporary protective and esthetic coating prior to shipment. While the standard enamel coating is durable, American Industrial does not warranty it as a long-term finish coating. It is strongly suggested that a more durable final coating be applied after installation or prior to long-term storage in a corrosive environment to cover any accidental scratches, enhance esthetics, and further prevent corrosion. It is the responsibility of the customer to provide regular maintenance against chips, scratches, etc... and regular touch up maintenance must be provided for long-term benefits and corrosion prevention.

d) Special Coatings: American Industrial offers as customer options, Air-Dry Epoxy, and Heresite (Air-Dry Phenolic) coatings at additional cost. American Industrial offers special coatings upon request, however American Industrial does not warrantee coatings to be a permanent solution for any equipment against corrosion. It is the responsibility of the customer to provide regular maintenance against chips, scratches, etc... and regular touch up maintenance must be provided for long-term benefits and corrosion prevention.

e) American Industrial recommends that the equipment supplied should be installed by qualified personnel who have solid understanding of system design, pressure and temperature ratings, and piping assembly. Verify the service conditions of the system prior to applying any air cooled heat exchanger series cooler. If the system pressure or temperature does not fall within the parameters on model rating tag located on the heat exchanger, contact our factory prior to installation or operation.

g) Heat exchanger should be securely fastened using the mounting foot brackets (included). All mounting holes should be used to secure unit into place. Optional horizontal mounting with vertical airflow is allowable by removing the foot brackets and using the (4 or 8) 1/2"-13 screw hard points located on the top and bottom panel for fastening. Heat exchanger unit must be set into a fabricated channel type frame with provision for additional motor support for heavy motors in conjunction with 1/2" frame fastening bolt points. Since the units are normally operated in the vertical position (horizontal airflow) reinforced motor support is suggested.

h) Connections should be made in "one pass" or "Two Pass" configurations exactly as indicated in the "piping hook up" illustration above. The process flow entering the "Fluid IN" port and exiting the "Fluid OUT" port eliminates air pockets and assures that the unit will stay completely flooded. Flexible hose can be applied to reduce the risk of core failure due to thermal expansion or system vibration. Piping alignment and support is required for hoses longer than four feet in length and for piping exerting more than 20 lbs of dynamic force. It is recommended that filtration be located ahead of the heat exchanger to prevent excessive backpressure and clogging.

i) With respect to the heat exchangers nozzle size, flow line sizes should be sized to handle the appropriate flow rate and system pressure drop requirements, normally flow line rates of about 8-12 feet per second and inlet pressure less than 100psig are experienced. If the flow line size is larger than the heat exchanger nozzle size, additional pressure loss beyond the published pressure loss data may occur.

j) Electric motors should be connected only to supply source of the same characteristics as indicated on the electric motor information plate. Prior to starting, verify that the motor and fan spin freely without obstruction. Check carefully that the fan turns in the correct rotation direction (normally counter clockwise) from the motor side (fan direction arrow). Failure to operate the fan in the proper direction could reduce performance or cause serious damage to the heat exchanger or other components. Fan blades should be rechecked for tightness after the first 100 hours of operation.

k) It is important to apply the catalog recommended flow rate for the hydraulic motor that corresponds with the specific model being used. A case drain is required for hydraulic motor installation. Failure to connect case drain can result in motor failure. The proper flow rate and direction to the hydraulic motor are critical to ensure fan direction and RPM. Exceeding the recommended RPM could result in fan failure and cause severe damage to the heat exchanger. See fan rotation on installation diagram.

Maintenance

Regular maintenance intervals based upon the surrounding and operational conditions should be maintained to verify equipment performance and to prevent premature component failure. Since some of the components such as, motors, fans, load adapters, etc... are not manufactured by American Industrial, maintenance requirements provided by the manufacture must be followed.

a) Inspect the entire heat exchanger and motor/fan assembly for loosened bolts, loose connections, broken components, rust spots, corrosion, fin/coil clogging, or external leakage. Make immediate repairs to all affected areas prior to restarting and operating the heat exchanger or its components.

b) Heat exchangers operating in oily or dusty environments will often need to have the coil cooling fins cleaned. Oily or clogged fins should be cleaned by carefully brushing the fins and tubes with water or a non-aggressive degreasing agent mixture *(Note: Cleaning agents that are not compatible with copper, brass, aluminum, steel or stainless steel should not be used)*. A compressed air or a water stream can be used to dislodge dirt and clean the coil further. Any external dirt or oil on the electric motor and fan assembly should be removed. *Caution: Be sure to disconnect the electric motor from its power source prior to doing any maintenance.*

c) In most cases it is not necessary to internally flush the coil. In circumstances where the coil has become plugged or has a substantial buildup of material, flushing the coil with water or a solvent may be done. Flushing solvents should be non-aggressive suitable for the materials of construction. Serviceable Core® models can be disassembled and inspected or cleaned if required.

d) Most low horsepower electric motors do not require any additional lubrication. However, larger motors must be lubricated with good quality grease as specified by the manufacture at least once every 6-9 months or as directed by the manufacture. T.E.F.C. air ventilation slots should be inspected and cleaned regularly to prevent clogging and starving the motor of cooling air. To maintain the electric motor properly see the manufactures requirements and specifications.

e) Fan blades should be cleaned and inspected for tightness during the regular maintenance schedule when handling a fan blade care must be given to avoid bending or striking any of the blades. Fan blades are factory balanced and will not operate properly if damaged or unbalanced. Damaged fan blades can cause excessive vibration and severe damage to the heat exchanger or drive motor. Replace any damaged fan with an American industrial suggested replacement.

f) Air cooled exchanger cabinets are constructed using 7ga. through 18ga. steel that may be bent back into position if damaged. Parts that are not repairable can be purchased through American Industrial.

g) Coil fins that become flattened can be combed back into position. This process may require removal of the coil from the cabinet.

h) It is not advisable to attempt repairs to brazed joints of a brazed construction coil unless it will be done by an expert in silver solder brazing. Brazed coils are heated uniformly during the original manufacturing process to prevent weak zones from occurring. Uncontrolled reheating of the coil may result in weakening of the tube joints surrounding the repair area. In many instances brazed units that are repaired will not hold up as well to the rigors of the system as will a new coil. American Industrial will not warranty or be responsible for any repairs done by unauthorized sources. Manipulation in any way other than normal application will void the manufactures warranty.

i) Solely at the request of customers, American Industrial provides direct acting internal inlet port to outlet port bypass relief valves as an additional safe guard against surge flow and over pressurization of the heat exchanger. However, American Industrial does not specify, recommend, suggest, guarantee, or warrantee the internal relief valve or its performance to safe guard the heat exchanger from damage or prevent failure due to excessive flow or over pressurization. It is the ultimately the sole responsibility of the customer/user to verify with the original equipment manufacture all conditions associated with applying an additional system relief valve prior to application.

Serviceable Core® Maintenance
Units containing a Serviceable Core® have bolted manifold covers that can be removed for cleaning or repair purposes.

Servicing Sequence
American Industrial has gone to great lengths to provide components that are repairable. If the heat exchanger core requires internal cleaning or attention the following steps will explain what must be done to access the internal tubes. Be sure to order gasket kits or repair parts prior to removal and disassembly to minimize down time.

a) To clean the internal tubes first remove all connection plumbing from the unit.

b) Be sure the unit is drained of all water etc...

c) Place the heat exchanger in an area that it can be accessed from all sides. Remove the core from the cabinet if required (AOCH, AOCS).

d) Mark the cover ① and tube-sheet ③ for both covers so that they can be replaced into the same position when finished. Remove the manifold cover bolts ② and hardware and place them into a secure place.

e) The manifold covers are tightly compressed and may need some prying to separate them from the gasket ⑥, physically remove the cover assemblies ① from both sides.

f) The tubes ④ and turbulators ⑤ are now accessible for cleaning. Note: turbulators are installed on AOCH & AOCS cores only. If you need to remove the turbulator that runs through the tubing, it will be necessary to first squeeze the flattened end of the protruding turbulator ⑤, so that on end will fit through the tube. From the opposite end pull the turbulator ⑤ out. You may need to use pliers to grip and pull the turbulators ⑤ out, especially if there is debris lodged inside. As the turbulators ⑤ come out, most of the dirt will too, so be prepared. *It is suggested that gloves be worn when handling the turbulators ⑤ as they may be sharp.*

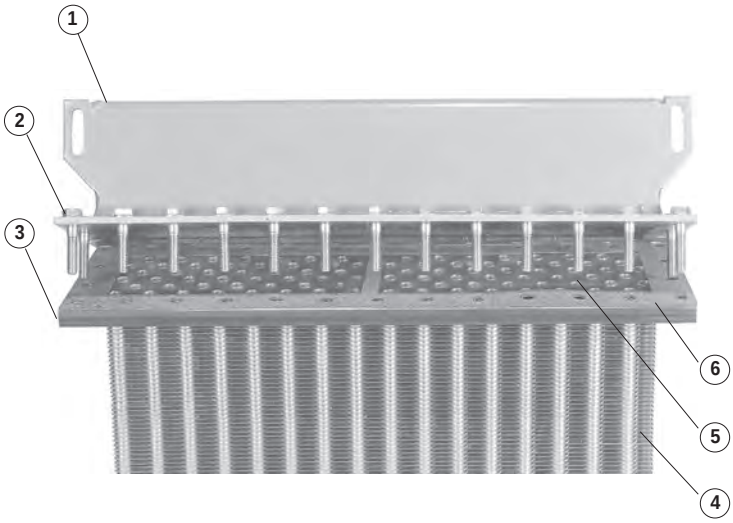
We suggest a mild water-soluble degreaser be used with a brush. Tubing I.D. is aproximatley .325 a plastic bristle brush on a rod will work best for cleaning the tubes ④. Steel brushes should be avoided since the steel is harder than the copper tubing and may heavily score the tubes ④ if used.

g) If there are any leaking tubes ④ you may plug them by carefully forcing a soft metal plug into the hole and tapping it tight. You may in some cases weld the leaking tube shut however, care should be taken since excessive heat may cause surrounding tube joints to loosen and leak.

h) When finished cleaning or repairing, be sure to replace ALL of the turbulators ⑤ back into any open tubes ④. When the turbulators ⑤ protrude from the opposite end flatten them again so they are tight and cannot be removed.

i) When finished reattach the manifold covers ① in the same position they were removed, using new gaskets ⑥, bolts ②, and hardware. We suggest using a torque wrench to final tighten the bolts ②.

j) Torque Specifications: For 5/16" bolts 22-23 ft-lbs, for 3/8" bolts to 38-42 ft-lbs. Since bolts and hardware can physically fatigue during application we suggest new bolt kits be used when reassembling.



AOCHL Series
Air Cooled Liquid Cooler

for high capacity with multiple motors

See page 182

website : www.aihti.com
general email : sales@aihti.com
technical email : engineering@aihti.com

Notes:

American Industrial Heat Transfer Inc.
Manufacturer of Quality Heat Exchangers

website : www.aihti.com
general email : sales@aihti.com
technical email : engineering@aihti.com

Air Cooled Liquid Cooler Application Request:

For AOCHL - AOCHLM Series

Email form to: sales@aihti.com or engineering@aihti.com or fax to 434-757-1810

Contact Name _____ Telephone _____ Date _____

Company Name _____ Email _____

Address: _____ Fax _____

_____

Hot Side

Fluid Type _____

If available:
- Density _____ lb/ft3
- Viscosity _____ cP
- Thermal Conductivity _____ Btu/hr.ft.°F
- Specific Heat _____ Btu/lb.°F

1. Flow Rate _____
2. Temperature In _____
3. Desired Temperature Out _____
4. Heat Load _____

Cold Side

Ambient Air _____

Altitude _____

1. Operating Pressure _____
2. Allowable Pressure Drop _____

To properly size the heat exchanger we need 3 of the 4 perameters on the Hot Side.

Cabinet Material:
- Standard : Steel ☐
- Options: Galvanized Steel ☐
- Options: Stainless Steel ☐

Tubing Material:
- Standard : Copper ☐
- Options: 90/10 Copper Nickel ☐
- Options: Stainless Steel ☐

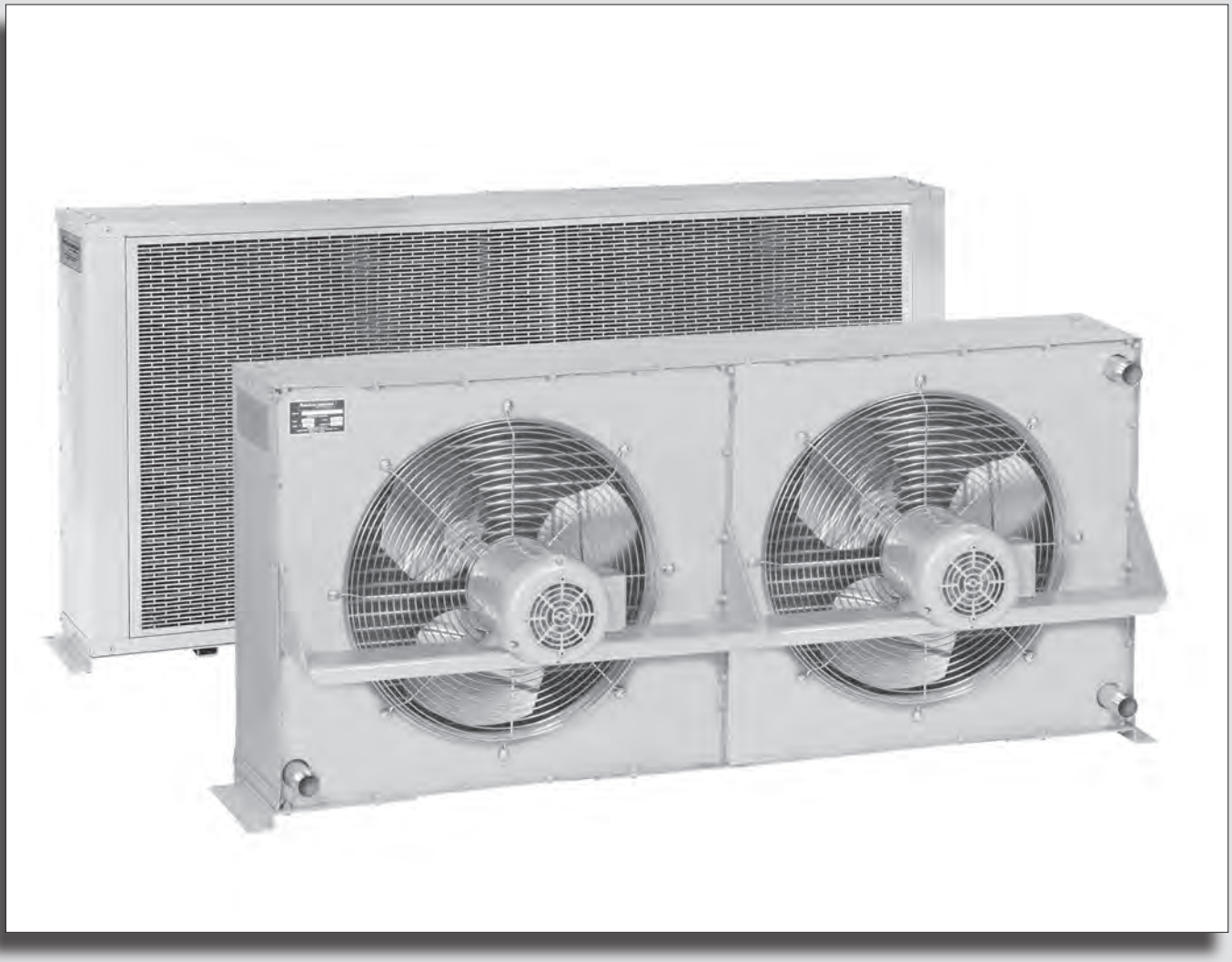
Motor
- 60Hz: 230/460 Volt, 3 Phase ☐
- 115/230 Volt, 1 Phase ☐
- 575 Volt, 3 Phase ☐
- 50Hz 230/400 Volt, 3 Phase ☐
- 110/220 Volt, 1 Phase ☐
- Hydraulic Motor ☐

Coating
- Standard Enamaled Gray Paint ☐
- Options: Epoxy Paint ☐

Fins
- Standared Aluminum ☐
- Options: Copper ☐
- Optional Coating: Heresite ☐

Comment: _____

_____

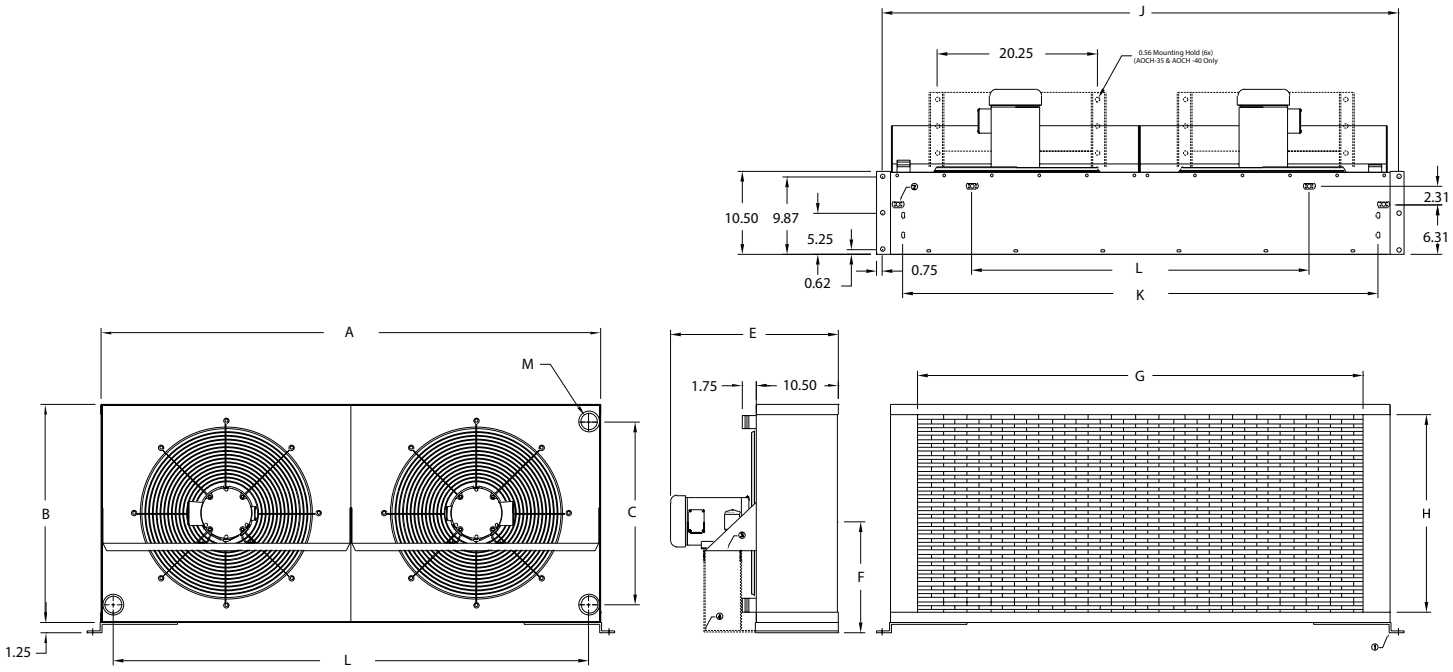


AIR COOLED

LIQUID COOLERS

- Severe duty construction with OSHA guard.
- Serviceable Core®.
- Thermal capacity to 250 hp (186 Kw).
- Operating temperature of 300°F at 300 PSI.
- Electric, hydraulic, or external drive.
- Optional: built-in bypass valve.
- Can be customized to fit any applications.
- Computer generated data sheet available for any application
- Field changeable drive from electric to hydraulic.
- Cools: Fluid power systems, rock crushers, conveyors, shredders, lubrication equipment for paper machinery, gear drives, offshore drilling equipment, etc.

AOCHL Series *dimensions*



DIMENSIONS (inches)													
Model	A	B	C	D	E	F	G	H	J	K	L	M NPT	M SAE
AOCHL - 5 -✱	29.62	11.81	7.69	23.38	19.39	5.90	16.62	9.19	33.62	25.88	—	1.50	24 SAE 1 7/8 -12UN-2B Thread
AOCHL - 10 -✱	38.00	13.13	8.88	31.76	19.48	6.56	25.00	10.50	42.00	34.26	—	1.50	
AOCHL - 15 -✱	40.76	15.75	11.50	34.50	19.48	7.88	27.76	13.12	44.76	37.00	—	1.50	
AOCHL - 20 -✱	47.62	18.38	14.00	41.12	19.48	9.19	34.38	15.75	51.62	43.62	—	2.00	32 SAE 2 1/2 -12UN-2B Thread
AOCHL - 25 -✱	53.36	23.63	19.25	47.12	23.58	11.81	40.38	21.00	57.36	49.62	—	2.00	
AOCHL - 30 -✱	63.23	27.56	23.19	57.00	23.33	13.78	50.26	24.94	67.26	59.50	22.00	2.00	
AOCHL - 35 -✱	67.62	30.19	25.81	61.38	23.06	15.09	54.62	27.56	71.62	63.88	22.00	2.00	
AOCHL - 40 -✱	83.26	36.75	32.38	77.00	23.06	18.38	70.26	34.12	87.26	79.50	26.50	2.00	

✱ Represents options.

1) All electric and hydraulic motor data are identical to to AOCH series and AOCHM series (see page 175, 177) except there are two seperate motors
2) The piping hookup would be identical to AOCH (see page 178)
3) The construction and material are identical to AOCH Series (see page 171)

Notes:

1) Removable foot mounting brackets are supplied with unit at no additional charge.
2) 1/2-12 UNC-2B Tabs, 4 points, 8 points on models AOCHL - 30,35 & 40 (top & bottom) for optional mounting purposes.
3) Motor mounting bracket is rotated 90 degrees on AOCHL - 5 & 10 units.
4) Dotted line represents motor mounting bracket on AOCHL-35 & 40.
6) All units are available with an optional preset 30 or 65-psi pressure internal bypass valve. (see note "i" on page 179)
7) All units can be connected in one or Two Pass configuration. Refer to piping instructions for detailed operating and maintenance information (see page 178).

Example of a model:

AOCHL - 40 - 3 - S - R65 - 2P - ____ - ____

- **Model**
- **Size**
- **Drive Type**
  - N = no motor
  - 3 = 3/60/230-460
  - 3EXP = Explosion Proof 3/60/230-460
  - 5 = 3/60/575
  - 9 = Hydraulic Mtr.
- **Connections**
  - blank = NPT
  - S = SAE O-Rings
  - F = 4 Bolt Flange
  - A = Ansi 150#RF Flange
- **Bypass**
  - R30 = 30psi
  - R65 = 65psi
- **Number of Passes**
  - 1P = 1 pass
  - 2P = 2 pass
- **Tubing**
  - Blank = Copper
  - U = 90/10 Cu Ni
  - C = Carbon Steel
  - SS = Stainless Steel
- **Coating**
  - G = Galvanize (cabinet)
  - T = Heresite (core)
  - X = Epoxy (cabinet)
  - Blank = Enamel (standard)
  - STS = Stainless Steel (cabinet)

note: AIHTI reserves the right to make reasonable design changes without notice.

355 American Industrial Drive LaCrosse, VA 23950 tel: 434-757-1800 fax: 434-757-1810 email: sales@aihti.com

website : www.aihti.com
general email : sales@aihti.com
technical email : engineering@aihti.com

Notes:

The advantage of the AOCHL series, when the ambient air is at a lower temperature is to maintain the cooling temperature

American Industrial Heat Transfer Inc.
Manufacturer of Quality Heat Exchangers

website : www.aihti.com
general email : sales@aihti.com
technical email : engineering@aihti.com

Air Cooled Liquid Cooler Application Request:

For AOCS Series

Email form to: sales@aihti.com or engineering@aihti.com or fax to 434-757-1810

Contact Name _____ Telephone _____ Date _____

Company Name _____ Email _____

Address: _____ Fax _____

_____

Hot Side

Fluid Type _____

If available:
- Density _____ lb/ft3
- Viscosity _____ cP
- Thermal Conductivity _____ Btu/hr.ft.°F
- Specific Heat _____ Btu/lb.°F

1. Flow Rate _____
2. Temperature In _____
3. Desired Temperature Out _____
4. Heat Load _____

Cold Side

Ambient Air _____

Altitude _____

1. Operating Pressure _____
2. Allowable Pressure Drop _____

ASME Code and Certified Yes ☐ No ☐

To properly size the heat exchanger we need 3 of the 4 perameters on the Hot Side.

Cabinet Material:

Standard : Steel ☐

Options:
- Galvanized Steel ☐
- Stainless Steel ☐

Tubing Material:

Standard : Copper ☐

Options:
- 90/10 Copper Nickel ☐
- Stainless Steel ☐

Motor

60Hz:
- 230/460 Volt, 3 Phase ☐
- 115/230 Volt, 1 Phase ☐
- 575 Volt, 3 Phase ☐

50Hz
- 230/400 Volt, 3 Phase ☐
- 110/220 Volt, 1 Phase ☐

Hydraulic Motor ☐

Coating

Standard Enameled Gray Paint ☐

Options:
- Epoxy Paint ☐

Fins

Standared Aluminum ☐

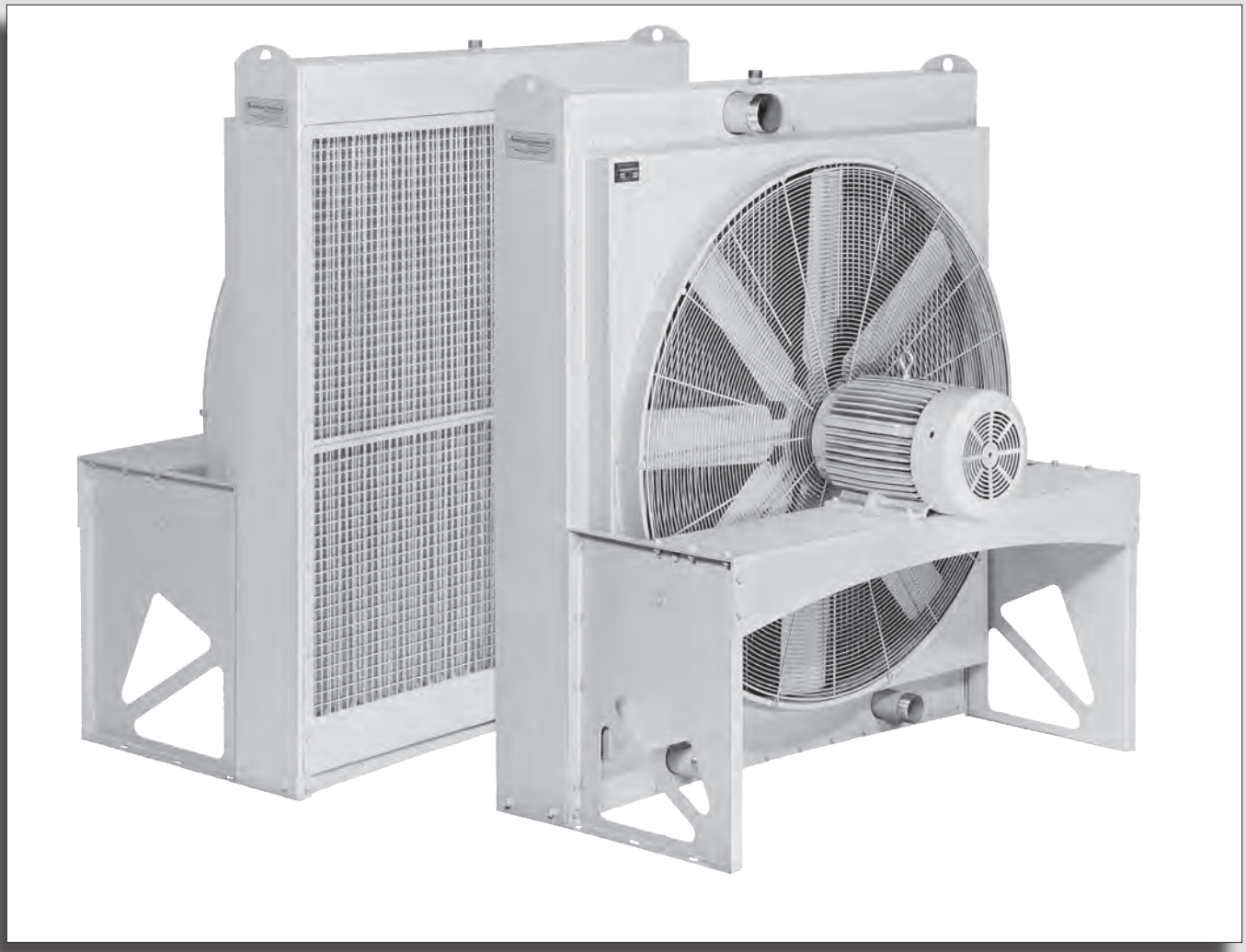
Options:
- Copper ☐

Optional Coating:
- Heresite ☐

Comment: _____

_____

AOCS SERIES

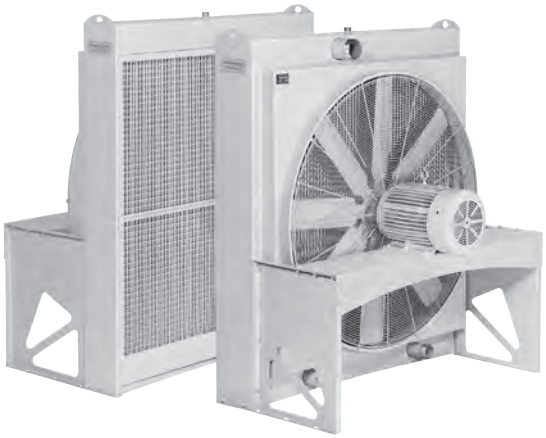


AIR COOLED

LIQUID COOLERS

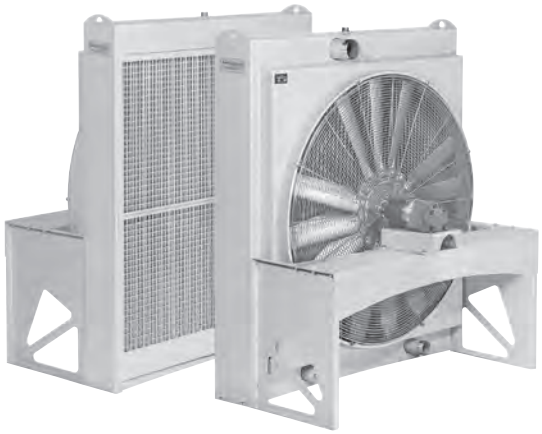
- Severe duty construction with OSHA guard.
- Serviceable Core®.
- Thermal capacity to 1,400 hp (1,043 Kw).
- Operating temperature of 300°F at 200 PSI.
- Electric, hydraulic, or external drive.
- Optional: built-in bypass valve.
- Can be customized to fit any applications.
- Computer generated data sheet available for any application
- Field changeable drive from electric to hydraulic.
- Cools: Fluid power systems, rock crushers, conveyors, shredders, lubrication equipment for paper machinery, gear drives, offshore drilling equipment, etc.

AOCS *overview*



AOCS Series *WITH ELECTRIC DRIVE*

Severe duty air-cooled oil coolers, super capacity, rolled tube industrial series heat exchangers with direct electric drive cooling fan, OSHA guard, and heavy duty front screen. Rated operating temperature of 300ºF at 300 PSIG. Standard flow rates from 10 to 600 GPM. NPT, ANSI flange, or SAE code 61 four bolt flange port connections. Optional built-in bypass relief valve 30 PSI or 65 PSI. Can be modified to meet your requirements. Suitable for most hydraulic oils, lubrications oils, synthetic compressor oils, ethylene glycol, and many other fluids compatible with listed material.



AOCS Series *WITH HYDRAULIC DRIVE*

Severe duty air-cooled oil coolers, super capacity, rolled tube industrial series heat exchangers with direct hydraulic drive cooling fan, OSHA guard, and heavy duty front screen. Rated operating temperature of 300ºF at 300 PSIG. Standard flow rates from 10 to 600 GPM. NPT, ANSI flange, or SAE code 61 four bolt flange port connections. Optional built-in bypass relief valve 30 PSI or 65 PSI. Can be modified to meet your requirements. Suitable for most hydraulic oils, lubrications oils, synthetic compressor oils, ethylene glycol, and many other fluids compatible with listed material.

AOCS Series

Durable design offered in eleven sizes available from stock for fast delivery.

AOCS Series

HORIZONTAL
IN ASME CODE AND
CERTIFIED
(SEE PAGE 204-205)

355 American Industrial Drive LaCrosse, VA 23950 tel: 434-757-1800 fax: 434-757-1810 email: sales@aihti.com

HIGH PERFORMANCE TURBULATOR

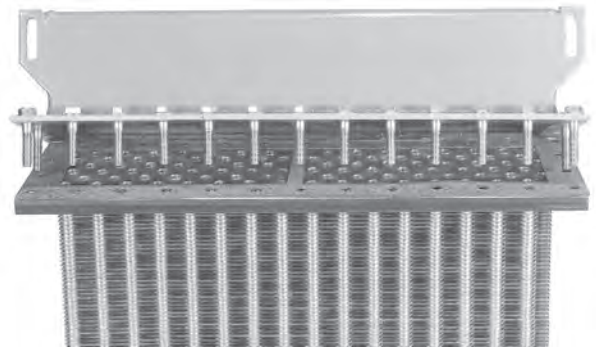
Exclusive American Industrial Turbulators installed in every flow tube, increase heat transfer by more than 100%.

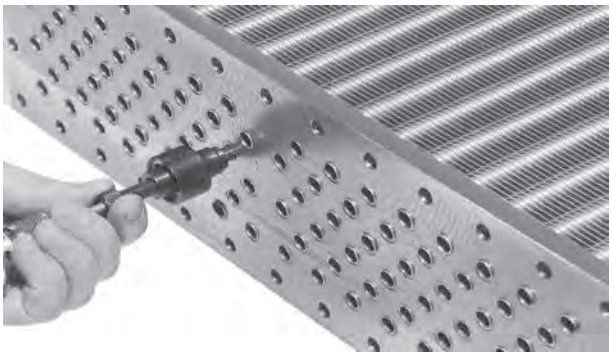
American Industrial Turbulators eliminate the laminar flow condition normally associated with other smooth tube heat exchangers. High viscosity hydraulic and lubricating oils are easily cooled by this new state of the art turbulator.

SERVICEABLE CORE ®

Core covers disassemble for easy access and cleaning. Repairable design for applications that required limited down time. Roller expanded tube to tube-sheet joint.

100% mechanical bond, no braze or solder joint to fatigue fail, corrode, crack, etc.. No rubber grommets to replace. Positive gasket seal is field replaceable for field maintenance or repair.





SUPERIOR COOLING FINS

Copper tubes are mechanically bonded to highly efficient aluminum cooling fins. Die-formed fin collars provide a durable precision fit for maximum heat transfer.

Custom fin design forces air to become turbulent and carry heat away more efficiently than old flat fin designs.

CONSTRUCTION MATERIALS & RATINGS

Standard Construction Materials		Optional Construction Materials	Standard Unit Ratings	
Tubes	Copper	316L Stainless Steel, 90/10 Cu.Ni, Carbon Steel	Operating Pressure	300 psig
Fins	Aluminum	Copper		
Turbulators	Steel	Brass, Stainless Steel	Operating Temperature	300 °F
Tube sheet	Steel	316L Stainless Steel		
Manifold cover	Steel	316L Stainless Steel	Altitude	0-3200 ft.
Connection pipes	Steel	316L Stainless Steel	For higher pressure and temperature consult factory	
Cabinet & frame	Steel	Galvanized Steel, 316L Stainless Steel,		
Fan Blade	Aluminum Hub / Non-sparking, Nylon Composite Blades	–		
Fan Guard	Zinc Plated Steel	Stainless Steel		
Gasket	Hypalon Composite	Viton, Nitrile, Composites		

note: AIHTI reserves the right to make reasonable design changes without notice.

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AOCS Series *selection*

Sizing
The performance curves provided are for petroleum oil at 63 ssu viscosity. However, fluids with characteristics other than the above mentioned may be used by applying a correction factor.

Heat Load
If the heat load is unknown, a horsepower value can be calculated by first determining the systems total potential. For a basic hydraulic system, it is helpful to know whether the system is open loop (with a large reservoir) or closed loop (normally on mobile equipment, with a very small reservoir). System potentials may be calculated quickly by using one of the two methods below.

There are some system parameters that will be required to properly accomplish the sizing calculations. Without system parameters it is difficult to determine the optimal heat exchanger size. Normally many of the system parameters can be found on hydraulic schematics or on tags located on the actual equipment. Following are some basic parameters that you should try to acquire before attempting the sizing calculations. However, it is not necessary to have every parameter listed below.

- Main system flow rate (gpm) & operating pressure (psi).
- Electric motor HP driving hydraulic pump (if more than one add up the Hp for all).
- Desired temperature (°F).
- Fluid type (SAE 10, 20, 30, etc....).
- Ambient air temperature (warmest day).
- Desired fan drive (hydraulic, electric, 12-24V DC, etc...).
- BTU's or HP to be cooled (normally given for lubrication systems).
- Maximum pressure drop allowed through the heat exchanger.
- Space available for heat exchanger (LxWxH).

Method 1
Normally used for open loop circuits. Multiply the main hydraulic systems Electric Motor Name plate Horsepower by a heat removal factor (normally 30-50%).

Example: 50 HP motor x 0.3 = 15 HP heat load

Method 2
Normally used when the HP input potential is unknown or for mobile applications where diesel engines operate the entire system. Multiply system pressure by the flow rate of the main system divided by 1714 equals system potential (HP). Multiply the system HP by a heat removal factor (Normally 25-35%). Note: In some closed loop systems only a portion of the total system flow is directed through the heat exchanger, this may affect the cooler selection process substantially. You may contact our factory for additional technical assistance.

Example: $\frac{(2000 \text{ psi} \times 30 \text{ gpm})}{1714} = [35 \text{ HP} \times .25] = 8.75 \text{ HP heat load}$

Determining Fs value
To determine the proper size heat exchanger for your application, use the following equation to first determine the (Fs) factor.

$$Fs = \frac{\{ \text{heat load (HP)} \times 2545 \times Cv \}}{\{ \text{°F (oil leaving - air entering)} \}}$$

Example:
Heat load = 50 HP
Cv = 1.14 (SAE 20) determined from chart. [Located on page 4.]
Desired operating temperature = 120 ºF
Ambient air temp. = 100 ºF

$$Fs = \frac{\{ 50 \times 2545 \times 1.14 \}}{\{ 120 \text{ °F} - 100 \text{ °F} \}} = 7254$$

Selection
To select a model, locate the flow rate (GPM) at the bottom of the flow vs Fs graph. Proceed upward until the GPM flow rate intersects with the calculated Fs. The curve closest above the intersection point will meet these conditions.

Example: Fs = 7254 = Model = AOCS - 1505 - ∗
GPM = 40
PASSES = 2

Pressure differentials
Determine the oil pressure drop from the curves as indicated. For viscosities other than 63 ssu, multiply the actual indicated pressure drop for your GPM flow by the value shown in the pressure differential curve for your viscosity value.

Example: AOCS-1505 @ 40 gpm & 63 ssu -2 pass curve-
Indicated pressure drop 5 psi (Approx)
{ 5 psi x 2.8Cp (for SAE-20 oil) } = 14.0 corrected psi

Average Liquid Temperature	Cv VISCOSITY CORRECTION FACTORS																
	SAE 5	SAE 10	SAE 20	SAE 30	SAE 40	ISO 22	ISO 32	ISO 46	ISO 68	ISO 100	ISO 150	ISO 220	ISO 320	MIL-L-7808	POLYGLYCOL	PHOSPHATE ESTER	50% ETHYLENE GLYCOL & WATER
100	1.11	1.15	1.25	1.38	1.45	1.08	1.14	1.18	1.26	1.37	1.43	1.56	1.84	1.19	0.92	0.83	0.85
110	1.09	1.12	1.20	1.32	1.40	1.06	1.13	1.16	1.25	1.31	1.39	1.48	1.67	1.14	0.89	0.80	0.84
120	1.06	1.10	1.17	1.27	1.35	1.04	1.11	1.14	1.20	1.27	1.35	1.40	1.53	1.09	0.88	0.79	0.84
130	1.04	1.08	1.13	1.24	1.29	1.03	1.09	1.13	1.17	1.24	1.30	1.34	1.44	1.05	0.85	0.77	0.83
140	1.03	1.05	1.11	1.19	1.25	1.02	1.08	1.10	1.16	1.20	1.26	1.30	1.39	1.03	0.84	0.76	0.82
150	1.01	1.04	1.09	1.16	1.22	1.02	1.06	1.09	1.13	1.17	1.22	1.27	1.33	1.01	0.83	0.74	0.82
200	0.98	0.99	1.01	1.04	1.07	0.98	0.99	1.00	1.01	1.02	1.08	1.09	1.14	0.98	0.79	0.71	0.80
250	0.95	0.96	0.97	0.98	0.99	0.95	0.96	0.96	0.96	0.97	0.99	1.01	1.02	0.97	0.76	0.69	0.79

Average Liquid Temperature	Cp PRESSURE DROP CORRECTION FACTORS																
	SAE 5	SAE 10	SAE 20	SAE 30	SAE 40	ISO 22	ISO 32	ISO 46	ISO 68	ISO 100	ISO 150	ISO 220	ISO 320	MIL-L-7808	POLYGLYCOL	PHOSPHATE ESTER	50% ETHYLENE GLYCOL & WATER
100	2.00	2.40	4.40	6.40	8.80	1.07	1.53	1.82	2.54	4.19	6.44	9.38	13.56	1.26	3.00	3.50	0.730
110	1.70	2.10	3.60	5.10	6.70	1.04	1.45	1.72	2.35	3.73	5.70	8.33	11.63	1.20	2.40	2.90	0.720
120	1.50	1.80	3.00	4.20	5.60	1.02	1.38	1.60	2.15	3.26	4.91	7.23	9.73	1.14	2.10	2.50	0.709
130	1.40	1.60	2.60	3.40	4.50	0.99	1.30	1.49	1.94	2.80	4.14	6.19	7.80	1.08	1.90	2.20	0.698
140	1.30	1.50	2.23	2.90	3.70	0.97	1.23	1.38	1.75	2.38	3.47	5.20	6.11	1.03	1.90	2.00	0.686
150	1.20	1.30	1.90	2.50	3.10	0.95	1.17	1.30	1.61	2.04	2.90	4.35	4.77	0.98	1.70	1.90	0.676
200	0.93	0.96	1.20	1.40	1.60	0.89	0.99	1.08	1.18	1.33	1.59	1.74	1.95	0.90	1.20	1.30	0.635
250	0.81	0.82	0.92	0.97	1.05	0.85	0.93	0.96	1.03	1.11	1.21	1.22	1.23	0.83	1.00	1.05	0.556

note: AIHTI reserves the right to make reasonable design changes without notice.
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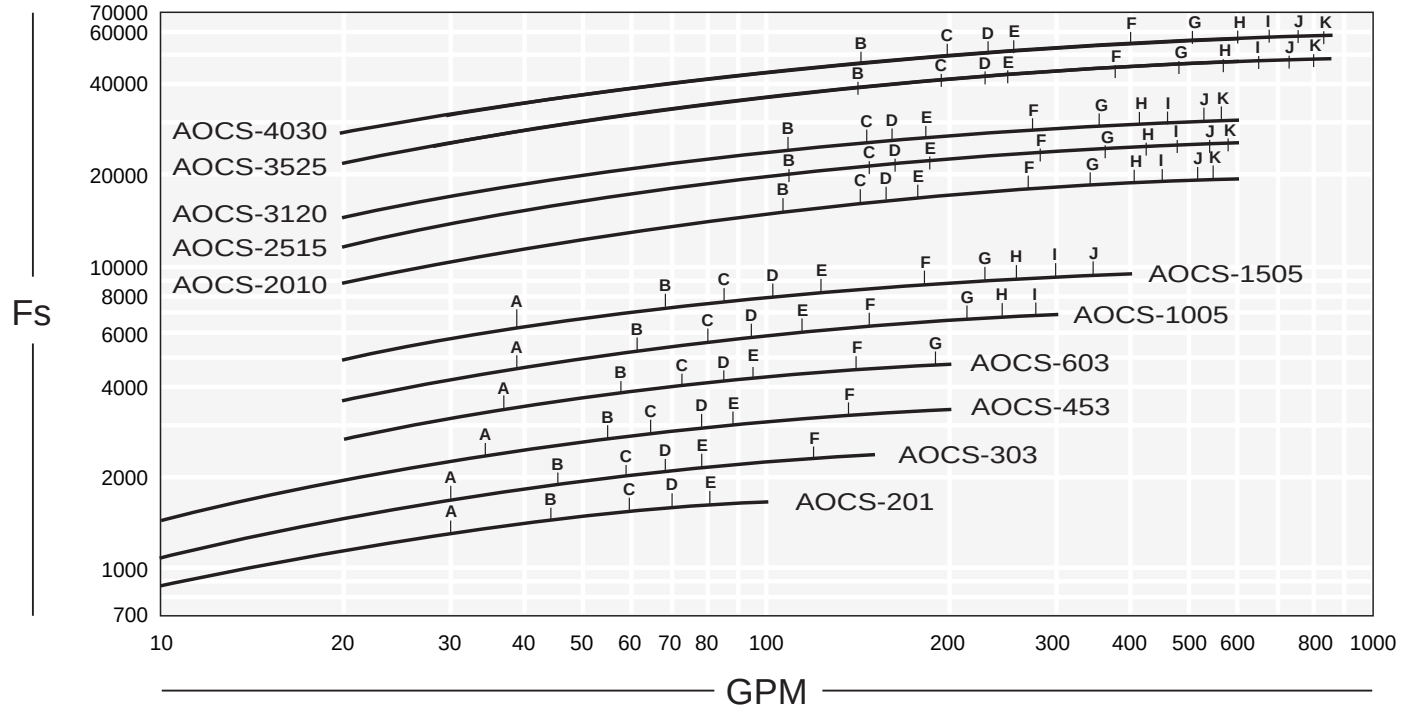
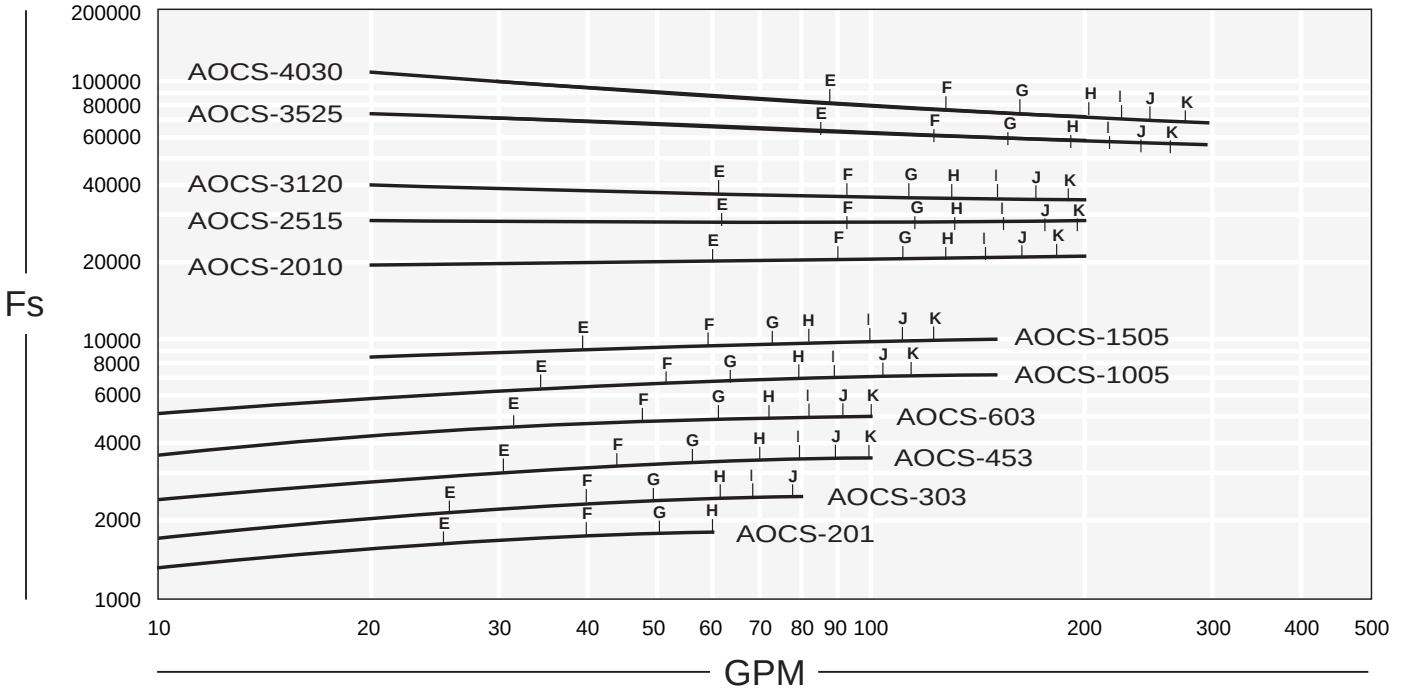
ONE PASS



TWO PASS

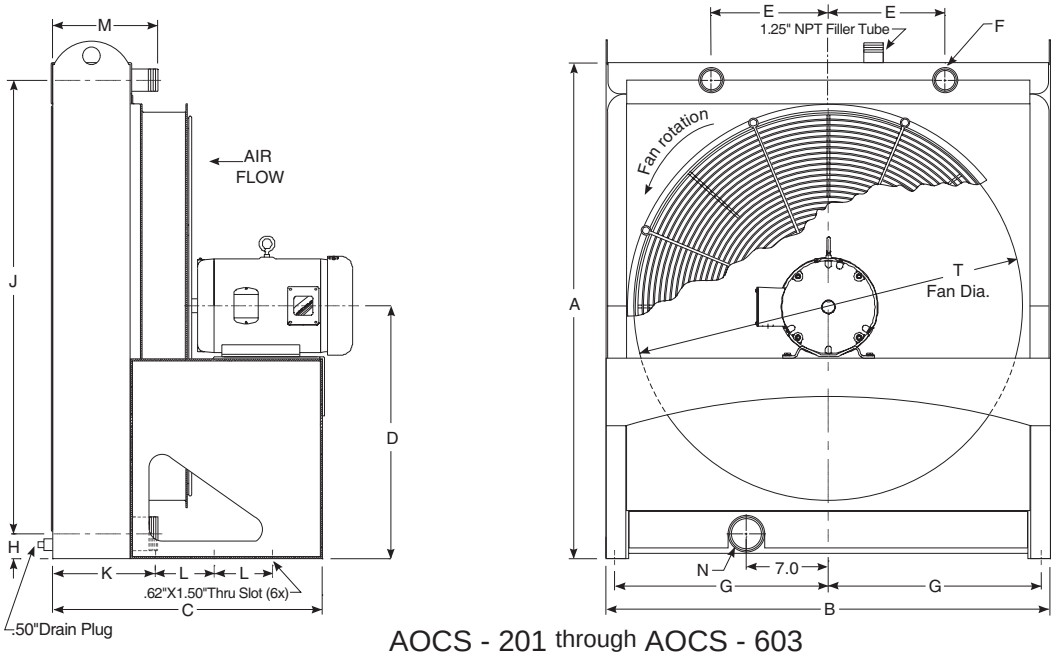


PERFORMANCE CALCULATION	OIL PRESSURE DROP (PSI) CODE
$F_s = \frac{\text{Horsepower to be removed (HP) x 2545 x Cv}}{^{\circ}\text{F (Oil Leaving* - Ambient Air Entering)}} = \frac{\text{BTU}}{\text{hr °F}}$	B = 2 PSI E = 5 PSI H = 20 PSI K = 35 PSI C = 3 PSI F = 10 PSI I = 25 PSI D = 4 PSI G = 15 PSI J = 30 PSI

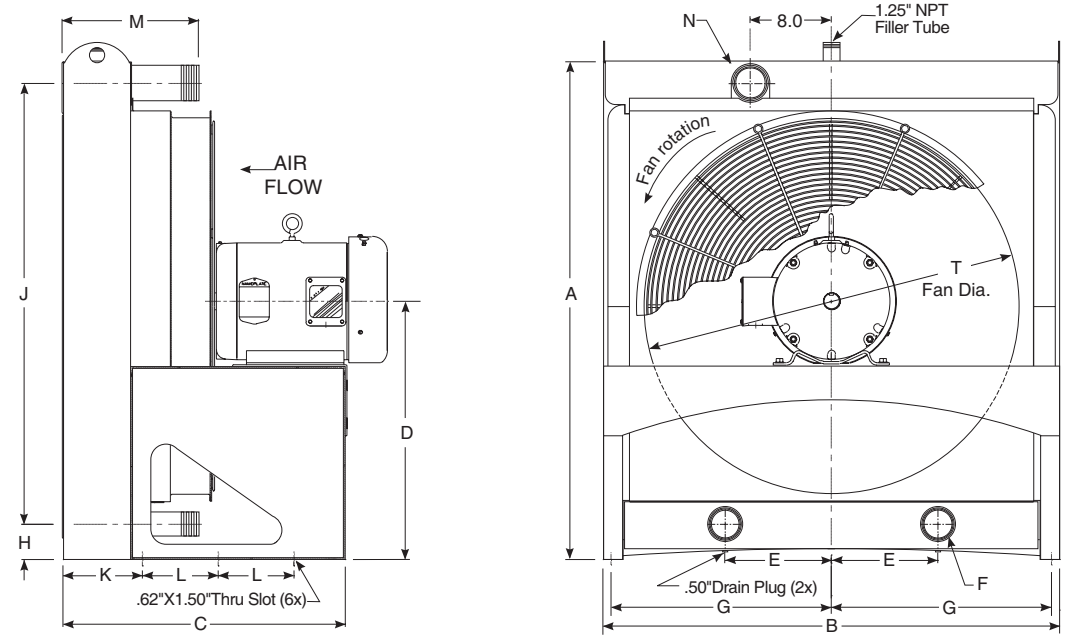
*Represents desired fluid leaving the cooler.

Note: When a model selection has been made, record whether the selection was from the one pass curve or the Two Pass curve so that the unit can be properly plumbed. Incorrect installation can seriously affect the performance.

AOCS Series *dimensions with electric drive*



AOCS - 201 through AOCS - 603



AOCS - 1005 through AOCS - 4030

(F and N*) are SAE code 61 four bolt flanges*

DIMENSIONS (inches)																
Model	A	B	C	D	E	F NPT	F* SAE	G	H	J	K	L	M	N NPT	N* SAE	T
AOCS-201 - ✱	27.13	23.50	20.56	13.63	6.00	1.25	1.25	11.00	1.38	24.50	7.38	5.00	9.00	1.50	1.50	18.00
AOCS-303 - ✱	32.38	27.50	21.94	16.38	7.00	1.25	1.25	13.00	1.88	29.00	7.38	5.00	9.00	2.00	2.00	22.00
AOCS-453 - ✱	36.38	33.00	23.06	18.50	8.00	1.50	1.50	15.75	1.88	33.00	8.81	5.00	9.00	2.00	2.00	28.00
AOCS-603 - ✱	42.38	38.00	23.06	21.62	10.00	1.50	1.50	18.25	2.13	38.75	8.81	5.00	9.00	2.50	2.50	32.00
AOCS-1005- ✱	49.00	45.00	24.88	25.00	10.50	2.00	2.00	21.75	3.50	43.50	7.81	7.50	13.50	3.00	3.00	36.00
AOCS-1505- ✱	56.00	53.00	24.88	28.50	12.50	2.00	2.00	25.75	3.50	50.50	7.69	7.00	13.50	3.00	3.00	42.00
AOCS-2010- ✱	65.00	59.50	32.13	33.00	15.00	3.00	3.00	29.00	4.50	58.00	11.06	7.50	15.50	4.00	4.00	48.00
AOCS-2515- ✱	73.25	67.25	34.78	37.00	16.00	3.00	3.00	32.87	4.50	66.00	11.06	7.50	15.50	4.00	4.00	54.00
AOCS-3120- ✱	79.25	69.50	34.78	40.00	17.00	3.00	3.00	34.00	4.50	72.00	11.06	9.00	15.50	4.00	4.00	60.00
AOCS-3525- ✱	85.50	74.00	40.00	43.00	18.00	3.00	3.00	37.00	4.50	78.00	13.00	9.00	18.00	4.00	4.00	60.00
AOCS-4030- ✱	91.50	80.00	40.00	46.00	20.00	3.00	3.00	40.00	4.50	84.00	13.00	9.00	18.00	4.00	4.00	60.00

✱*Represents the options for motor drive.*

note: AIHTI reserves the right to make reasonable design changes without notice.

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ELECTRIC MOTOR DATA

Model	Horse Power	Phase	Hz	Volts	RPM	NEMA Frame	Type	Full Load Amperes	Service Factor	Thermal Overload
AOCS-201-3	1	3	60	208-230/460	1800	143T	TEFC	2.9/1.5	1.15	NO
AOCS-201-5	1	3	60	575	1800	143T	TEFC	1.13	1.25	NO
AOCS-303-3	3	3	60	208-230/460	1800	182T	TEFC	7.6/3.8	1.15	NO
AOCS-303-5	3	3	60	575	1800	182T	TEFC	3.05	1.15	NO
AOCS-453,603-3	3	3	60	208-230/460	1200	213T	TEFC	8.3/4.2	1.15	NO
AOCS-453,603-5	3	3	60	575	1200	213T	TEFC	3.34	1.15	NO
AOCS-1005,1505-3	5	3	60	208-230/460	1200	215T	TEFC	13.5/6.7	1.15	NO
AOCS-1005,1505-5	5	3	60	575	1200	215T	TEFC	5.39	1.15	NO
AOCS-2010-3	10	3	60	208-230/460	1200	256T	TEFC	27.6/13.8	1.15	NO
AOCS-2010-5	10	3	60	575	1200	256T	TEFC	11.0	1.15	NO
AOCS-2515-3	15	3	60	208-230/460	1200	284T	TEFC	35.8/17.9	1.25	NO
AOCS-2515-5	15	3	60	575	1200	284T	TEFC	14.3	1.25	NO
AOCS-3120-3	20	3	60	208-230/460	1200	286T	TEFC	48.4/24.2	1.25	NO
AOCS-3120-5	20	3	60	575	1200	286T	TEFC	19.4	1.25	NO
AOCS-3525-3	25	3	60	208-230/460	1200	324T	TEFC	60.8/30.4	1.25	NO
AOCS-3525-5	25	3	60	575	1200	324T	TEFC	24.3	1.25	NO
AOCS-4030-3	30	3	60	208-230/460	1200	326T	TEFC	71.6/35.8	1.25	NO
AOCS-4030-5	30	3	60	575	1200	326T	TEFC	28.6	1.25	NO

NOTE: All of the AOCS Series are available in 50hz upon request as a special

ELECTRIC MOTOR NOTES:

1) All motors are NEMA, high efficiency
2) All standard direct drive models are supplied with TEFC electric motor for continuous duty at 104ºF (40ºC).
3) The above motor electrical ratings are an approximate guide and may vary slightly between motor manufactures. Consult motor ratings listed directly on motor data plate prior to installation and operation
4) High altitude, high temperature, severe duty, crusher duty, chemical, IEC, Canadian Standards Association, and Underwriters Laboratory recognized motors are available upon request.
5) American industrial Heat Transfer, Inc. reserves the right to enact changes to motor brand, type, and ratings regarding horsepower, RPM, FLA, and Service factor for standard products without notice. All specified customer requirements will be honored without change or as directed.
6) Fan rotation is clockwise facing the motor shaft.
7) For lubrication information refer to manufactures maintenance instructions.
8) **Abbreviation Index**

TEFC ..... Totally Enclosed, Fan Cooled

X-PROOF ..... Explosion Proof

CLASS I,DIV.1, GROUP D or CLASS II,DIV.2, GROUP F & G EXPLOSION PROOF MOTOR DATA

Model	Horse Power	Phase	Hz	Volts	RPM	NEMA Frame	Enclosure Type	Full Load Amperes	Service Factor	Thermal Overload
AOCS-201-3EXP	1	3	60	208-230/460	1800	143T	EPFC	2.8/1.4	1.15	YES
AOCS-303-3EXP	3	3	60	208-230/460	1800	182T	EPFC	7.8/3.9	1.15	YES
AOCS-453,603-3EXP	3	3	60	208-230/460	1200	213T	EPFC	8.8/4.4	1.15	YES
AOCS-1005,1505-3EXP	5	3	60	208-230/460	1200	215T	EPFC	13.6/6.8	1.15	YES
AOCS-2010-3EXP	10	3	60	208-230/460	1200	256T	EPFC	26.6/13.3	1.15	YES
AOCS-2515-3EXP	15	3	60	208-230/460	1200	284T	EPFC	35.0/17.5	1.15	YES
AOCS-3120-3EXP	20	3	60	208-230/460	1200	286T	EPFC	48.4/24.2	1.15	YES
AOCS-3525-3EXP	25	3	60	208-230/460	1200	324T	EPFC	60.8/30.4	1.15	YES
AOCS-4030-3EXP	30	3	60	208-230/460	1200	326T	EPFC	73.4/36.7	1.15	YES

NOTE: All of the AOCS Series explosion proof motors are available in 50hz upon request as a special

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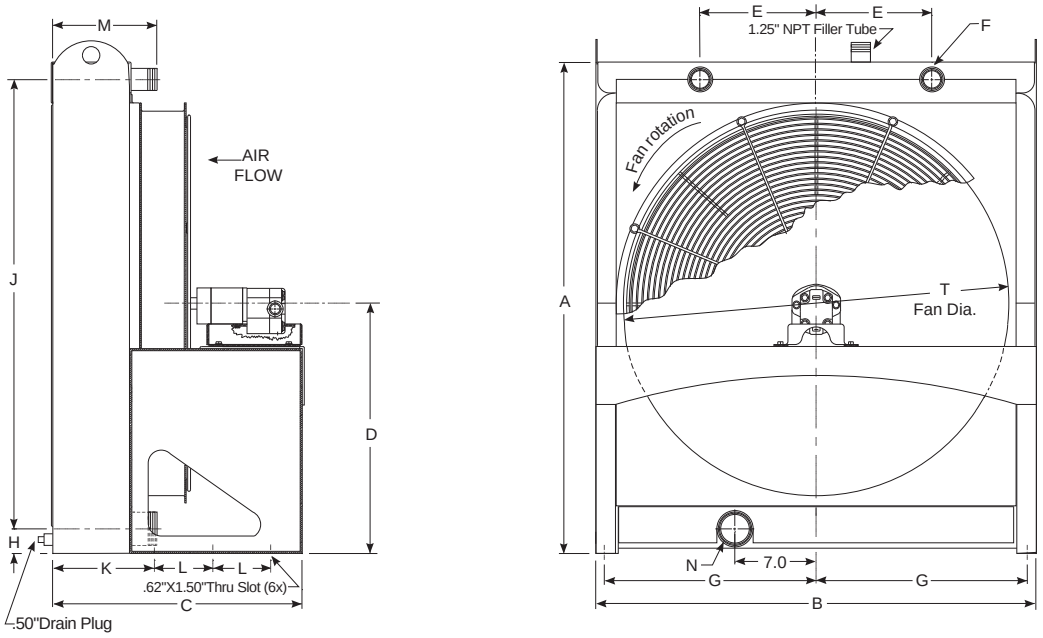
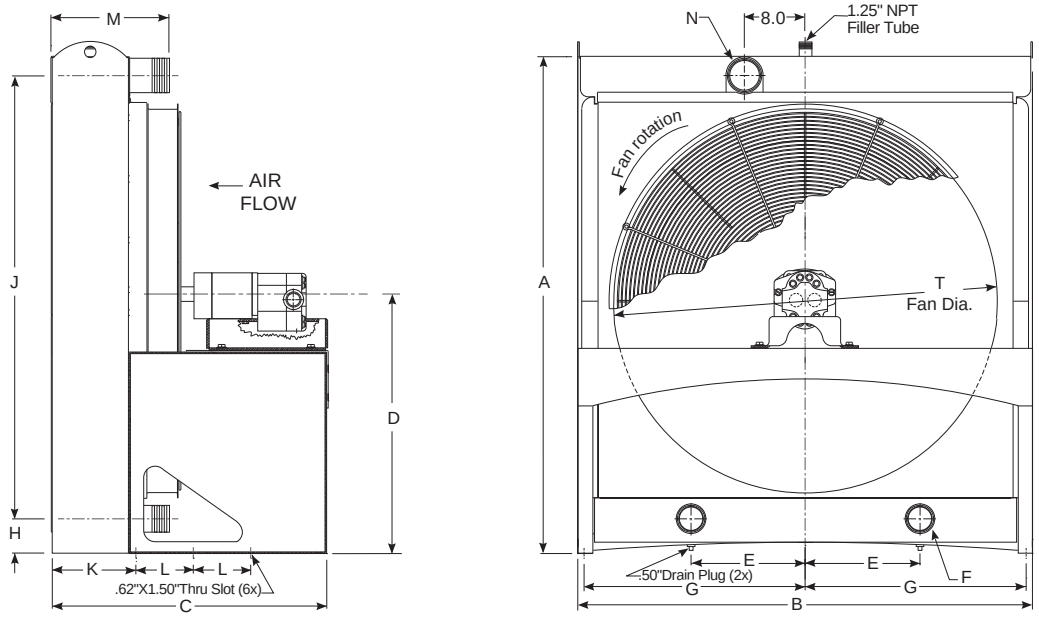
AOCS Series *dimensions with hydraulic drive*



AOCS - 201 through AOCS - 603



AOCS - 1005 through AOCS - 4030

(F and N*) are SAE code 61 four bolt flanges*

DIMENSIONS (inches)																
Model	A	B	C	D	E	F NPT	F* SAE	G	H	J	K	L	M	N NPT	N* SAE	T
AOCS-201 - 9	27.13	23.50	20.56	13.63	6.00	1.25	1.25	11.00	1.38	24.50	7.38	5.00	9.00	1.50	1.50	18.00
AOCS-303 - 9	32.38	27.50	21.94	16.38	7.00	1.25	1.25	13.00	1.88	29.00	7.38	5.00	9.00	2.00	2.00	22.00
AOCS-453 - 9	36.38	33.00	23.06	18.50	8.00	1.50	1.50	15.75	1.88	33.00	8.81	5.00	9.00	2.00	2.00	28.00
AOCS-603 - 9	42.38	38.00	23.06	21.62	10.00	1.50	1.50	18.25	2.13	38.75	8.81	5.00	9.00	2.50	2.50	32.00
AOCS-1005- 9	49.00	45.00	24.88	25.00	10.50	2.00	2.00	21.75	3.50	43.50	7.81	7.50	13.50	3.00	3.00	36.00
AOCS-1505- 9	56.00	53.00	24.88	28.50	12.50	2.00	2.00	25.75	3.50	50.50	7.69	7.00	13.50	3.00	3.00	42.00
AOCS-2010- 9	65.00	59.50	32.13	33.00	15.00	3.00	3.00	29.00	4.50	58.00	11.06	7.50	15.50	4.00	4.00	48.00
AOCS-2515- 9	73.25	67.25	34.78	37.00	16.00	3.00	3.00	32.87	4.50	66.00	11.06	7.50	15.50	4.00	4.00	54.00
AOCS-3120- 9	79.25	69.50	34.78	40.00	17.00	3.00	3.00	33.25	4.50	72.00	11.06	9.00	15.50	4.00	4.00	60.00
AOCS-3525- 9	85.50	74.00	40.00	43.00	18.00	3.00	3.00	37.00	4.50	78.00	13.00	9.00	18.00	4.00	4.00	60.00
AOCS-4030- 9	91.50	80.00	40.00	46.00	20.00	3.00	3.00	40.00	4.50	84.00	13.00	9.00	18.00	4.00	4.00	60.00

note: AIHTI reserves the right to make reasonable design changes without notice.

355 American Industrial Drive LaCrosse, VA 23950 tel: 434-757-1800 fax: 434-757-1810 email: sales@aihti.com

HYDRAULIC MOTOR DATA

Model	Motor RPM	Displacement in³/Rev	Required Flow		Oper. pressure start / run PSIG	Case Drain	SAE Size	Side Port SAE O-Ring	Max. Continuous Pressure PSIG
			GPM	LPM					
AOCS-201- 9	1725	0.68	6.0	22.7	400 / 290	Ext.	A	#12; 1-1/16-12	3000
AOCS-303- 9	1725	0.68	6.0	22.7	1400 / 860	Ext.	A	#12; 1-1/16-12	3000
AOCS-453- 9	1160	1.00	5.9	22.3	1300 / 870	Ext.	A	#12; 1-1/16-12	3000
AOCS-603- 9	1160	1.00	5.9	22.3	1300 / 870	Ext.	A	#12; 1-1/16-12	3000
AOCS-1005- 9	1160	1.45	8.5	32.2	1500 / 1000	Ext.	A	#12; 1-1/16-12	3000
AOCS-1505- 9	1160	1.45	8.5	32.2	1500 / 1000	Ext.	A	#12; 1-1/16-12	3000
AOCS-2010- 9	1160	2.32	13.7	51.9	1750 / 1250	Ext.	B	#16; 1-5/16-12	3000
AOCS-2515- 9	1160	3.30	19.5	73.8	2000 / 1350	Ext.	B	#16; 1-5/16-12	3000
AOCS-3120- 9	1160	3.30	19.5	73.8	2500 / 1800	Ext.	B	#16; 1-5/16-12	3000
AOCS-3525- 9	1160	3.80	22.5	85.0	2500 / 1900	Ext.	B	#16; 1-5/16-12	3000
AOCS-4030- 9	1160	5.30	26.6	100.7	3000 / 2200	Ext.	B	#16; 1-5/16-12	3000

Note:
Maximum degree of fluid contamination; Class 18/15 according to ISO 4406. Therefore, we recommend a filter with a retention rate of B 20 >. For longer life, we recommend class 17/14, achievable with a filter B10 > -100.

HYDRAULIC MOTOR NOTES:

1) Standard units are supplied with a bi-directional hydraulic gear motor for the fan drive. The gear motor requires an external case drain be used during operation. The external case drain should be connected directly to hydraulic reservoir or a return line with not greater than 10PSIG back pressure. (NOTE: *Failure to properly connect and use the external case drain during motor operation could result in motor failure and external leakage of hydraulic fluid.*
2) Hydraulic motor flow requirements are provided with an efficiency rating of approximately 85%. Pressure requirements are calculated theoretical minimum operating requirements.
3) Hydraulic motor load adapters are provided to bridge and align the space between the hydraulic motor and the fan. Load adapters require periodic maintenance lubrication (see accompanying information).
4) Maximum degree of fluid contamination, class 18/15 according to ISO 4406. Therefore, it is recommended to use a filter with retention rating of B20>. For longer life, it is recommended to use class 17/14 achievable with filter B10>-100.
5) A shaft coupling bushing is used on some models to join the fan drive shaft to the fan. All fans, either hub style or bushing connection, should be checked and retightened after the first 100 hours of operation.
6) Fan rotation is clockwise when facing the motor shaft.
7) Optional displacement motors available upon request.
8) American industrial reserves the right to enact changes to hydraulic motor, brand, type, ratings, port sizes, or any additional non-specified attribute for standard products without notice. All specific requirements will be honored without change pending availability.

Example of a model:

AOCS - 1505 - 3 - S - R65 - 2P - ____ - ____

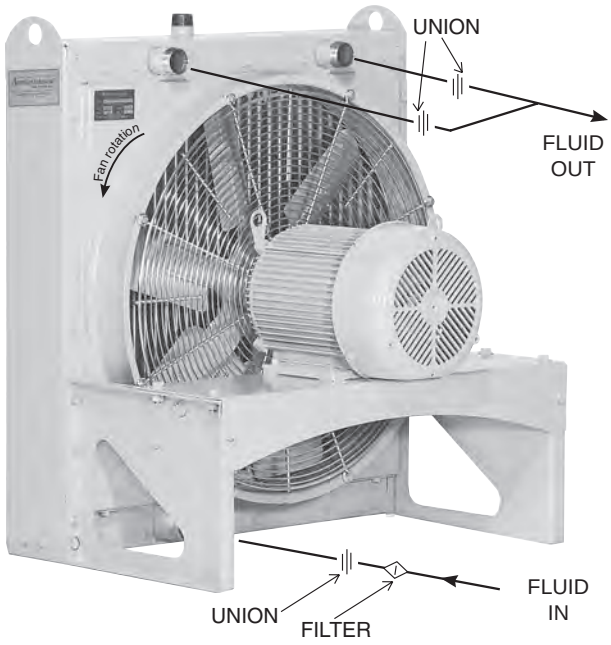
- Model
- Size
- Drive Type
  - N = no motor
  - 3 = 3/60/230-460
  - 3EXP = Explosion Proof 3/60/230-460
  - 5 = 3/60/575
  - 9 = Hydraulic Mtr.
- Connections
  - blank = NPT
  - S = SAE 4 Bolt Flange
  - A = ANSI 150#RF Flange
- Bypass
  - R30 = 30psi
  - R65 = 65psi
- Number of Passes
  - 1P = 1 pass
  - 2P = 2 pass
- Tubing
  - Blank = Copper
  - U = 90/10 Cu Ni
  - C = Carbon Steel
  - SS = Stainless Steel
- Coating
  - G = Galvanize (cabinet)
  - T = Heresite (core)
  - X = Epoxy (cabinet)
  - Blank = Enamel (standard)
  - STS = Stainless Steel (cabinet)

COMMON DATA

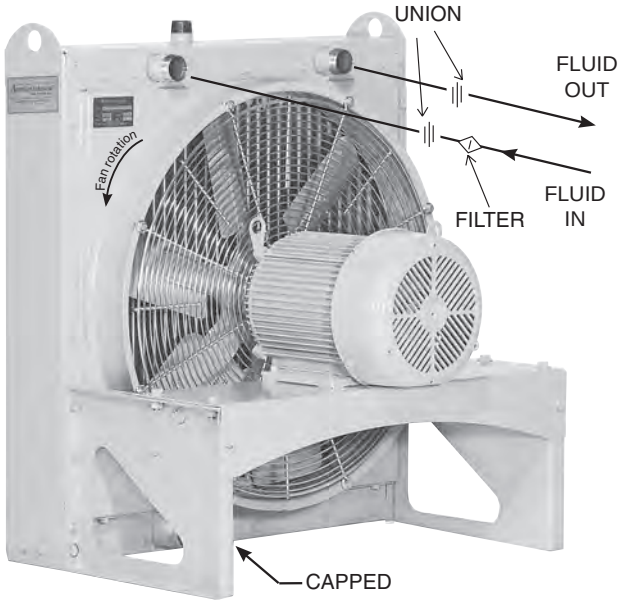
Model	Air Flow		Sound Level dB(A) @ 13ft	Liquid Volume		Weight Electric		Weight Hydraulic		Serviceable Core™
	CFM	m³/s		gal.	cm³	lb	kg	lb	kg	
AOCS-201 - ✱	3000	1.41	77	1.7	6435	200	91	185	84	Yes
AOCS-303 - ✱	4380	2.07	82	3.8	14383	310	141	260	118	Yes
AOCS-453 - ✱	5920	2.79	78	4.8	18168	490	222	410	186	Yes
AOCS-603 - ✱	8750	4.13	80	6.1	23089	580	263	490	222	Yes
AOCS-1005- ✱	12650	5.97	84	7.7	29145	690	313	575	261	Yes
AOCS-1505- ✱	16150	7.65	87	10.4	39364	910	413	1025	465	Yes
AOCS-2010- ✱	23350	11.73	92	22.8	86298	1280	580	1062	482	Yes
AOCS-2515- ✱	32000	15.00	95	27.5	104088	1610	730	1320	598	Yes
AOCS-3120- ✱	39000	18.40	99	31.9	120742	1810	821	1483	673	Yes
AOCS-3525- ✱	46000	21.71	99	47.0	177895	1980	898	1622	736	Yes
AOCS-4030- ✱	54000	25.48	99	47.0	185466	2150	975	1762	799	Yes

NOTES: a) ✱ Represents the options for motor drive.
b) To estimate the sound level at distances other than 13 feet (4 meters) from the cooler, add 6 db for each halving of distance, or substract 6 db for each doubling of the distance.

AOCS - 201 through AOCS - 603



ONE PASS



TWO Pass

Receiving / Installation

a) Inspect unit for any shipping damage before uncrating. Indicate all damages to the trucking firms' delivery person and mark it on the receiving bill before accepting the freight. Make sure that the core and fan are not damaged. Rotate the fan blade to make sure that it moves freely. The published weight information located in this brochure is approximate. True shipment weights are determined at the time of shipping and may vary. Approximate weight information published herein is for engineering approximation purposes and should not be used for exact shipping weight. *Since the warranty is based upon the unit date code located on the model identification tag, removal or manipulation of the identification tag will void the manufacturers warranty.*

b) When handling the heat exchanger, special care should be taken to avoid damage to the core and fan. All units are shipped with wood skids for easy forklift handling

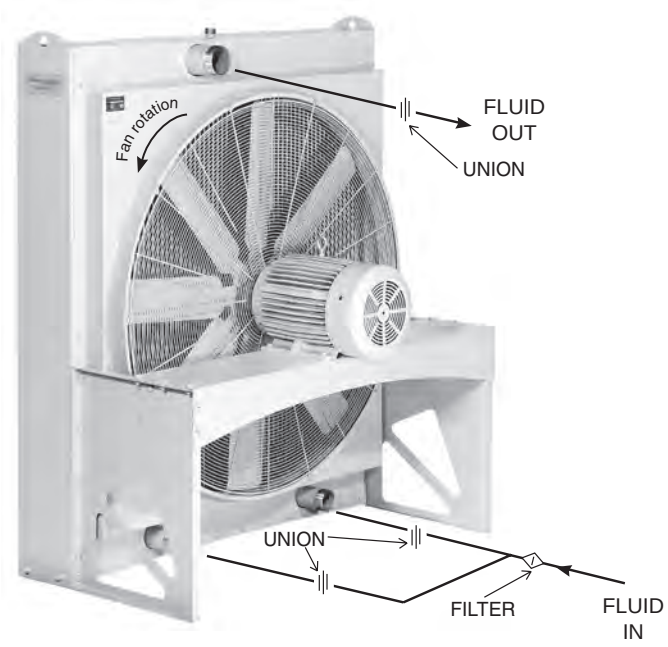
c) Standard Enamel Coating: American Industrial provides its standard products with a normal base coat of oil base air cure enamel paint. The enamel paint is applied as a temporary protective and esthetic coating prior to shipment. While the standard enamel coating is durable, American Industrial does not warranty it as a long-term finish coating. It is strongly suggested that a more durable final coating be applied after installation or prior to long-term storage in a corrosive environment to cover any accidental scratches, enhance esthetics, and further prevent corrosion. It is the responsibility of the customer to provide regular maintenance against chips, scratches, etc... and regular touch up maintenance must be provided for long-term benefits and corrosion prevention.

d) Special Coatings: American Industrial offers as customer options, Air-Dry Epoxy, and Heresite (Air-Dry Phenolic) coatings at additional cost. American Industrial offers special coatings upon request, however American Industrial does not warrantee coatings to be a permanent solution for any equipment against corrosion. It is the responsibility of the customer to provide regular maintenance against chips, scratches, etc... and regular touch up maintenance must be provided for long-term benefits and corrosion prevention.

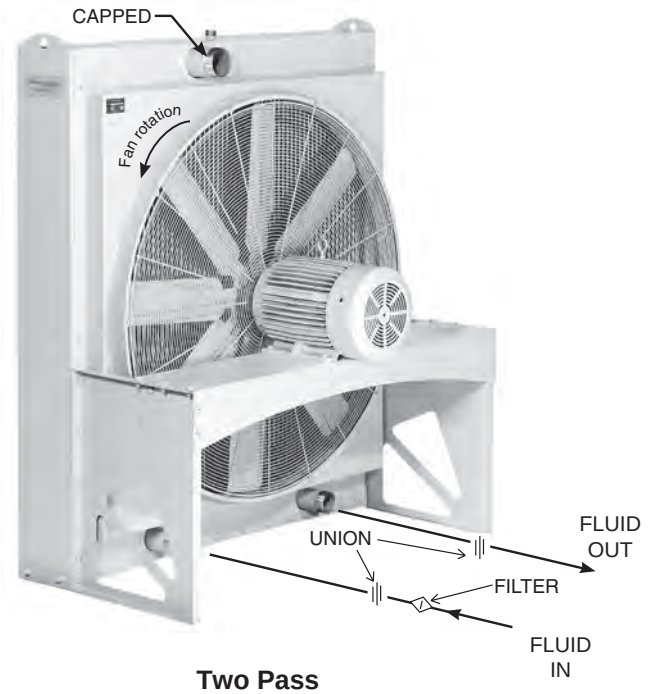
e) American Industrial recommends that the equipment supplied should be installed by qualified personnel who have solid understanding of system design, pressure and temperature ratings, and piping assembly. Verify the service conditions of the system prior to applying any air cooled heat exchanger series cooler. If the system pressure or temperature does not fall within the parameters on model rating tag located on the heat exchanger, contact our factory prior to installation or operation.

g) Heat exchanger should be securely fastened using the mounting foot brackets (included). All mounting holes should be used to secure unit into place. Optional horizontal mounting with vertical air flow is possible with specially designed mounting legs available through American Industrial. The special mounting legs incorporate motor mount and are recommended for horizontal operation. Customer modifications are not recommended to convert vertical mount units into horizontal units.

h) Connections should be made in "one pass" or "Two Pass" configurations exactly as indicated in the "piping hook up" illustration above and page opposite. The process flow entering the "Fluid IN" port and exiting the "Fluid OUT" port eliminates air pockets and assures that the unit will stay completely flooded. Flexible hose can be applied to reduce the risk of core failure due to thermal expansion or system vibration. Piping alignment and support is required for hoses longer than four feet in length and for piping exerting more than 20 lbs of dynamic force. It is recommended that filtration be located ahead of the heat exchanger to prevent excessive backpressure and clogging.



ONE PASS



Two Pass

i) With respect to the heat exchangers nozzle size, flow line sizes should be sized to handle the appropriate flow rate and system pressure drop requirements, normally flow line rates of about 8-12 feet per second and inlet pressure less than 100psig are experienced. If the flow line size is larger than the heat exchanger nozzle size, additional pressure loss beyond the published pressure loss data may occur.

j) Electric motors should be connected only to supply source of the same characteristics as indicated on the electric motor information plate. Prior to starting, verify that the motor and fan spin freely without obstruction. Check carefully that the fan turns in the correct rotation direction (normally counter clockwise) from the motor side (fan direction arrow). Failure to operate the fan in the proper direction could reduce performance or cause serious damage to the heat exchanger or other components. Fan blades should be rechecked for tightness after the first 100 hours of operation.

k) It is important to apply the catalog recommended flow rate for the hydraulic motor that corresponds with the specific model being used. A case drain is required for hydraulic motor installation. Failure to connect case drain can result in motor failure. The proper flow rate and direction to the hydraulic motor are critical to ensure fan direction and RPM. Exceeding the recommended RPM could result in fan failure and cause severe damage to the heat exchanger. See fan rotation on installation diagram.

Maintenance

Regular maintenance intervals based upon the surrounding and operational conditions should be maintained to verify equipment performance and to prevent premature component failure. Since some of the components such as, motors, fans, load adapters, etc... are not manufactured by American Industrial, maintenance requirements provided by the manufacture must be followed.

a) Inspect the entire heat exchanger and motor/fan assembly for loosened bolts, loose connections, broken components, rust spots, corrosion, fin/coil clogging, or external leakage. Make immediate repairs to all affected areas prior to restarting and operating the heat exchanger or its components.

b) Heat exchangers operating in oily or dusty environments will often need to have the coil cooling fins cleaned. Oily or clogged fins should be cleaned by carefully brushing the fins and tubes with water or a non-aggressive degreasing agent mixture *(Note: Cleaning agents that are not compatible with copper, brass, aluminum, steel or stainless steel should not be used)*. A compressed air or a water stream can be used to dislodge dirt and clean the coil further. Any external dirt or oil on the electric motor and fan assembly should be removed. *Caution: Be sure to disconnect the electric motor from its power source prior to doing any maintenance.*

c) In most cases it is not necessary to internally flush the coil. In circumstances where the coil has become plugged or has a substantial buildup of material, flushing the coil with water or a solvent may be done. Flushing solvents should be non-aggressive suitable for the materials of construction. Serviceable Core® models can be disassembled and inspected or cleaned if required.

d) Most low horsepower electric motors do not require any additional lubrication. However, larger motors must be lubricated with good quality grease as specified by the manufacture at least once every 6-9 months or as directed by the manufacture. T.E.F.C. air ventilation slots should be inspected and cleaned regularly to prevent clogging and starving the motor of cooling air. To maintain the electric motor properly see the manufactures requirements and specifications. The hydraulic motor uses an over hung load adapter for motor alignment and to extend the shaft to accept the fan.

Grease ports located on the adapter should be greased regularly with a high quality bearing grease.

e) Initial inspection, check the fan blade bolts for loosening after the first 100 hours of operation. Re-tighten the fan blade bolts to the proper torque if required. Note: Failure to check and maintain the fan blade could result in damage or failure of the equipment. Fan blades should be cleaned and inspected for tightness during the regular maintenance schedule when handling a fan blade care must be given to avoid bending or striking any of the blades. Fan blades are factory balanced and will not operate properly if damaged or unbalanced. Damaged fan blades can cause excessive vibration and severe damage to the heat exchanger or drive motor. Replace any damaged fan with an American industrial suggested replacement.

f) Air cooled exchanger cabinets are constructed using 7ga. through 18ga. steel that may be bent back into position if damaged. Parts that are not repairable can be purchased through American Industrial.

g) Coil fins that become flattened can be combed back into position. This process may require removal of the coil from the cabinet.

i) Solely at the request of customers, American Industrial provides direct acting internal inlet port to outlet port bypass relief valves as an additional safe guard against surge flow and over pressurization of the heat exchanger. However, American Industrial does not specify, recommend, suggest, guarantee, or warrantee the internal relief valve or its performance to safe guard the heat exchanger from damage or prevent failure due to excessive flow or over pressurization. It is the ultimately the sole responsibility of the customer/user to verify with the original equipment manufacture all conditions associated with applying an additional system relief valve prior to application.

Serviceable Core® Maintenance
Units containing a Serviceable Core® have bolted manifold covers that can be removed for cleaning or repair purposes. Most AOCH or AOCS cores manufactured after January 1, 1998 are Serviceable Cores®.

Servicing Sequence
American Industrial has gone to great lengths to provide components that are repairable. If the heat exchanger core requires internal cleaning or attention the following steps will explain what must be done to access the internal tubes. Be sure to order gasket kits or repair parts prior to removal and disassembly to minimize down time.

a) To clean the internal tubes first remove all connection plumbing from the unit.

b) Be sure the unit is drained of all water etc...

c) Place the heat exchanger in an area that it can be accessed from all sides. Remove the core from the cabinet if required (AOCH, AOCS).
d) Mark the cover ① and tube-sheet ③ for both covers so that they can be replaced into the same position when finished. Remove the manifold cover bolts ② and hardware and place them into a secure place.

e) The manifold covers are tightly compressed and may need some prying to separate them from the gasket ⑥, physically remove the cover assemblies ① from both sides.

f) The tubes ④ and turbulators ⑤ are now accessible for cleaning. Note: turbulators are installed on AOCH & AOCS cores only. If you need to remove the turbulator that runs through the tubing, it will be necessary to first squeeze the flattened end of the protruding turbulator ⑤, so that on end will fit through the tube. From the opposite end pull the turbulator ⑤ out. You may need to use pliers to grip and pull the turbulators ⑤ out, especially if there is debris lodged inside. As the turbulators ⑤ come out, most of the dirt will too, so be prepared. *It is suggested that gloves be worn when handling the turbulators ⑤ as they may be sharp.*

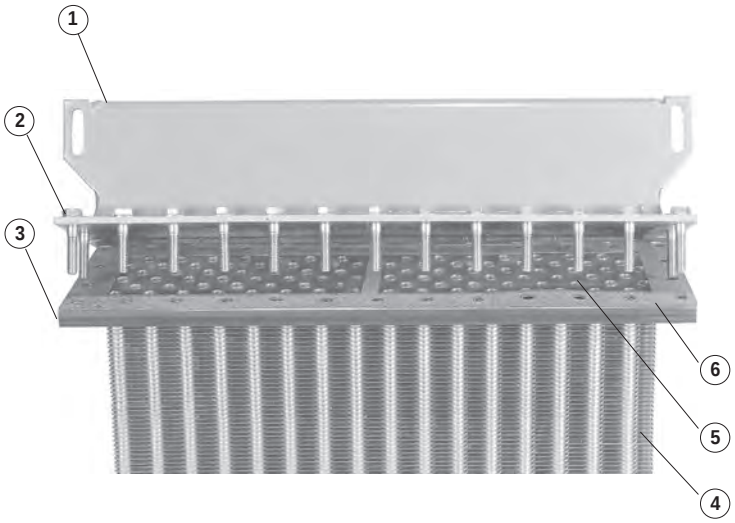
We suggest a mild water-soluble degreaser be used with a brush. Tubing I.D. is aproximatley .325 a plastic bristle brush on a rod will work best for cleaning the tubes ④. Steel brushes should be avoided since the steel is harder than the copper tubing and may heavily score the tubes ④ if used.

g) If there are any leaking tubes ④ you may plug them by carefully forcing a soft metal plug into the hole and tapping it tight. You may in some cases weld the leaking tube shut however, care should be taken since excessive heat may cause surrounding tube joints to loosen and leak.

h) When finished cleaning or repairing, be sure to replace ALL of the turbulators ⑤ back into any open tubes ④. When the turbulators ⑤ protrude from the opposite end flatten them again so they are tight and cannot be removed.

i) When finished reattach the manifold covers ① in the same position they were removed, using new gaskets ⑥, bolts ②, and hardware. We suggest using a torque wrench to final tighten the bolts ②.

j) Torque Specifications: For 5/16" bolts 22-23 ft-lbs, for 3/8" bolts to 38-42 ft-lbs. Since bolts and hardware can physically fatigue during application we suggest new bolt kits be used when reassembling.



website : www.aihti.com
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technical email : engineering@aihti.com

Notes:

American Industrial Heat Transfer Inc.
Manufacturer of Quality Heat Exchangers

website : www.aihti.com
general email : sales@aihti.com
technical email : engineering@aihti.com

Air Cooled Liquid Cooler Application Request:

For AOCSH Series

Email form to: sales@aihti.com or engineering@aihti.com or fax to 434-757-1810

Contact Name _____ Telephone _____ Date _____

Company Name _____ Email _____

Address: _____ Fax _____

_____

Hot Side

Fluid Type _____

If available:
- Density _____ lb/ft3
- Viscosity _____ cP
- Thermal Conductivity _____ Btu/hr.ft.°F
- Specific Heat _____ Btu/lb.°F

1. Flow Rate _____
2. Temperature In _____
3. Desired Temperature Out _____
4. Heat Load _____

Cold Side

Ambient Air _____

Altitude _____

1. Operating Pressure _____
2. Allowable Pressure Drop _____

ASME Code and Certified Yes ☐ No ☐

To properly size the heat exchanger we need 3 of the 4 perameters on the Hot Side.

Cabinet Material:
- Standard : Steel ☐
- Options: Galvanized Steel ☐
- Options: Stainless Steel ☐

Tubing Material:
- Standard : Copper ☐
- Options: Stainless Steel ☐
- Options: 90/10 Copper Nickel ☐

Motor
- 60Hz: 230/460 Volt, 3 Phase ☐
- 115/230 Volt, 1 Phase ☐
- 575 Volt, 3 Phase ☐
- 50Hz 230/400 Volt, 3 Phase ☐
- 110/220 Volt, 1 Phase ☐
- Hydraulic Motor ☐

Coating
- Standard Enameled Gray Paint ☐
- Options: Epoxy Paint ☐

Fins
- Standared Aluminum ☐
- Options: Copper ☐
- Optional Coating: Heresite ☐

Comment: _____

_____

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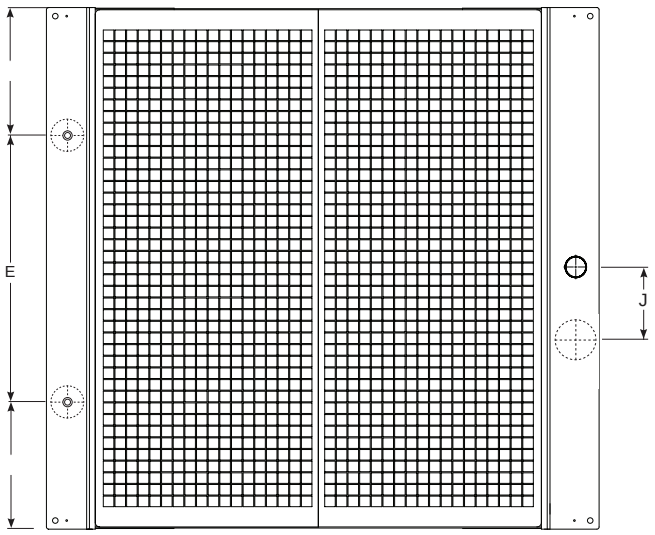
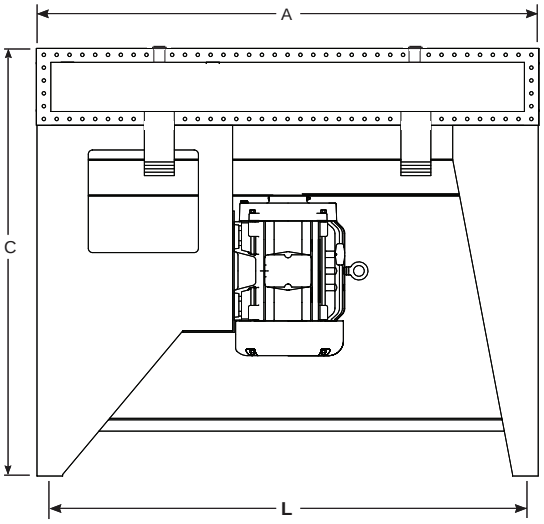
AIR COOLED

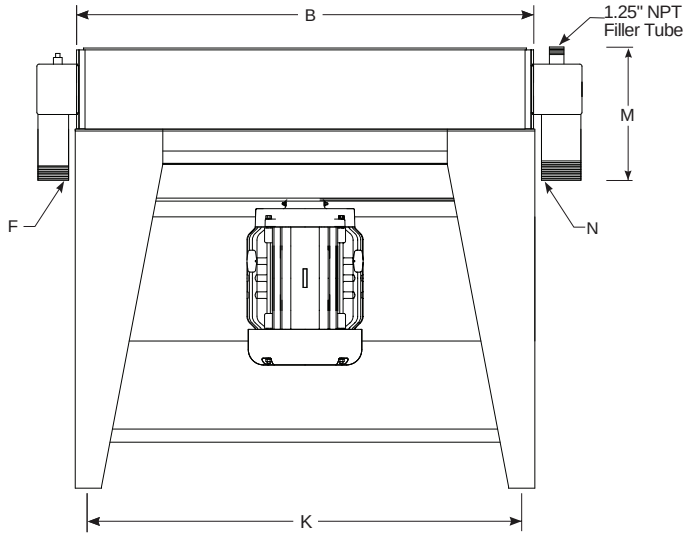
LIQUID COOLERS

- Severe duty construction with OSHA guard.
- Serviceable Core®.
- Thermal capacity to 1,400 hp (1,043 Kw).
- Operating temperature of 300°F at 200 PSI.
- Electric, hydraulic, or external drive.
- Optional: built-in bypass valve.
- Can be customized to fit any applications.
- Field changeable drive from electric to hydraulic.
- Cools: Fluid power systems, rock crushers, conveyors, shredders, lubrication equipment for paper machinery, gear drives, offshore drilling equipment, etc.

AOCSH Series *dimensions with electric / hydraulic drive*







AOCSH - 1005 through AOCSH - 4030

(F and N*) are SAE code 61 four bolt flanges*

DIMENSIONS (inches)																
Model	A	B	C	D	E	F NPT	F* SAE	G	H	J	K	L	M	N NPT	N* SAE	T
AOCSH-201 - ∗	26.00	22.75	38.50	6.00	6.00	1.25	1.25	11.00	1.38	7.00	13.25	19.61	9.00	1.50	1.50	18.00
AOCSH-303 - ∗	31.25	26.75	38.50	6.00	7.00	1.25	1.25	13.00	1.88	7.00	18.48	23.61	9.00	2.00	2.00	22.00
AOCSH-453 - ∗	35.00	32.25	40.88	6.00	8.00	1.50	1.50	15.75	1.88	7.00	22.23	29.13	9.00	2.00	2.00	28.00
AOCSH-603 - ∗	41.00	37.25	40.88	6.00	10.00	1.50	1.50	18.25	2.13	7.00	28.23	34.13	9.00	2.50	2.50	32.00
AOCSH-1005-∗	46.25	44.25	42.75	6.00	10.50	2.00	2.00	21.75	3.50	8.00	33.48	41.13	13.50	3.00	3.00	36.00
AOCSH-1505-∗	53.25	52.25	42.75	6.00	12.50	2.00	2.00	25.75	3.50	8.00	40.48	19.13	13.50	3.00	3.00	42.00
AOCSH-2010-∗	62.25	58.75	80.00	9.00	15.00	3.00	3.00	29.00	4.50	8.00	49.48	55.61	15.50	4.00	4.00	48.00
AOCSH-2515-∗	70.50	66.50	52.65	37.00	16.00	3.00	3.00	32.87	4.50	8.00	57.73	63.56	15.50	4.00	4.00	54.00
AOCSH-3120-∗	76.50	68.75	52.65	40.00	17.00	3.00	3.00	34.00	4.50	8.00	63.76	65.61	15.50	4.00	4.00	60.00
AOCSH-3525-∗	82.75	73.25	52.87	43.00	18.00	3.00	3.00	37.00	4.50	8.00	70.00	70.11	18.00	4.00	4.00	60.00
AOCSH-4030-∗	88.78	79.25	52.87	46.00	20.00	3.00	3.00	40.00	4.50	8.00	76.00	76.13	18.00	4.00	4.00	60.00

∗*Represents the options for motor drive.*

note: AIHTI reserves the right to make reasonable design changes without notice.
 355 American Industrial Drive LaCrosse, VA 23950 tel: 434-757-1800 fax: 434-757-1810 email: sales@aihti.com

1. The AOCSH series construction materials are identical to AOCS series, (See page 189)
2. AOCSH electric motors and hydraulic motors are identical to AOCS Series (See page 193, 195)
3. Will provide a detailed drawing of the unit upon receiving an order
4. The overall height of the heat exchanger (C dimension) can change to meet any appplication

Example of a model:

AOCSH - 1505 - 3 - S - R65 - 2P - ____ - ____

- **Model**
- **Size**
- **Drive Type**
  - N = no motor
  - 3 = 3/60/230-460
  - 3EXP = Explosion Proof 3/60/230-460
  - 5 = 3/60/575
  - 9 = Hydraulic Mtr.
- **Connections**
  - blank = NPT
  - S = SAE 4 Bolt Flange
  - A = ANSI 150#RF Flange
- **Bypass**
  - R30 = 30psi
  - R65 = 65psi
- **Number of Passes**
  - 1P = 1 pass
  - 2P = 2 pass
- **Tubing**
  - Blank = Copper
  - U = 90/10 Cu Ni
  - C = Carbon Steel
  - SS = Stainless Steel
- **Coating**
  - G = Galvanize (cabinet)
  - T = Heresite (core)
  - X = Epoxy (cabinet)
  - Blank = Enamel (standard)
  - STS = Stainless Steel (cabinet)

COMMON DATA

Model	Air Flow		Sound Level dB(A) @ 13ft	Liquid Volume		Weight Electric		Weight Hydraulic		Serviceable Core™
	CFM	m^3/s		gal.	cm^3	lb	kg	lb	kg	
AOCSH-201-∗	3000	1.41	77	1.7	6435	200	91	185	84	Yes
AOCSH-303 - ∗	4380	2.07	82	3.8	14383	310	141	260	118	Yes
AOCSH-453 - ∗	5920	2.79	78	4.8	18168	490	222	410	186	Yes
AOCSH-603 - ∗	8750	4.13	80	6.1	23089	580	263	490	222	Yes
AOCSH-1005-∗	12650	5.97	84	7.7	29145	690	313	575	261	Yes
AOCSH-1505-∗	16150	7.65	87	10.4	39364	910	413	1025	465	Yes
AOCSH-2010-∗	23350	11.73	92	22.8	86298	1280	580	1062	482	Yes
AOCSH-2515-∗	32000	15.00	95	27.5	104088	1610	730	1320	598	Yes
AOCSH-3120-∗	39000	18.40	99	31.9	120742	1810	821	1483	673	Yes
AOCSH-3525-∗	46000	21.71	99	47.0	177895	1980	898	1622	736	Yes
AOCSH-4030-∗	54000	25.48	99	47.0	185466	2150	975	1762	799	Yes

Accessories for Air / Liquid Application

For detailed information and part number see Page 274

Electrical Temperature controller with Bulb Well Assembly (for Air / Liquid Coolers)

Part Number	Description
310-4011	TC-511 with 6-Foot Capallary Tube & Bulb Well
310-4002	TC-511 with 20-Foot Capallary Tube & Bulb Well
310-2025	Replacement Bulb Well TC-511

"3-Way" Thermostatic Valve

For detailed information and model selection see page 275

American Industrial Heat Transfer Inc.
Manufacturer of Quality Heat Exchangers

website : www.aihti.com
general email : sales@aihti.com
technical email : engineering@aihti.com

Air Cooled Liquid Cooler Application Request:

For AOCS-ASME Certified Series

Email form to: sales@aihti.com or engineering@aihti.com or fax to 434-757-1810

Contact Name _____ Telephone _____ Date _____

Company Name _____ Email _____

Address: _____ Fax _____

_____

Hot Side

Fluid Type _____

If available:

Density _____ lb/ft3
Viscosity _____ cP
Thermal Conductivity _____ Btu/hr.ft.°F
Specific Heat _____ Btu/lb.°F

Cold Side

Ambient Air _____

Altitude _____

1. Flow Rate _____
2. Temperature In _____
3. Desired Temperature Out _____
4. Heat Load _____

1. Operating Pressure _____
2. Allowable Pressure Drop _____

ASME Code and Certified Yes ☐ No ☐

To properly size the heat exchanger we need 3 of the 4 parameters on the Hot Side.

Cabinet Material:

Standard : Steel ☐

Options: Galvanized Steel ☐ / Stainless Steel ☐

Tubing Material:

Standard : Copper ☐

Options: 90/10 Copper Nickel ☐ / Stainless Steel ☐

Motor

60Hz: 230/460 Volt, 3 Phase ☐
115/230 Volt, 1 Phase ☐
575 Volt, 3 Phase ☐

50Hz 230/400 Volt, 3 Phase ☐
110/220 Volt, 1 Phase ☐

Hydraulic Motor ☐

Coating

Standard Enameled Gray Paint ☐

Options: Epoxy Paint ☐

Fins

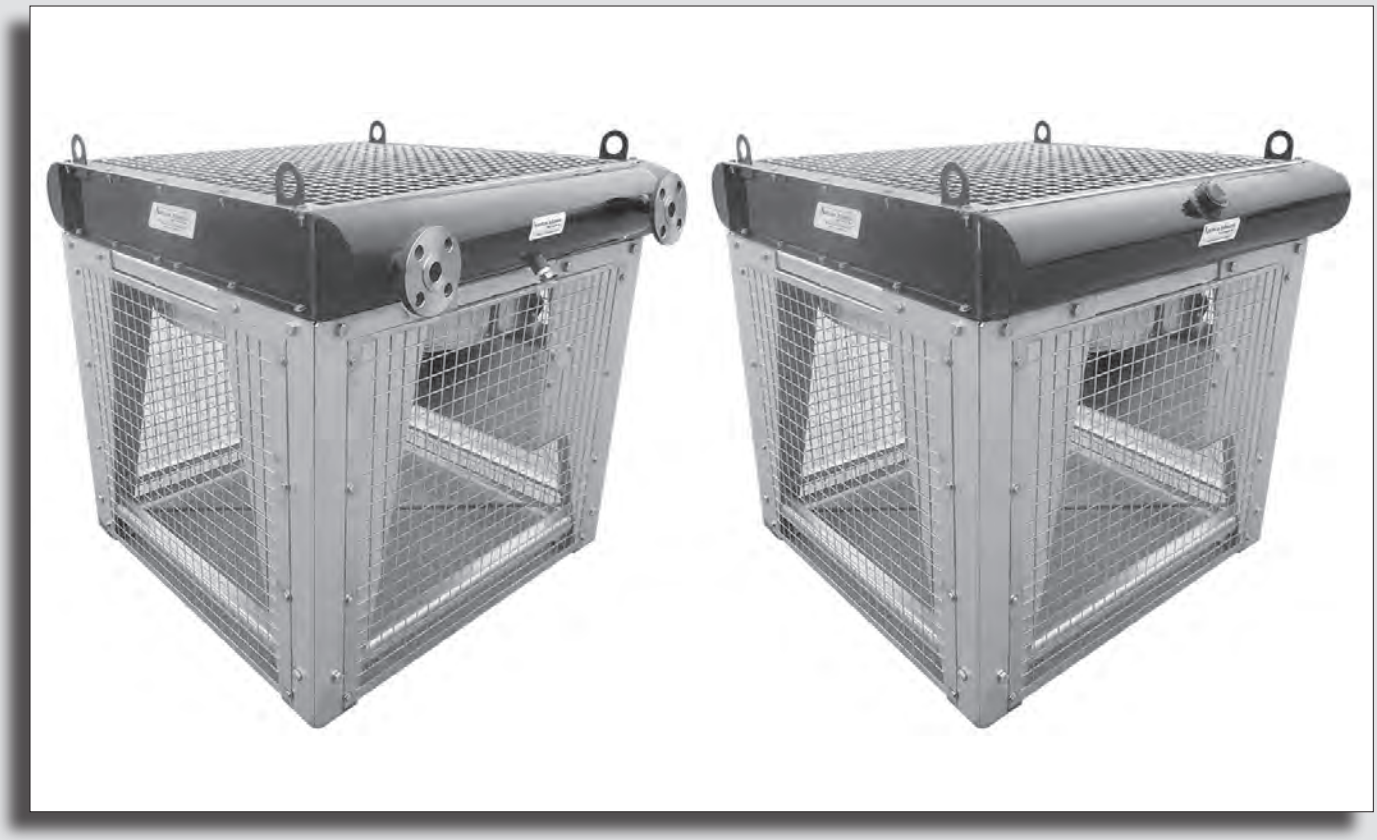
Standared Aluminum ☐

Options: Copper ☐
Optional Coating: Heresite ☐

Comment: _____

_____

ASME CERTIFIED AIR / LIQUID UNITS



ASME CERTIFIED

HEAT EXCHANGERS

At American Industrial we manufacture a various sizes of heat exchangers, from 3 inch to 50 inches diameter, the length can range from 20 inches to 40 feet long. Heat exchangers can be manufactured in a variety of materials to meet customer requirements with ASME code and stamp with certificate.

Since we manufacture all components in our facility, we can meet the quality and delivery our customers require.

We can duplicate any existing heat exchanger from a drawing, free-hand sketch, or by sending the actual physical unit to our facility. We will guarantee to meet material construction, dimensions, and performance of the unit.

You may contact:

Engineering department: 434-757-1800 • 847-731-1000
engineering@aihti.com • sales@aihti.com

American Industrial Heat Transfer Inc.
Manufacturer of Quality Heat Exchangers

website: www.aihti.com
general email: sales@aihti.com
technical email: engineering@aihti.com

Air Cooled Combi Cooler Application Request

For ACOC Combination Series

Contact Name _____ Telephone _____ Date _____

Company Name _____ Fax _____

Address _____ Email _____

Section 1	Section 2	Section 3
Type of Fluid: _____	Type of Fluid: _____	Type of Fluid: _____
If available:	If available:	If available:
Density _____ lb/ft3	Density _____ lb/ft3	Density _____ lb/ft3
Viscosity _____ cP	Viscosity _____ cP	Viscosity _____ cP
Thermal Conductivity _____ Btu/hr.ft.°F	Thermal Conductivity _____ Btu/hr.ft.°F	Thermal Conductivity _____ Btu/hr.ft.°F
Specific Heat _____ Btu/lb.°F	Specific Heat _____ Btu/lb.°F	Specific Heat _____ Btu/lb.°F
1. Flow Rate: _____	1. Flow Rate: _____	1. Flow Rate: _____
2. Temp In: _____	2. Temp In: _____	2. Temp In: _____
3. Temp Out: _____	3. Temp Out: _____	3. Temp Out: _____
4. Heat Load: _____	4. Heat Load: _____	4. Heat Load: _____

To properly size the heat exchanger we need 3 of the 4 parameters of each section

Inlet Pressure: _____ Inlet Pressure: _____ Inlet Pressure: _____

Allowable Pressure Drop: _____ Allowable Pressure Drop: _____ Allowable Pressure Drop: _____

Ambient Air: _____ Altitude: _____ ASME Code and Certified Yes ☐ No ☐

Cabinet Material:

Standard : Steel ☐

Options: Galvanized Steel ☐ Stainless Steel ☐

Tubing Material:

Standard : Copper ☐

Options: Stainless Steel ☐ 90/10 Copper Nickel ☐

Motor

60Hz: 230/460 Volt, 3 Phase ☐ 115/230 Volt, 1 Phase ☐ 575 Volt, 3 Phase ☐

50Hz 230/400 Volt, 3 Phase ☐ 110/220 Volt, 1 Phase ☐

Hydraulic Motor ☐

Coating

Standard Enameled Gray Paint ☐

Options: Epoxy Paint ☐

Fins

Standared Aluminum ☐

Options: Copper ☐

Optional Coating: Heresite ☐

Comment: _____

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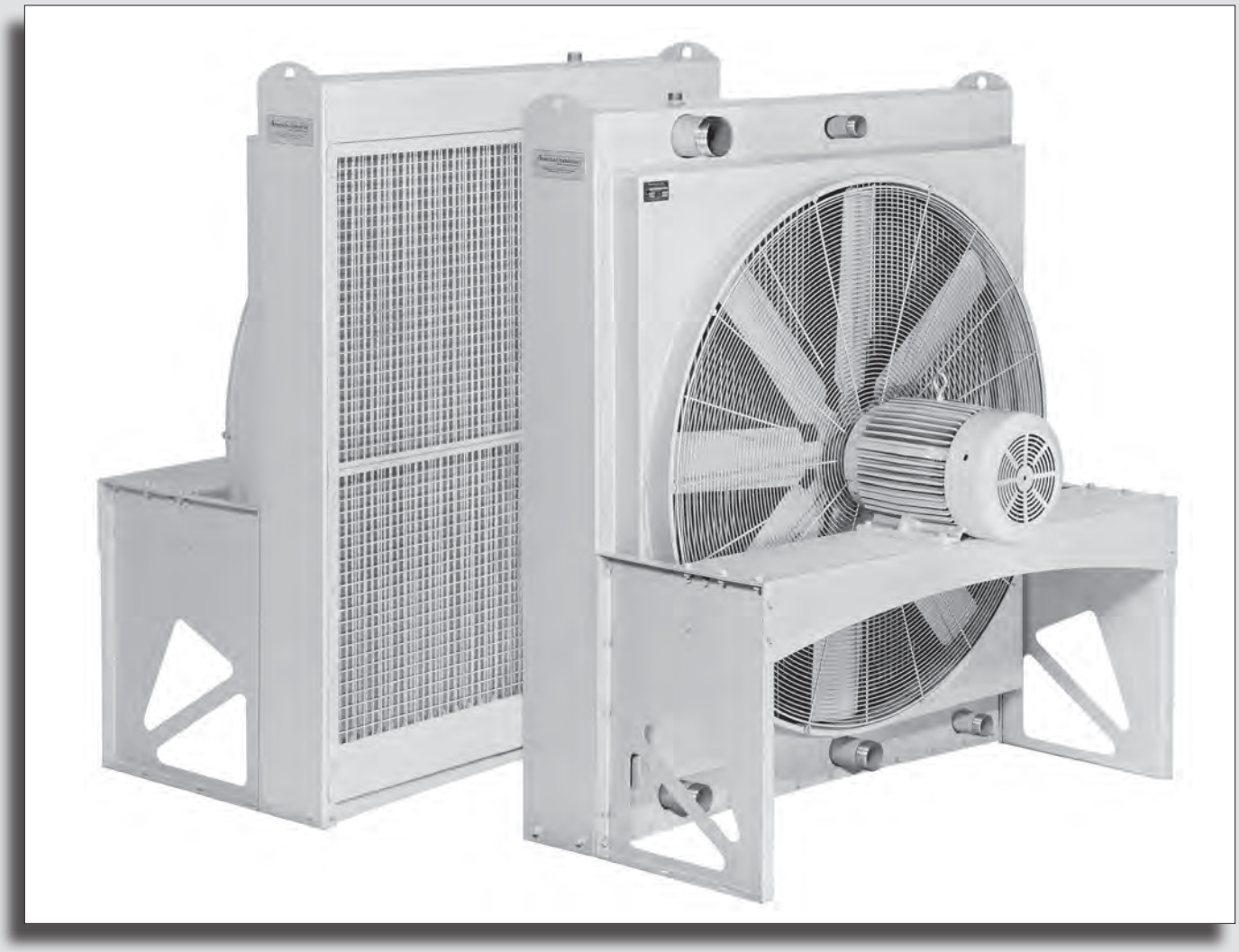
ACOC COMBINATION COOLER



AIR COOLED

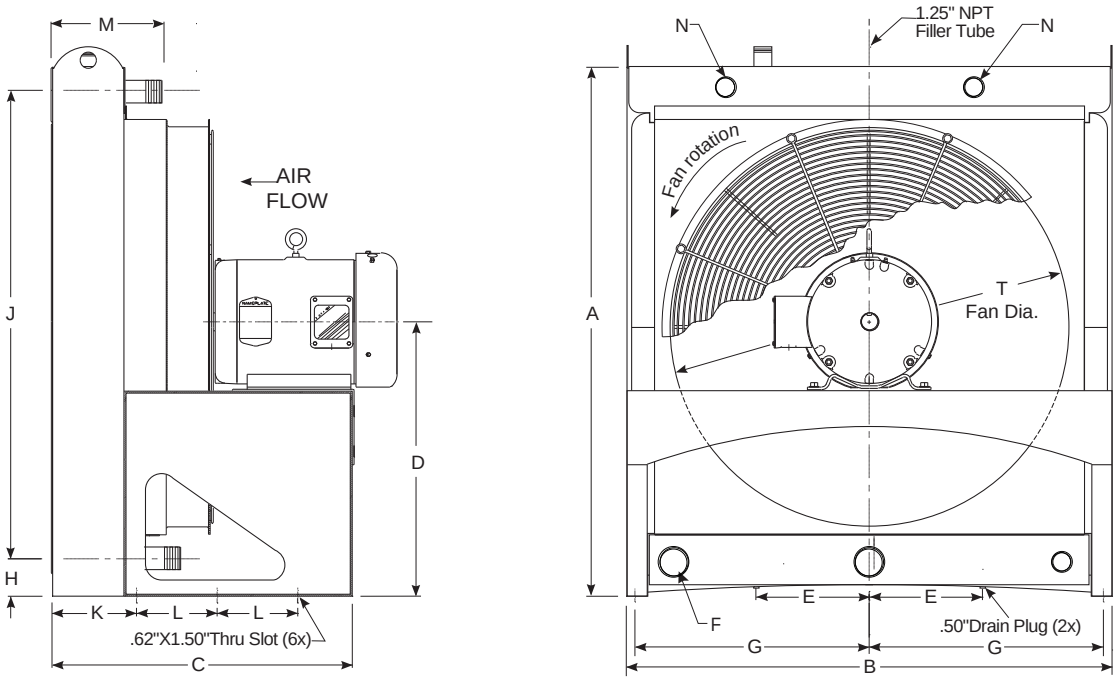
LIQUID COOLERS

- Severe duty construction with OSHA guard.
- Serviceable Core®.
- Operating temperature of 300°F at 300 PSI.
- Electric, hydraulic, or external drive.
- Optional: built-in bypass valve.
- Can be customized to fit any applications.
- Computer generated data sheet available for any application

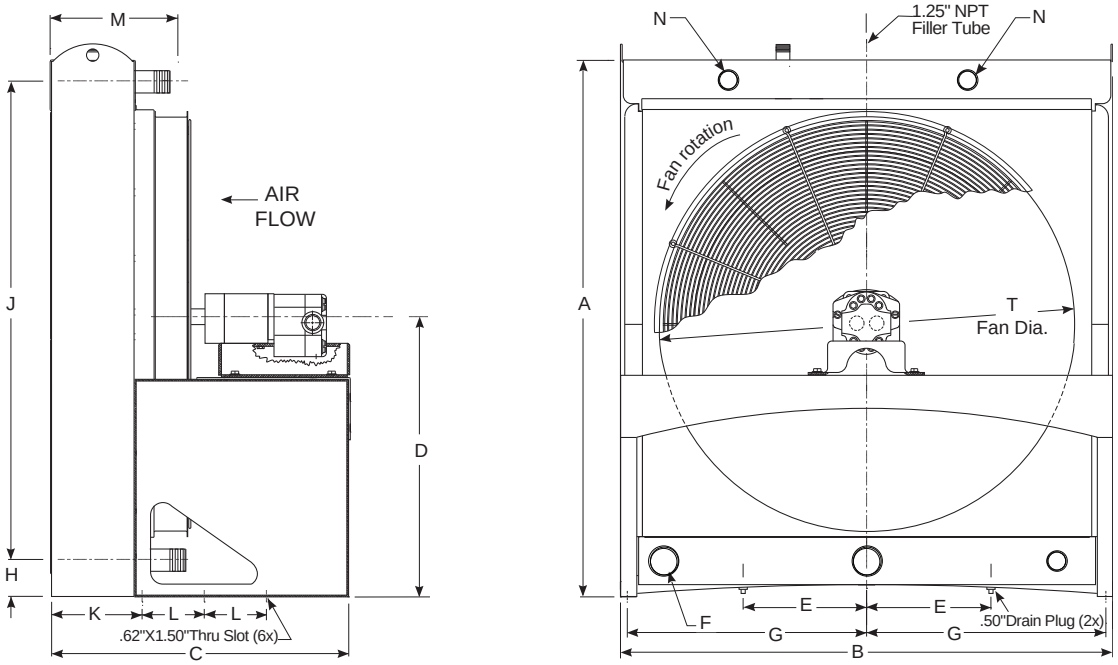
note: AIHTI reserves the right to make reasonable design changes without notice.

 355 American Industrial Drive LaCrosse, VA 23950 tel: 434-757-1800 fax: 434-757-1810 email: sales@aihti.com

ACOC Combination Cooler Series *dimensions*



ACOC - 1005 through ACOC - 4030 ELECTRIC DRIVEN



ACOC - 1005 through ACOC - 4030 HYDRAULIC DRIVEN

NOTE: (F and F , N and N* will be sized based on the application) *SAE indicates code 61 four bolt flange*

DIMENSIONS (inches)																
Model	A	B	C	D	E	F NPT	F* SAE	G	H	J	K	L	M	N NPT	N* SAE	T
ACOC-1005- ✱	49.00	45.00	24.88	25.00	10.50	2.00	2.00	21.75	3.50	43.50	7.81	7.50	13.50	3.00	3.00	36.00
ACOC-1505- ✱	56.00	53.00	24.88	28.50	12.50	2.00	2.00	25.75	3.50	50.50	7.69	7.00	13.50	3.00	3.00	42.00
ACOC-2010- ✱	65.00	59.50	32.13	33.00	15.00	3.00	3.00	29.00	4.50	58.00	11.06	7.50	15.50	4.00	4.00	48.00
ACOC-2515- ✱	73.25	67.25	34.78	37.00	16.00	3.00	3.00	32.87	4.50	66.00	11.06	7.50	15.50	4.00	4.00	54.00
ACOC-3120- ✱	79.25	69.50	34.78	40.00	17.00	3.00	3.00	34.00	4.50	72.00	11.06	9.00	15.50	4.00	4.00	60.00
ACOC-3525- ✱	85.50	74.00	40.00	43.00	18.00	3.00	3.00	37.00	4.50	78.00	13.00	9.00	18.00	4.00	4.00	60.00
ACOC-4030- ✱	91.50	80.00	40.00	46.00	20.00	3.00	3.00	40.00	4.50	84.00	13.00	9.00	18.00	4.00	4.00	60.00

note: AIHTI reserves the right to make reasonable design changes without notice.
 355 American Industrial Drive LaCrosse, VA 23950 tel: 434-757-1800 fax: 434-757-1810 email: sales@aihti.com

1. The ACOC series construction materials are identical to AOCS series, (See page 189)

2. ACOC electric motors and hydraulic motors are identical to AOCS Series (See page 193,195)

3. Provide a detailed computerized calculation, piping size and material construction based on the unit application

4. Will provide detailed drawing, piping connection upon receiving an order for approval

Example of a model:

ACOC - 1505 - 3 - S - R65 - 2P - ____ - ____

- Model
- Size
- Drive Type
  - N = no motor
  - 3 = 3/60/230-460
  - 3EXP = Explosion Proof 3/60/230-460
  - 5 = 3/60/575
  - 9 = Hydraulic Mtr.
- Connections
  - blank = NPT
  - S = SAE 4 Bolt Flange
  - A = ANSI 150#RF Flange
- Bypass
  - R30 = 30psi
  - R65 = 65psi
- Number of Passes
  - 1P = 1 pass
  - 2P = 2 pass
- Tubing
  - Blank = Copper
  - U = 90/10 Cu Ni
  - C = Carbon Steel
  - SS = Stainless Steel
- Coating
  - G = Galvanize (cabinet)
  - T = Heresite (core)
  - X = Epoxy (cabinet)
  - Blank = Enamel (standard)
  - STS = Stainless Steel (cabinet)

COMMON DATA

Model	Air Flow		Sound Level	Liquid Volume		Weight Electric		Weight Hydraulic		Serviceable Core™
	CFM	m^3/s	dB(A) @ 13ft	gal.	cm^3	lb	kg	lb	kg	
ACOC-1005- ✱	12650	5.97	84	7.7	29145	690	313	575	261	Yes
ACOC-1505- ✱	16150	7.65	87	10.4	39364	910	413	1025	465	Yes
ACOC-2010- ✱	23350	11.73	92	22.8	86298	1280	580	1062	482	Yes
ACOC-2515- ✱	32000	15.00	95	27.5	104088	1610	730	1320	598	Yes
ACOC-3120- ✱	39000	18.40	99	31.9	120742	1810	821	1483	673	Yes
ACOC-3525- ✱	46000	21.71	99	47.0	177895	1980	898	1622	736	Yes
ACOC-4030- ✱	54000	25.48	99	47.0	185466	2150	975	1762	799	Yes

Accessories for Air / Liquid Application

For detailed information and part number see Page 274

Electrical Temperature controller with Bulb Well Assembly (for Air / Liquid Coolers)

Part Number	Description
310-4011	TC-511 with 6-Foot Capallary Tube & Bulb Well
310-4002	TC-511 with 20-Foot Capallary Tube & Bulb Well
310-2025	Replacement Bulb Well TC-511

"3-Way" Thermostatic Valve

For detailed information and model selection see page 275

American Industrial Heat Transfer Inc.
Manufacturer of Quality Heat Exchangers

website : www.aihti.com
general email : sales@aihti.com
technical email : engineering@aihti.com

Air Cooled Liquid Cooler Application Request:

For EOC and EOCF Series

Email form to: sales@aihti.com or engineering@aihti.com or fax to 434-757-1810

Contact Name _____ Telephone _____ Date _____

Company Name _____ Email _____

Address: _____ Fax _____

_____

Hot Side

Fluid Type _____

If available:
- Density _____ lb/ft3
- Viscosity _____ cP
- Thermal Conductivity _____ Btu/hr.ft.°F
- Specific Heat _____ Btu/lb.°F

1. Flow Rate _____
2. Temperature In _____
3. Desired Temperature Out _____
4. Heat Load _____

Cold Side

Ambient Air _____

Altitude _____

1. Operating Pressure _____
2. Allowable Pressure Drop _____

To properly size the heat exchanger we need 3 of the 4 parameters on the Hot Side.

Cabinet Material:

Standard : Steel ☐

Options:
- Galvanized Steel ☐
- Stainless Steel ☐

Tubing Material:

Standard : Copper ☐

Options:
- Stainless Steel ☐
- 90/10 Copper Nickel ☐

Motor

60Hz:
- 230/460 Volt, 3 Phase ☐
- 115/230 Volt, 1 Phase ☐
- 575 Volt, 3 Phase ☐

50Hz
- 230/400 Volt, 3 Phase ☐
- 110/220 Volt, 1 Phase ☐

Hydraulic Motor ☐

Coating

Standard Enameled Gray Paint ☐

Options:
- Epoxy Paint ☐

Fins

Standared Aluminum ☐

Options:
- Copper ☐

Optional Coating:
- Heresite ☐

Comment: _____

_____

EOC and EOCF SERIES

INDUSTRIAL & MOBILE AIR COOLED

LIQUID COOLERS

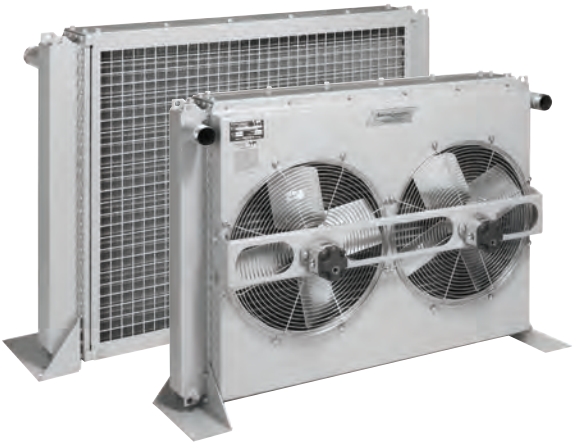
- Standard NPT or SAE models in stock.
- AC - DC or hydraulic fan drives.
- High quality serviceable air filter.
- Operating temperature of 300ºF & pressure of 300 PSI.
- Can be customized to fit any applications.
- Cores available in both brazed or serviceable construction
- Computer generated data sheet available for any application
- Adjustable mounting brackets included for easy installation.
- Cools: fluid power systems, injection molding machines, hydraulic presses, gear drives, torque convertors, machine tools, etc...

 355 American Industrial Drive LaCrosse, VA 23950 tel: 434-757-1800 fax: 434-757-1810 email: sales@aihti.com

EOC Series *overview*

EOC & EOCF with electric drive

Mobile & industrial air-cooled liquid coolers. Serviceable core ®, mobile and industrial series heat exchangers available with optional washable filter and integral relief valve, 30 PSI or 65 PSI. Standard single phase, three phase, 12 volt DC (21amp) or 24 volt DC (10.5 amp) motors with single or dual cooling fans. Rated operating temperature of 300°F at 300 PSIG. Standard flow rates to 160 GPM. Thermal capacity up to 225 hp (168 Kw). N PT or SAE strait thread O-ring port connections. Can be modified to meet your requirements. Suitable for most hydraulic oils, lubrication oils, synthetic compressor oils, ethylene glycol, and many other fluids compatible with listed materials.



EOC & EOCF with hydraulic drive

Mobile & industrial air-cooled liquid coolers. Serviceable core ®, mobile and industrial series heat exchangers available with optional washable filter and integral relief valve, 30 PSI or 65 PSI. Standard hydraulic drive motor(s) with single or dual cooling fans. Rated operating temperature of 300°F at 300 PSIG. Standard flow rates to 160 GPM. Thermal capacity up to 225 hp (168 Kw). N PT or SAE strait thread O-ring port connections. Can be modified to meet your requirements. Suitable for most hydraulic oils, lubrication oils, synthetic compressor oils, ethylene glycol, and many other fluids compatible with listed materials.

EOC 375 thru EOC 700

EOC 190 thru EOC 337

note: AIHTI reserves the right to make reasonable design changes without notice.

355 American Industrial Drive LaCrosse, VA 23950 tel: 434-757-1800 fax: 434-757-1810 email: sales@aihti.com

HIGH PERFORMANCE TURBULATOR

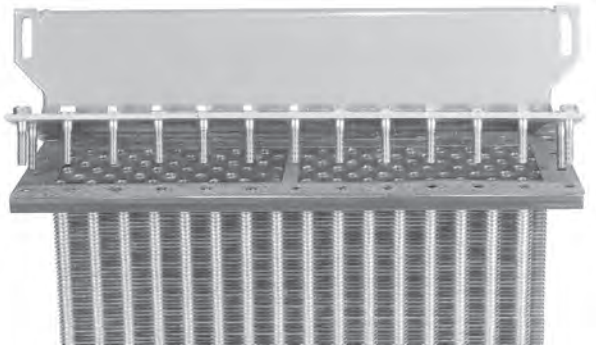
Exclusive American Industrial Turbulators (installed in every flow tube) increase heat transfer by more than 100%.

American Industrial Turbulators eliminate the laminar flow condition normally associated with other smooth tube heat exchangers. High viscosity hydraulic and lubricating oils are easily cooled by this new state-of-the-art turbulator.

SERVICEABLE CORE ®

Core covers disassemble for easy access and cleaning. Repairable design for applications that require limited down time. Roller expanded tube to tube-sheet joint.

100% mechanical bond. Positive gasket seal is field replaceable for field maintenance or repair.



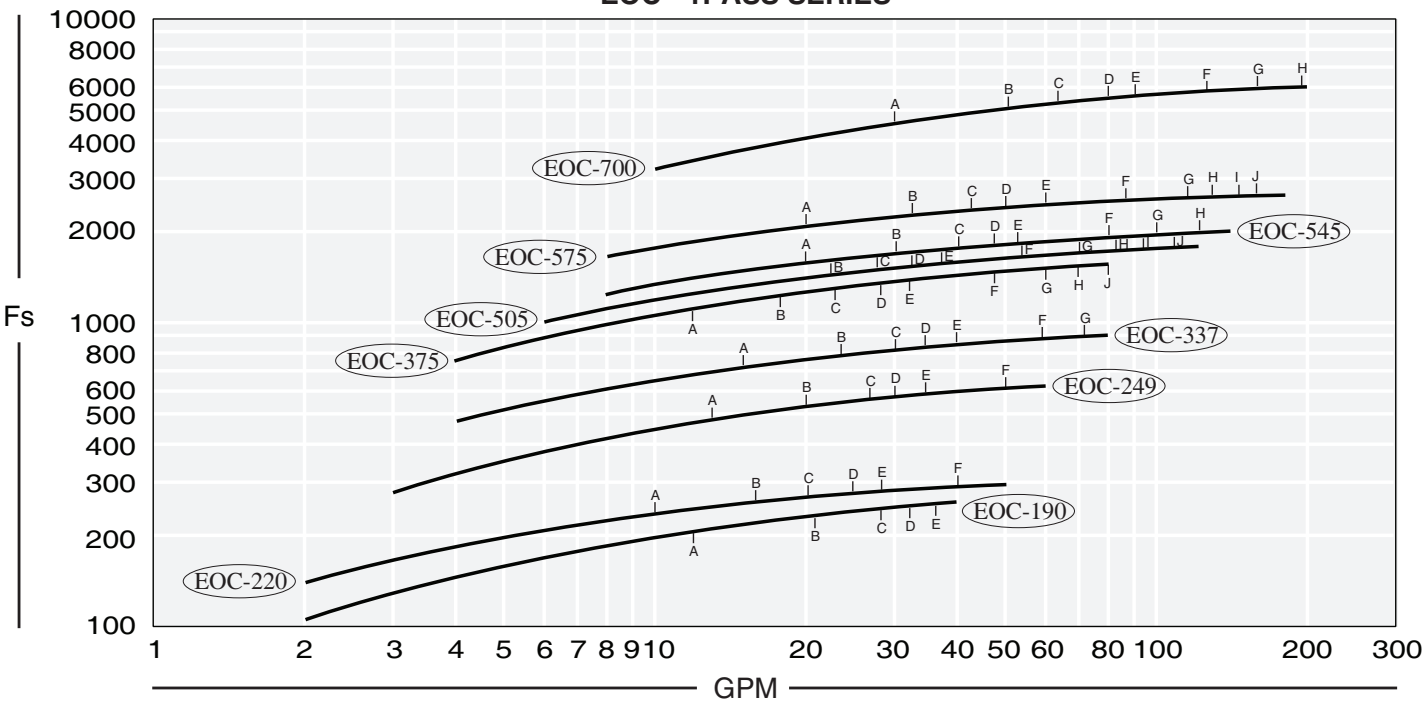
CONSTRUCTION MATERIALS & RATINGS

Standard Construction Materials		Optional Construction Materials	Standard Unit Ratings	
Tubes	Copper	Stainless Steel or Carbon Steel	Operating Pressure	300 psig
Fins	Aluminum	Copper	Operating Temperature	300 °F
Turbulators	Steel	Stainless Steel or Brass	Max. Fan Over-speed	10 %
Tank	Steel	Stainless Steel	Max. Ambient Conditions	104 °F
Connection pipes	Steel	Stainless Steel	Altitude	0-3300 ft.
Cabinet & frame	Steel	Galvanized or Stainless Steel		
Fan Blade	Aluminum with steel hub	Plastic, Non-sparking		
Fan Guard	Zinc plated steel	Zinc plated steel		

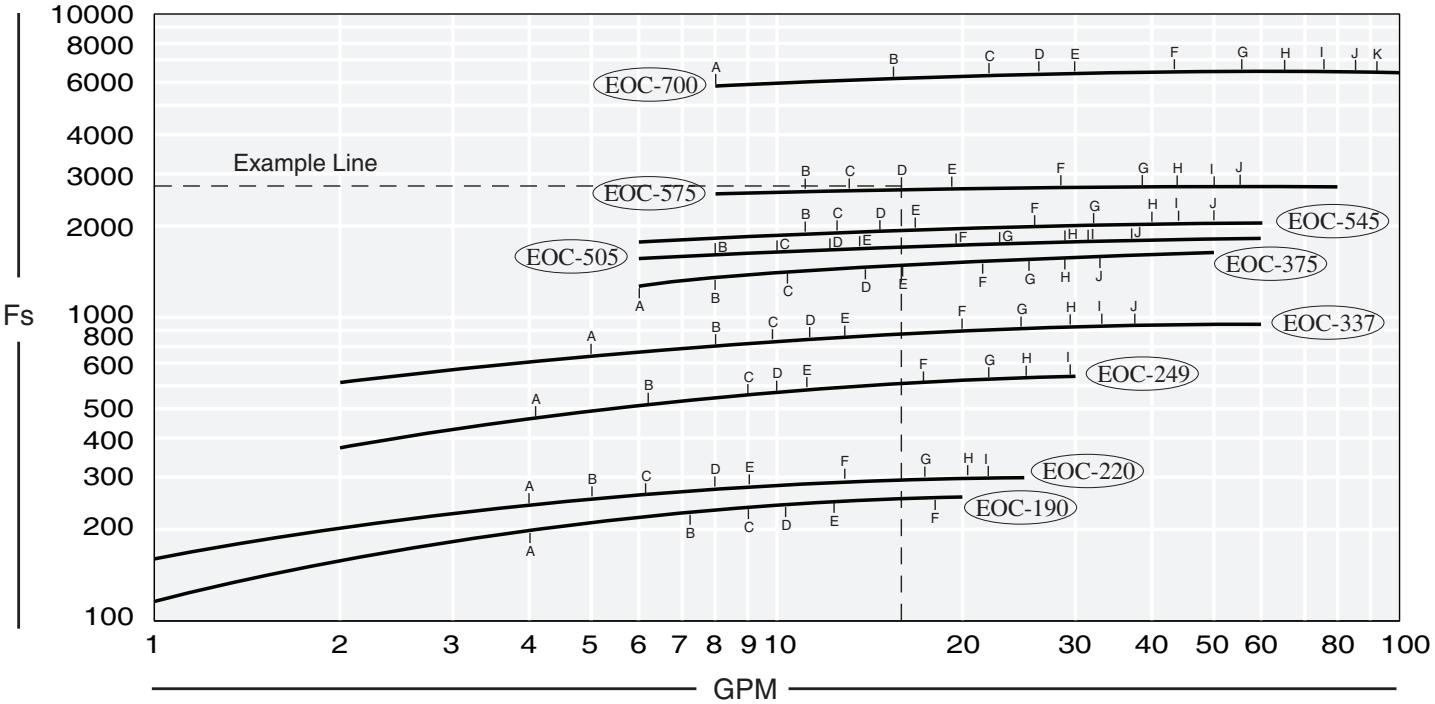
FOR HIGHER PRESSURE AND TEMPERATURE RATING CONSULT FACTORY

EOC Series *performance*

EOC - 1PASS SERIES



EOC - 2PASS SERIES



PERFORMANCE CALCULATION	OIL PRESSURE DROP (PSI) CODE
$F_s = \frac{\text{Horsepower to be removed (HP) x 2545 x Cv}}{\text{°F (Oil Leaving* - Ambient Air Entering)}} = \frac{\text{BTU}}{\text{hr °F}}$	A = 1 PSI D = 4 PSI G = 15 PSI J = 30 PSI B = 2 PSI E = 5 PSI H = 20 PSI K = 35 PSI C = 3 PSI F = 10 PSI I = 25 PSI

*Represents desired fluid leaving the cooler.

Note: When a model selection has been made, record whether the selection was from the one pass curve or the Two Pass curve so that the unit can be properly plumbed. Incorrect installation can seriously affect the performance.

SIZING
To properly size a DC fan drive air-cooled oil cooler for mobile equipment, you should first determine some basic parameters associated with the system.

HEAT LOAD
There are some system parameters that will be required to properly accomplish the sizing calculations. Without system parameters, it is difficult to determine the optimal heat exchanger size. Normally many of the system parameters can be found on hydraulic schematics or on tags located on the actual equipment. Following are some basic param-eters that you should try to acquire before attempting the sizing calculations. However, it is not necessary to have every parameter listed below.

- Main system flow rate (gpm) & working pressure (psi).
- Electric motor HP driving hydraulic pump (if more than one add up the HP for all).
- Desired temperature (°F).
- Fluid type (SAE 10, 20, 30, etc....).
- Ambient air temperature (warmest day).
- Desired fan drive (hydraulic, electric, 12-24V DC, etc...).
- BTU's or HP to be cooled (normally given for lubrication systems).
- Maximum pressure drop allowed through the heat exchanger.
- Space available for heat exchanger (LxWxH).
- External air condition (dirty, papers,etc…).

In many instances the heat load must be determined by using a "total potential" method. This total potential or horse power method is the most common method, and is the simplest way to determine basic heat rejection requirements for mobile hydraulic systems. The total potential is equal to the maximum operating flow and pressure that are generated by the system under full load. To determine the total potential (HP) use the following formula.

HP = [System Pressure (PSI) x System flow (GPM)] / 1714

Example:
HP = (3000 PSI x 40 GPM) / 1714 = 70 HP or the total input potential

To determine the system heat load in BTU / HR we must use a percentage *(v)* of the system potential HP. The factor *(v)* can be calculated by adding up the actual inefficiencies of a system; however, for most applications a *(v)* value of 25% - 30% can be used.

Example:
70 HP x .25 = 17.5 HP heat

To convert the horsepower of heat into BTU/HR use the formula below:
HP x 2542 = BTU/HR

Example:
17.5 HP x 2545 = 44,538 BTU/HR

Applying into a return line
For most open loop systems with a vane or gear type fixed delivery pumps. To calculate the Fs value required when applying the air/oil cooler into a return line use the formula.

$$Fs = \frac{\text{Btu/ hr x Cv}}{T - t_{ambient}} \qquad \frac{44{,}538_{Btu/hr} \times 1.13_{Cv}}{140^{o}F - 100^{o}F_{ambient}} = 1258\ Fs$$

T = Desired system oil temperature leaving the cooler °F
$t_{ambient}$ = Ambient air temperature entering the cooler °F
Cv = Correction factor for oil viscosity.
Example: ISO68 oil @ 150°F = 1.13 *(see chart below)*

Average Liquid Temperature	Cp PRESSURE DROP CORRECTION FACTORS																
	SAE 5	SAE 10	SAE 20	SAE 30	SAE 40	ISO 22	ISO 32	ISO 46	ISO 68	ISO 100	ISO 150	ISO 220	ISO 320	MIL-L-7808	POLYGLYCOL	PHOSPHATE ESTER	50% ETHYLENE GLYCOL & WATER
100	2.00	2.40	4.40	6.40	8.80	1.07	1.53	1.82	2.54	4.19	6.44	9.38	13.56	1.26	3.00	3.50	0.730
110	1.70	2.10	3.60	5.10	6.70	1.04	1.45	1.72	2.35	3.73	5.70	8.33	11.63	1.20	2.40	2.90	0.720
120	1.50	1.80	3.00	4.20	5.60	1.02	1.38	1.60	2.15	3.26	4.91	7.23	9.73	1.14	2.10	2.50	0.709
130	1.40	1.60	2.60	3.40	4.50	0.99	1.30	1.49	1.94	2.80	4.14	6.19	7.80	1.08	1.90	2.20	0.698
140	1.30	1.50	2.23	2.90	3.70	0.97	1.23	1.38	1.75	2.38	3.47	5.20	6.11	1.03	1.90	2.00	0.686
150	1.20	1.30	1.90	2.50	3.10	0.95	1.17	1.30	1.61	2.04	2.90	4.35	4.77	0.98	1.70	1.90	0.676
200	0.93	0.96	1.20	1.40	1.60	0.89	0.99	1.08	1.18	1.33	1.59	1.74	1.95	0.90	1.20	1.30	0.635
250	0.81	0.82	0.92	0.97	1.05	0.85	0.93	0.96	1.03	1.11	1.21	1.22	1.23	0.83	1.00	1.05	0.556

Average Liquid Temperature	Cv VISCOSITY CORRECTION FACTORS																
	SAE 5	SAE 10	SAE 20	SAE 30	SAE 40	ISO 22	ISO 32	ISO 46	ISO 68	ISO 100	ISO 150	ISO 220	ISO 320	MIL-L-7808	POLYGLYCOL	PHOSPHATE ESTER	50% ETHYLENE GLYCOL & WATER
100	1.11	1.15	1.25	1.38	1.45	1.08	1.14	1.18	1.26	1.37	1.43	1.56	1.84	1.19	0.92	0.83	0.85
110	1.09	1.12	1.20	1.32	1.40	1.06	1.13	1.16	1.25	1.31	1.39	1.48	1.67	1.14	0.89	0.80	0.84
120	1.06	1.10	1.17	1.27	1.35	1.04	1.11	1.14	1.20	1.27	1.35	1.40	1.53	1.09	0.88	0.79	0.84
130	1.04	1.08	1.13	1.24	1.29	1.03	1.09	1.13	1.17	1.24	1.30	1.34	1.44	1.05	0.85	0.77	0.83
140	1.03	1.05	1.11	1.19	1.25	1.02	1.08	1.10	1.16	1.20	1.26	1.30	1.39	1.03	0.84	0.76	0.82
150	1.01	1.04	1.09	1.16	1.22	1.02	1.06	1.09	1.13	1.17	1.22	1.27	1.33	1.01	0.83	0.74	0.82
200	0.98	0.99	1.01	1.04	1.07	0.98	0.99	1.00	1.01	1.02	1.08	1.09	1.14	0.98	0.79	0.71	0.80
250	0.95	0.96	0.97	0.98	0.99	0.95	0.96	0.96	0.96	0.97	0.99	1.01	1.02	0.97	0.76	0.69	0.79

EOC Series *selection*

APPLYING INTO A CASE DRAIN LINE
In circumstances where the system is a closed loop or when return line flow is not available, the case drain flow can be utilized to help cool the system However, in many instances, the case drain flow alone will not be enough to reject all of the heat generated by the system. Case drain lines should not be treated as a normal return lines since the pressure drop allowable usually can vary from 2-10 PSI max. Check with your pump manufacturer for the appropriate pressure drop tolerance before applying any cooler. To size the system for case flow or case flow plus any additional flushing loops, please use the following method.

Formula:
Tc_{exit} = The corrected temperature of the oil exiting the cooler.

$$Tc_{exit} = \{ T - [Q / (\text{case flow gpm} \times 210)]\}$$

Example:
$$Tc_{exit} = \{ 150 - [44{,}538 / (8 \times 210)]\} = 123.5$$

$$Fs = \frac{Q \times Cv}{Tc_{exit} - t_{ambient}} \qquad \frac{44{,}538_{Btu/hr} \times 1.13_{Cv}}{123.5^{o}F\text{-}100^{o}F} = 2{,}142$$

Re-circulation Cooling Application (Kidney Loop)
When applying any American Industrial air-cooled heat exchanger into a re-circulation (filtration loop) some important differences should be noted. The standard air-cooled heat transfer calculation can be used however some preliminary calculations must be done prior to using the formula. Before applying the standard air-cooled heat transfer formula, the air oil cooler exiting temperature must be derived from.

Example Re-circulation Loop Application
Fluid - Oil SAE 5w
Flow - 15 GPM re-circulating
Desired Reservoir Temp - 125ºF
Ambient Temp - 90ºF
Input potential 60 HP
Heat to be removed 1/3 x 60HP = 20HP
Fan drive requirements 3/60/230-460 motor.

Step 1
Formula 1
$$\triangle T = \frac{HP \text{ (to be removed)} \times 2545}{\text{Loop Flow (GPM)}}$$

Example
$$\triangle T = \frac{20HP \times 2545}{15gpm \times 210} = 16.6^{o}F$$

Step 2
Formula 2
$$Fs = \frac{HP(\text{to be removed}) \times 2545 \times CV}{(T1\text{-}\triangle T) - \text{Ambient } ^{o}F}$$

Example
$$Fs = \frac{220HP \times 2545 \times 1.06}{(125\text{-}16.2) - 90^{o}F} = 2{,}869.9 \text{ Fs}$$

Step 3
Selection from the heat energy dissipation chart (page 172.) EOC-575-3-2P
See example line 2pass curve.

SELECTION
To select a model, locate the flow rate (GPM) at the bottom of the flow vs Fs graph. Proceed upward until the GPM intersects with the calculated Fs. The curve closest above the intersection point will meet these conditions.
Examples:

Return Line	Case Line	Recirculation Loop
Fs = 1,258	Fs = 2,142	Fs = 2,869.9
GPM = 40 "return flow"	GPM = 8 "case flow"	GPM = 15 "loop flow"
Model = EOC-375-4	Model = EOC-575-4-2P	Model = EOC-575-3-2P

PRESSURE DROP
Determine the oil pressure drop from the curves as indicated. For viscosities other than 50 ssu, multiply the actual indicated pressure drop (psi) for your GPM by the Cp value in the pressure differential curve for your viscosity value.

Examples:	EOC-375 @GPM = 40	EOC-575-2P @GPM = 8
Indicated pressure drop	7.8 PSI	4 PSI
Cp correction factor (pg.173)	1.61	1.45
Corrected Pressure drop	12.56 PSI	5.8 PSI

EOC - 337 - 1 - __ - S - R65 - ____ - ____

Model
EOC = standard
EOCF = with washable filter

Size

Motor
blank = no motor
1 = single phase
1EXP = explosion proof
3 = three phase
3EXP = explosion proof
5 = 575 volt
4 = 12v DC
6 = 24v DC
9 = hydraulic

Passes
blank = one pass
2P = two pass

Connection Type
blank = NPT
S = SAE

Bypass*
R65 = 65psi
R30 = 30psi

Tubing
blank = Copper
C = Carbon Steel

Coating
blank = Enamel (standard)
G = Galvanize (cabinet)
T = Heresite (core)
X = Epoxy (cabinet)
STS = Stainless Steel (cabinet)

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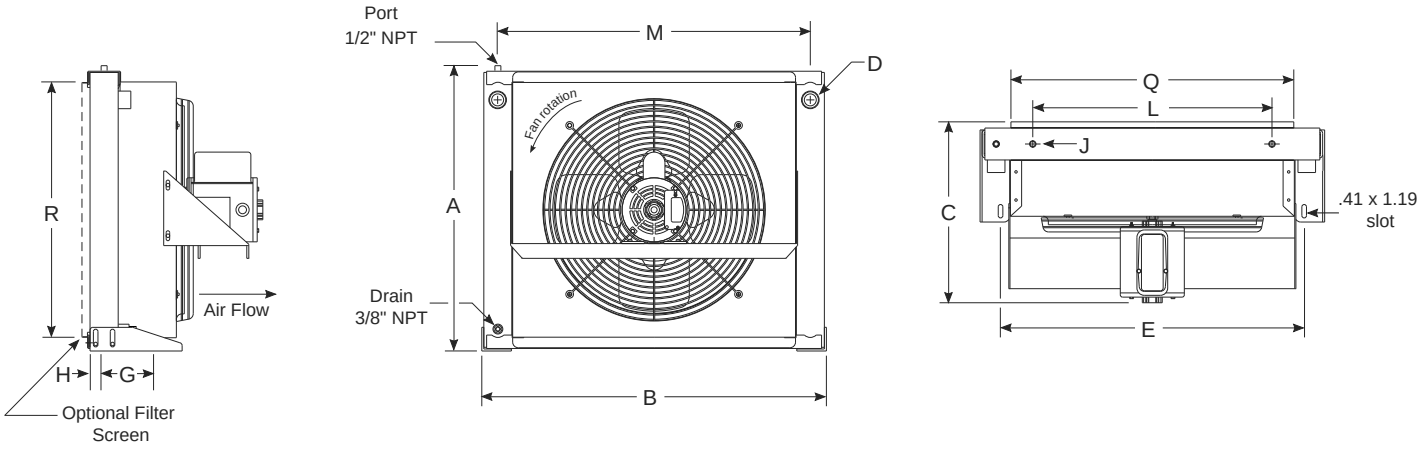
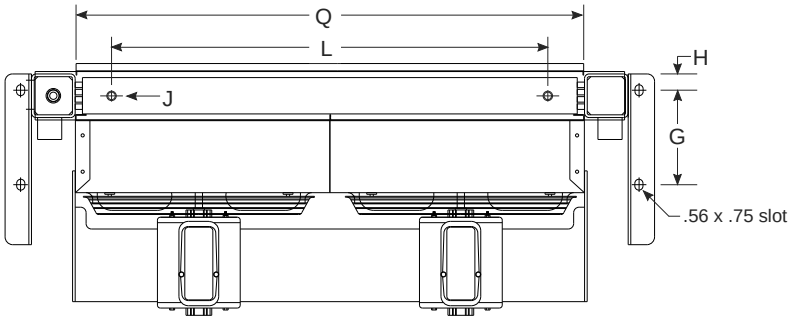
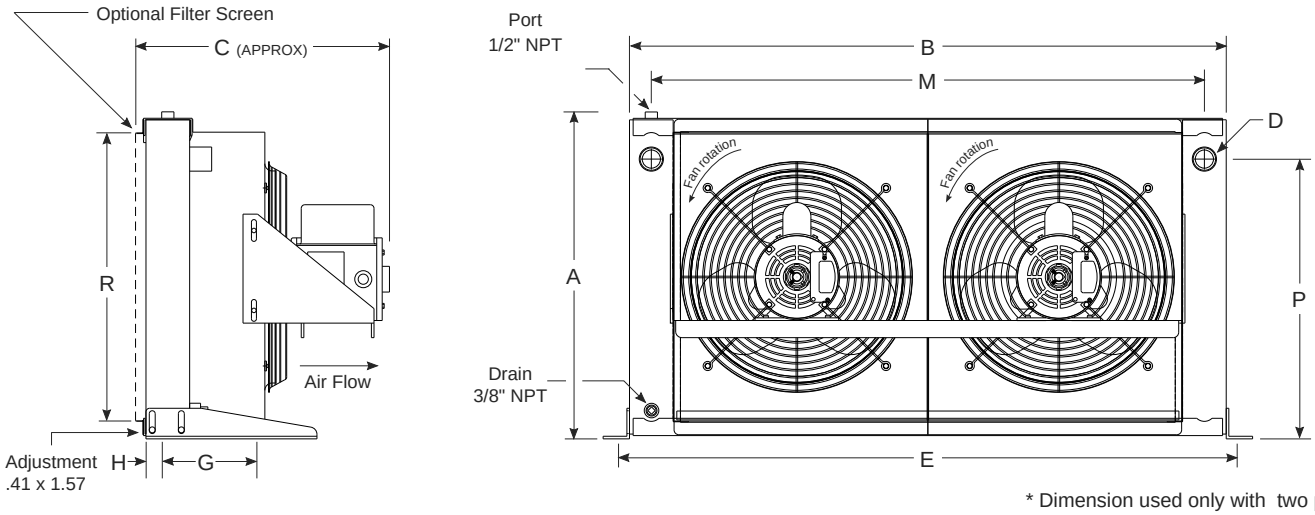
EOC & EOCF Series *dimensions with electric drive Single Pass*

MODEL EOC - 190 through EOC - 337



MODEL EOC - 375
through EOC - 700





* Dimension used only with two pass units

Model	A	B	C	D NPT	D SAE	E	G	H	J 1/2-13 tab	L	M	P	Q	R
EOC - 190 - ✱	13.62	16.50	14.21	.75	#12	14.75	5.00	5.00		8.00	15.00	10.31	11.38	10.38
EOC - 220 - ✱	15.62	22.00	16.32	.75	#12	18.69	5.00	5.00		14.00	20.50	12.31	16.88	12.25
EOC - 249 - ✱	19.62	24.75	16.32	.75	#12	21.44	5.00	5.00		14.00	23.25	16.31	20.00	16.25
EOC - 337 - ✱	25.62	30.25	16.32	1.00	#16	26.97	5.00	5.00		21.25	28.75	22.31	25.00	22.38
EOC - 375 - ✱	18.50	39.00	17.75	1.25	#20	40.50	6.50	6.50	(4)	30.00	36.50	15.25	33.00	15.13
EOC - 505 - ✱	22.50	41.0	17.13	1.25	#20	42.50	6.50	6.50		30.00	38.50	19.25	34.75	19.63
EOC - 545 - ✱	30.50	42.00	17.32	1.50	#24	43.75	9.00	9.00		30.00	39.50	27.25	35.75	27.50
EOC - 575 - ✱	36.50	48.00	17.32	2.00	#32	49.75	9.00	9.00		36.00	45.50	32.75	41.75	33.50
EOC - 700 - ✱	38.38	51.00	21.23	2.00	#32	52.75	9.00	9.00	(8)	–	48.50	34.00	43.50	34.50

note: AIHTI reserves the right to make reasonable design changes without notice.

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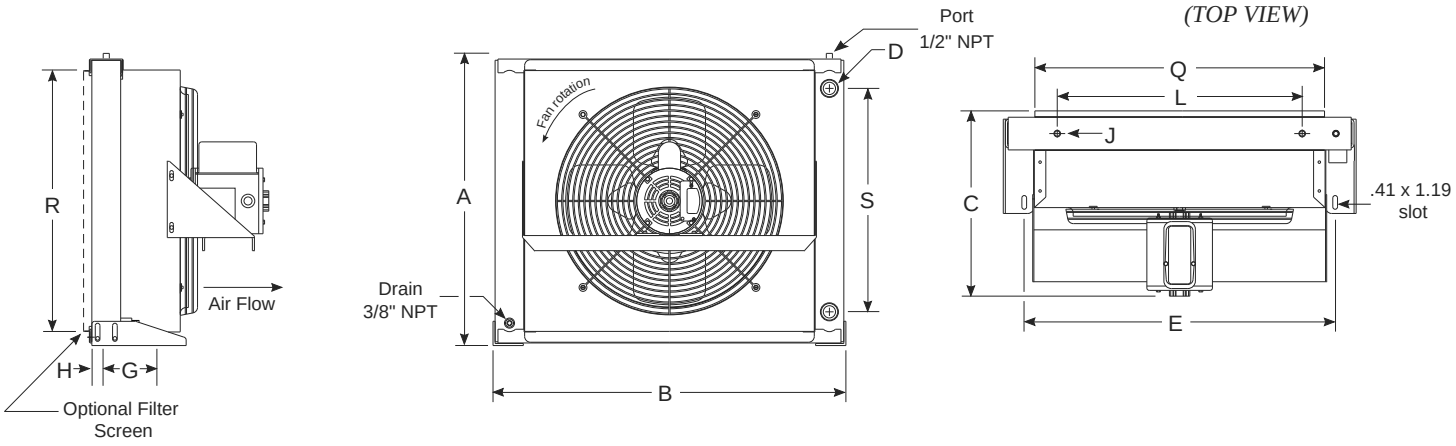
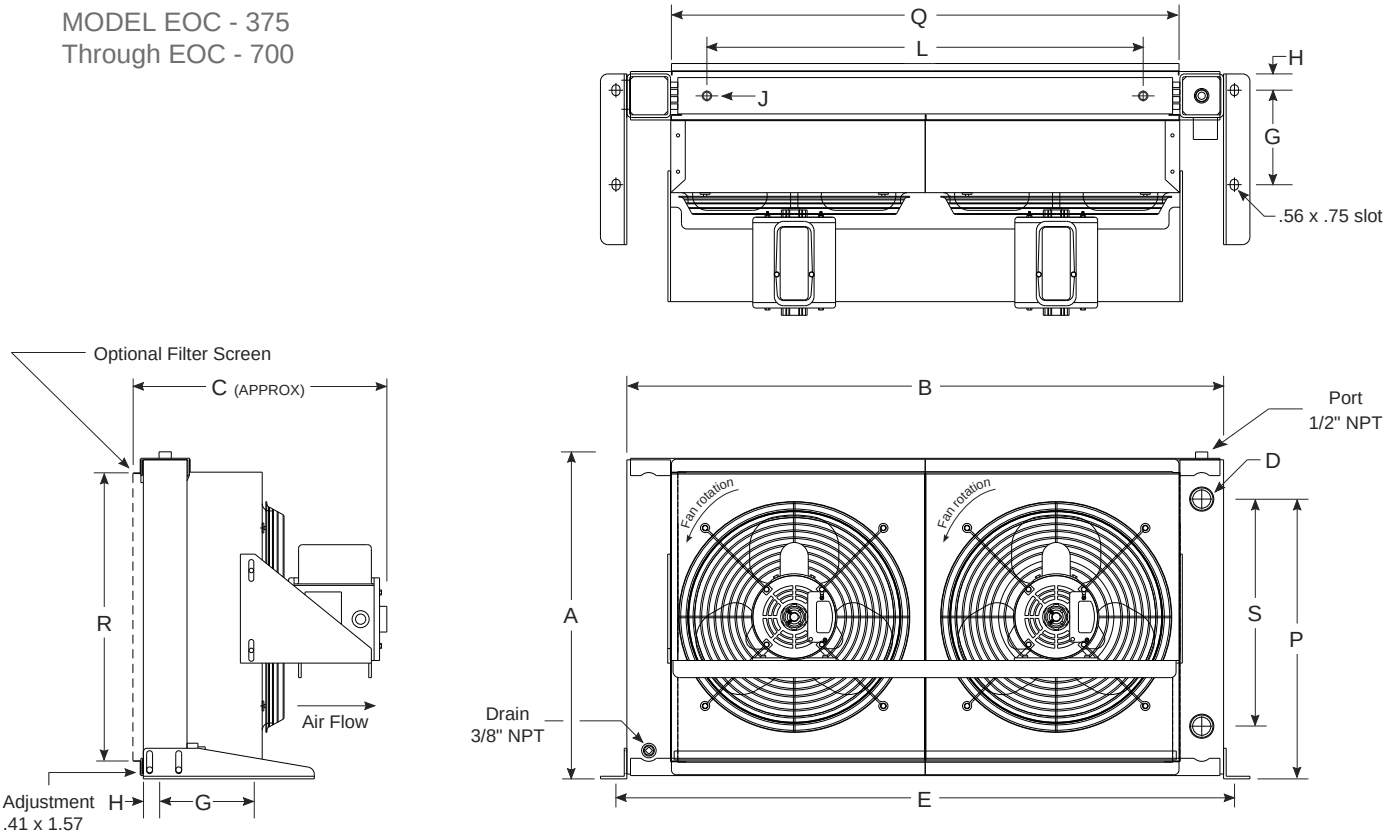
EOC & EOCF Series *dimensions with electric drive - Two Pass*

MODEL EOC - 190 Through EOC - 337



MODEL EOC - 375
Through EOC - 700



Model	A	B	C	D NPT	D SAE	E	G	H	J 1/2-13 tab	L	P	Q	R	S
EOC - 190 - ✱	13.62	16.50	14.21	.75	#12	14.75	5.00	5.00		8.00	10.31	11.38	10.38	7.65
EOC - 220 - ✱	15.62	22.00	16.32	.75	#12	18.69	5.00	5.00		14.00	12.31	16.88	12.25	10.25
EOC - 249 - ✱	19.62	24.75	16.32	.75	#12	21.44	5.00	5.00		14.00	16.31	20.00	16.25	15.00
EOC - 337 - ✱	25.62	30.25	16.32	1.00	#16	26.97	5.00	5.00		21.25	22.31	25.00	22.38	19.38
EOC - 375 - ✱	18.50	39.00	17.75	1.25	#20	40.50	6.50	6.50	(4)	30.00	15.25	33.00	15.13	12.50
EOC - 505 - ✱	22.50	41.0	17.13	1.25	#20	42.50	6.50	6.50		30.00	19.25	34.75	19.63	16.50
EOC - 545 - ✱	30.50	42.00	17.32	1.50	#24	43.75	9.00	9.00		30.00	27.25	35.75	27.50	24.63
EOC - 575 - ✱	36.50	48.00	17.32	2.00	#32	49.75	9.00	9.00		36.00	32.75	41.75	33.50	29.25
EOC - 700 - ✱	38.38	51.00	21.23	2.00	#32	52.75	9.00	9.00	(8)	–	34.00	43.50	34.50	32.50

note: AIHTI reserves the right to make reasonable design changes without notice.

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EOC & EOCF ELECTRIC MOTOR @ 60 Hz. DATA

Model	Horse Power	No. of Motors	Phase	Hz	Volts	RPM	NEMA Frame	Type	Full Load Amperes	Service Factor	Thermal Overload
EOC-190 thru EOC-337	1/4	1	1	60	115/230	1800	48	TEFC	1.3	1.15	NO
EOC-190 thru EOC-337	1/4	1	3	60	208-230/460	1800	48	TEFC	0.7	1.0	NO
EOC-190 thru EOC-337	1/3	1	3	60	575	1800	56	TEFC	0.6	1.15	NO
EOC-375 thru EOC-575	1/4	2	1	60	115/230	1800	48	TEFC	1.3	1.15	NO
EOC-375 thru EOC-575	1/4	2	3	60	208-230/460	1800	48	TEFC	0.7	1.0	NO
EOC-375 thru EOC-575	1/3	2	3	60	575	1800	56	TEFC	0.6	1.15	NO
EOC - 700	1.0	2	1	60	115-208/230	1800	56	TEFC	6.4	1.0	NO
EOC - 700	1.0	2	3	60	208-230/460	1800	56	TEFC	1.5	1.15	NO
EOC - 700	1.0	2	3	60	575	1800	56	TEFC	1.45	1.15	NO

EOC & EOCF ELECTRIC MOTOR @ 50 Hz. DATA

Model	Horse Power	Phase	Hz	Volts	RPM	NEMA Frame	Type	Full Load Amperes	Service Factor	Thermal Overload
EOC - 190 thru EOC - 575	Available as a single phase 50hz motor upon request as a special									
EOC - 190 thru EOC - 575	1 / 4	3	50	230/380	1500	48	TEFC	1.7/1.0	1 . 15	NO
EOC - 700	1.0	1	50	110/220	1500	56	TEFC	12.8/6.4	1 . 0	NO
EOC - 700	1.0	3	50	220/380	1500	56	TEFC	3.5/2.0	1 . 15	NO

NOTE: EOC-190 thru EOC-575 quarter horse power single phase / 50 hz available upon request as a special

DC ELECTRIC MOTOR DATA

Model	Horse Power	Current	Volts	RPM	NEMA Frame	Enclosure Type	Full Load Amperes	Service Factor	Thermal Overload
EOC - 190 thru EOC - 575	1 / 4	DC	12	1800	48	TENV	21	1.0	NO
EOC - 190 thru EOC - 575	1 / 4	DC	24	1800	48	TENV	10.5	1.0	NO

CLASS I,DIV.1, GROUP D or CLASS II,DIV.2, GROUP F & G EXPLOSION PROOF MOTOR DATA

Model	Horse Power	Phase	Hz	Volts	RPM	NEMA Frame	Enclosure Type	Full Load Amperes	Service Factor	Thermal Overload
EOC - 190 thru EOC - 575	1 / 4	1	60	115-208/230	1800	48	X-PROOF	2.5	1 . 0	YES
EOC - 190 thru EOC - 575	1 / 4	3	60	208-230/460	1800	48	X-PROOF	0.7	1 . 0	YES
EOC - 700	1	1	60	115/230	1800	56	X-PROOF	6.5	1 . 0	YES
EOC - 700	1	3	60	208-230/460	1800	56	X-PROOF	1.8	1 . 0	YES

NOTE: All of the EOC & EOCF Series explosion proof motors are available in 50hz upon request as a special

ELECTRIC MOTOR NOTES:

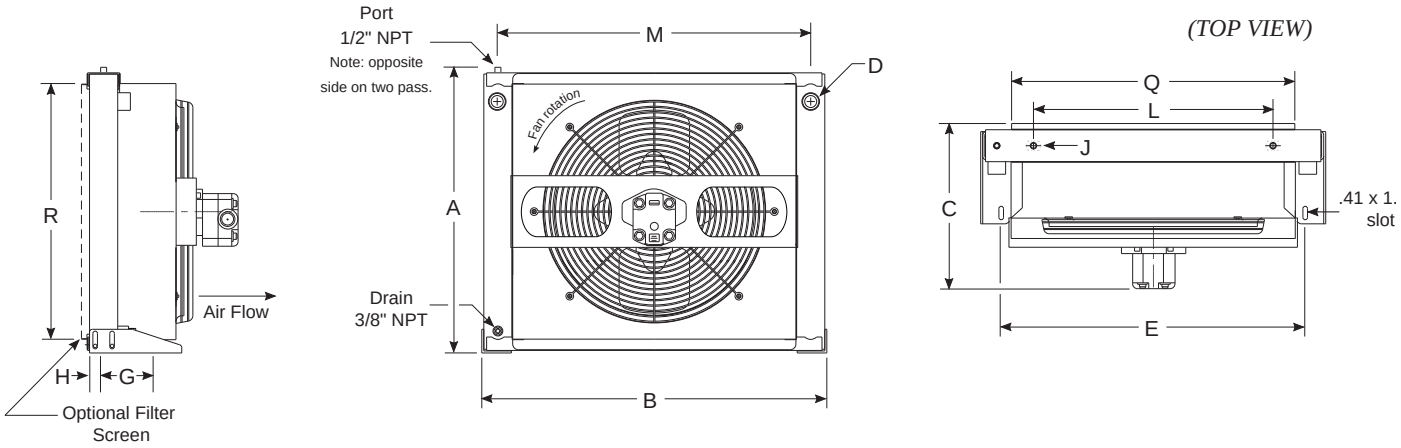
1) All motors are NEMA, high efficiency
2) TEFC motors are available for all models.
3) Motor electrical ratings are an approximate guide and may vary between motor manufacturers. Consult ratings on motor data plate prior to installation and operation.
4) Explosion proof, high temperature, severe duty, chemical, IEC, Canadian Standards Association, and Underwriters Laboratory recognized motors are available upon request.
5) American Industrial reserves the right to enact changes to motor brand, type and ratings regarding horsepower, RPM,FLA,and service factor for standard products without notice. All specific requirements will be honored without change.
6) Fan rotation is clockwise when facing the motor shaft.
7) The above motors contain factory lubricated shielded ball bearings.
8) **Abbreviation Index**

TEFC ..... Totally Enclosed, Fan Cooled

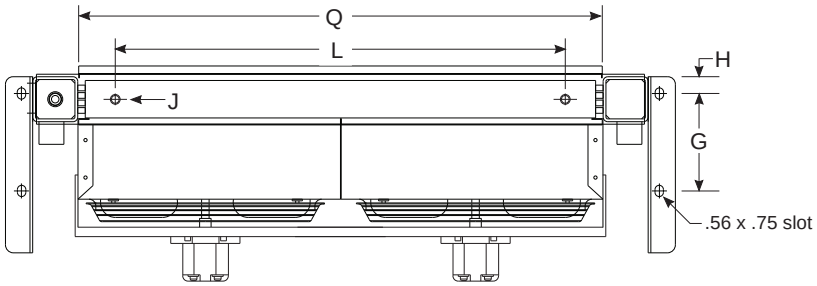
X-PROOF ..... Explosion Proof

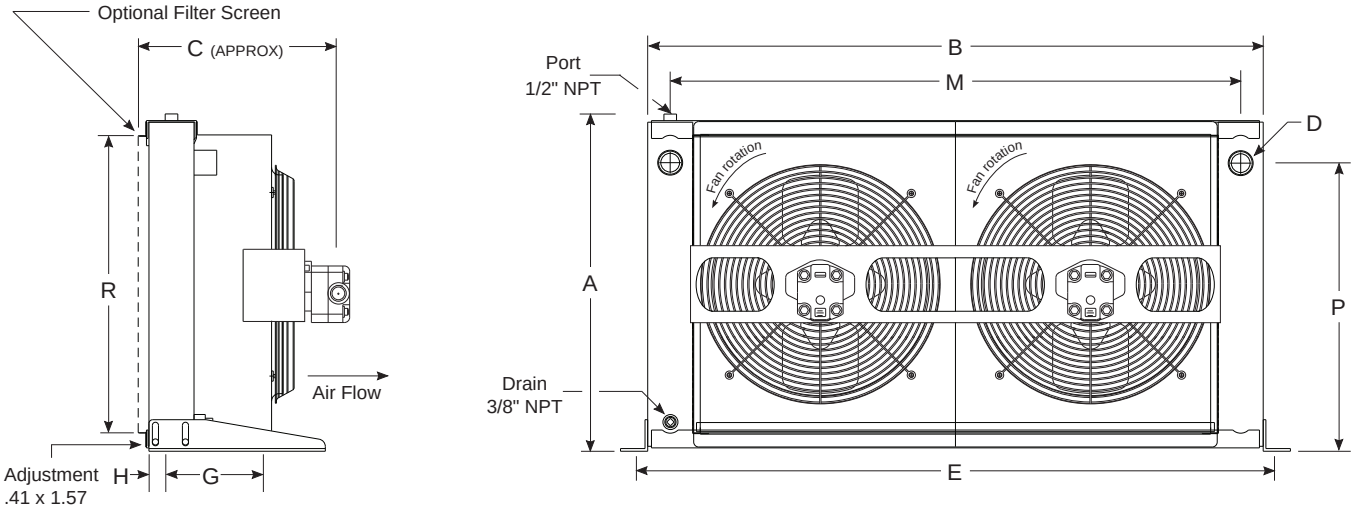
EOC & EOCF Series *dimensions with hydraulic drive - Single Pass*

MODEL EOC - 190 Through EOC - 337



MODEL EOC - 375
through EOC - 700





COMMON DIMENSIONS

Model	A	B	C	D NPT	D SAE	E	G	H	J 1/2-13 tab	L	M	P	Q	R
EOC - 190 - ✱	13.62	16.50	12.20	.75	#12	14.75	5.00	5.00		8.00	15.00	10.31	11.38	10.38
EOC - 220 - ✱	15.62	22.00	14.64	.75	#12	18.69	5.00	5.00		14.00	20.50	12.31	16.88	12.25
EOC - 249 - ✱	19.62	24.75	14.19	.75	#12	21.44	5.00	5.00		14.00	23.25	16.31	20.00	16.25
EOC - 337 - ✱	25.62	30.25	14.64	1.00	#16	26.97	5.00	5.00		21.25	28.75	22.31	25.00	22.38
EOC - 375 - ✱	18.50	39.00	15.14	1.25	#20	40.50	6.50	6.50	(4)	30.00	36.50	15.25	33.00	15.13
EOC - 505 - ✱	22.50	41.0	15.14	1.25	#20	42.50	6.50	6.50		30.00	38.50	19.25	34.75	19.63
EOC - 545 - ✱	30.50	42.00	15.14	1.50	#24	43.75	9.00	9.00		30.00	39.50	27.25	35.75	27.50
EOC - 575 - ✱	36.50	48.00	15.29	2.00	#32	49.75	9.00	9.00		36.00	45.50	32.75	41.75	33.50
EOC - 700 - ✱	38.38	51.00	15.40	2.00	#32	52.75	9.00	9.00	(8)	–	48.50	34.00	43.50	34.50

note: AIHTI reserves the right to make reasonable design changes without notice.

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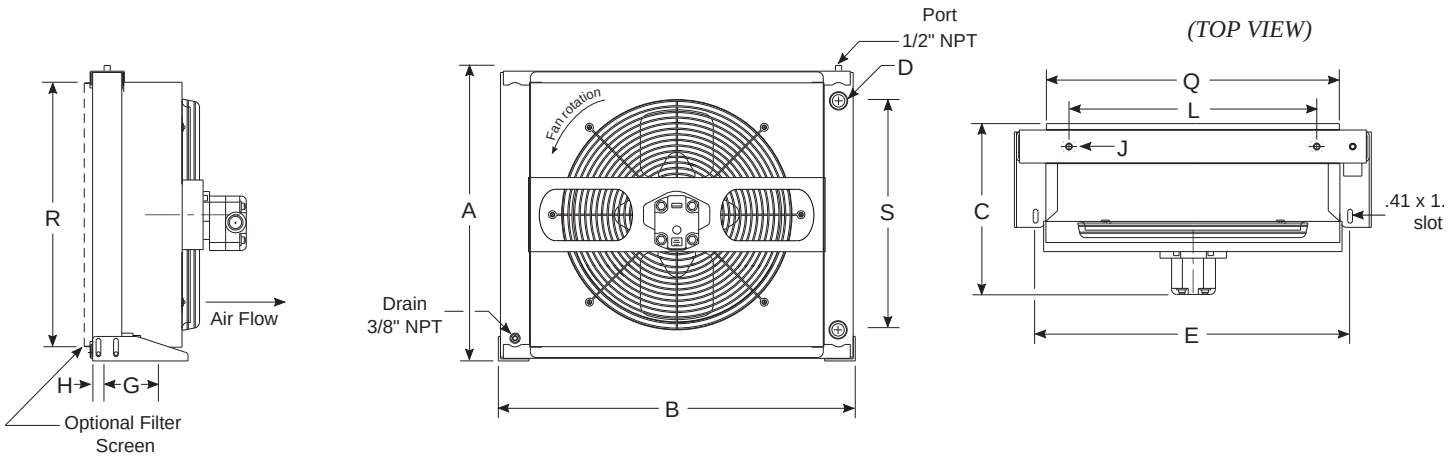
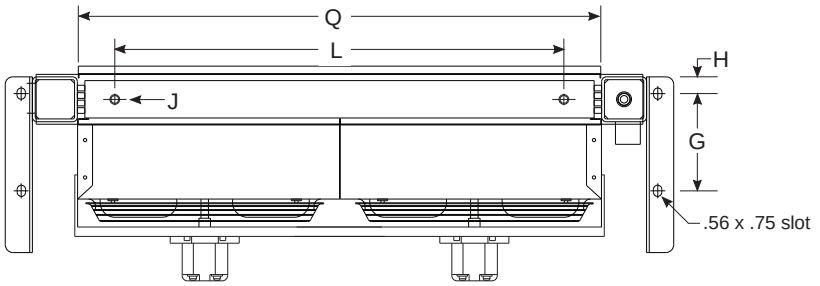
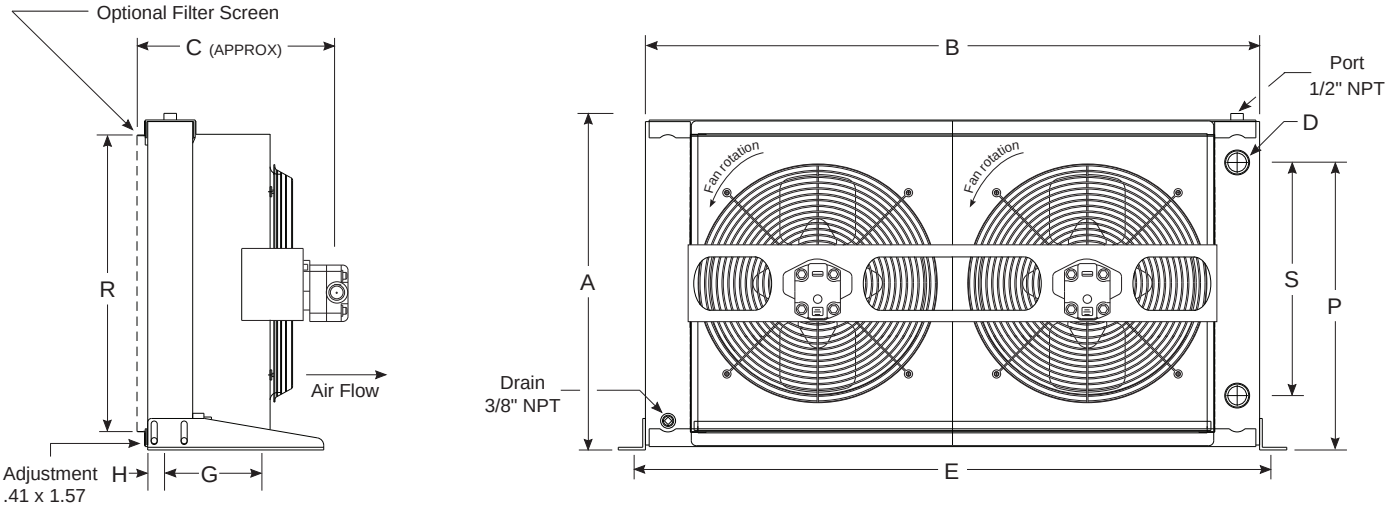
EOC & EOCF Series *dimensions with hydraulic drive - Two Pass*

MODEL EOC - 190 Through EOC - 337



MODEL EOC - 375
through EOC - 700





COMMON DIMENSIONS

Model	A	B	C	D NPT	D SAE	E	G	H	J 1/2-13 tab	L	P	Q	R	S
EOC - 190 - ✱	13.62	16.50	12.20	.75	#12	14.75	5.00	5.00		8.00	10.31	11.38	10.38	7.65
EOC - 220 - ✱	15.62	22.00	14.64	.75	#12	18.69	5.00	5.00		14.00	12.31	16.88	12.25	10.25
EOC - 249 - ✱	19.62	24.75	14.19	.75	#12	21.44	5.00	5.00		14.00	16.31	20.00	16.25	15.00
EOC - 337 - ✱	25.62	30.25	14.64	1.00	#16	26.97	5.00	5.00		21.25	22.31	25.00	22.38	19.38
EOC - 375 - ✱	18.50	39.00	15.14	1.25	#20	40.50	6.50	6.50	(4)	30.00	15.25	33.00	15.13	12.50
EOC - 505 - ✱	22.50	41.0	15.14	1.25	#20	42.50	6.50	6.50		30.00	19.25	34.75	19.63	16.50
EOC - 545 - ✱	30.50	42.00	15.14	1.50	#24	43.75	9.00	9.00		30.00	27.25	35.75	27.50	24.63
EOC - 575 - ✱	36.50	48.00	15.29	2.00	#32	49.75	9.00	9.00		36.00	32.75	41.75	33.50	29.25
EOC - 700 - ✱	38.38	51.00	15.40	2.00	#32	52.75	9.00	9.00	(8)	–	34.00	43.50	34.50	32.50

note: AIHTI reserves the right to make reasonable design changes without notice.

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EOC & EOCF Series *motor data*

HYDRAULIC MOTOR DATA

Model	No. of Motors	Motor Connections	RPM	Displacement IN^3/Rev	Min.Oil Flow Required (GPM)	Min.Operation Pressure (PSI)	Maximum Pressure (PSI)	Size	Shaft
EOC-190	1	SAE-12 1 - 1/16 -12	1725	.43	3.75	200	3000	SAE A 2 Bolt	.625 Keyed Short
EOC-220									
EOC-249									
EOC-337									
EOC-375	2								
EOC-505									
EOC-545									
EOC-575									
EOC-700				.68	6.00	400			

HYDRAULIC MOTOR NOTES:

1) Standard units are supplied with a bi-directional hydraulic gear motor for the fan drive. The gear motor requires an external case drain be used during operation. The external case drain should be connected directly to hydraulic reservoir or a return line with not greater than 10PSIG back pressure. (NOTE: *Failure to properly connect and use the external case drain during motor operation could result in motor failure and external leakage of hydraulic fluid.*
2) Hydraulic motor flow requirements are provided with an efficiency rating of approximately 85%. Pressure requirements are calculated theoretical minimum operating requirements.
3) Shaft adapters are used to bridge the differences in length between the fan and hydraulic motor.
4) Maximum degree of fluid contamination, class 18/15 according to ISO 4406. Therefore, it is recommended to use a filter with retention rating of B20>. For longer life, it iscommended to use class 17/14 achievable with filter B10>-100.
5) Fan rotation is clockwise when facing the motor shaft.
6) Optional displacement motors available upon request.
7) American industrial reserves the right to enact changes to hydraulic motor, brand, type, ratings, port sizes, or any additional non-specified attribute for standard products without notice. All specific requirements will be honored without change pending availability.

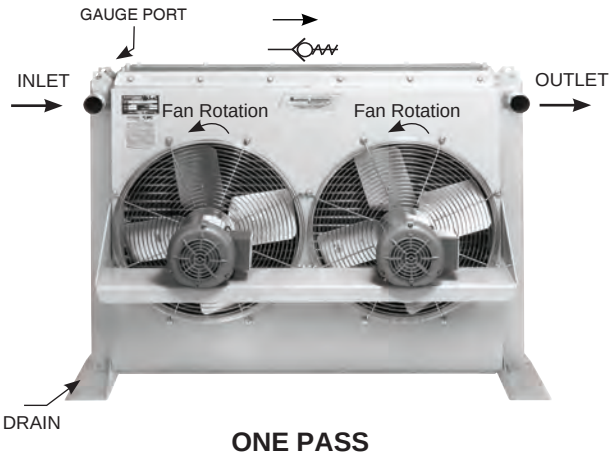
Model	Total Air Flow		Sound Level	Liquid Volume		Weight Electric		Weight Hydraulic		Bypass Valve Adder (lbs)	Serviceable Core
	CFM	m^3/s	dB(A) @ 7ft	gal.	cm^3	lb	kg	lb	kg		
EOC-190	800	.376	68	.76	2877	49	22	44	20	5	NO
EOC-220	800	.376	68	.85	3217	64	29	59	27	5	NO
EOC-249	2000	.942	71	1.28	4845	87	39	82	37	5	NO
EOC-337	2500	1.177	81	1.85	7003	102	46	97	44	6	NO
EOC-375	4000	1.884	73	1.94	7343	142	64	130	59	6	NO
EOC-505	4000	1.884	73	2.50	9464	151	68	139	63	7	NO
EOC-545	4000	1.884	73	3.51	13287	163	74	151	68	7	NO
EOC-575	5000	2.355	83	4.34	16428	241	109	227	103	8	NO
EOC-700	9500	4.475	87	7.53	28504	428	194	414	188	8	YES

NOTES: To estimate the sound level at distances other than 7 feet (2.1 meters) from the cooler, add 6 db for each halving of distance, or substract 6 db for each doubling of the distance.

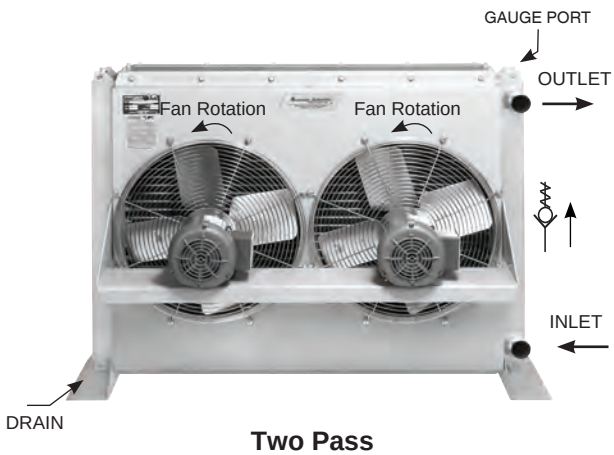
Electrical Temperature controller with Bulb Well Assembly (for Air / Liquid Coolers)

Part Number	Description
310-4011	TC-511 with 6-Foot Capallary Tube & Bulb Well
310-4002	TC-511 with 20-Foot Capallary Tube & Bulb Well
310-2025	Replacement Bulb Well TC-511

PIPING HOOK UP



ONE PASS



Two Pass

Receiving / Installation

a) Inspect unit for any shipping damage before uncrating. Indicate all damages to the trucking firms' delivery person and mark it on the receiving bill before accepting the freight. Make sure that the core and fan are not damaged. Rotate the fan blade to make sure that it moves freely. The published weight information located in this brochure is approximate. True shipment weights are determined at the time of shipping and may vary. Approximate weight information published herein is for engineering approximation purposes and should not be used for exact shipping weight. *Since the warranty is based upon the unit date code located on the model identification tag, removal or manipulation of the identification tag will void the manufacturers warranty.*

b) When handling the heat exchanger, special care should be taken to avoid damage to the core and fan. All units are shipped with wood skids for easy forklift handling

c) Standard Enamel Coating: American Industrial provides its standard products with a normal base coat of oil base air cure enamel paint. The enamel paint is applied as a temporary protective and esthetic coating prior to shipment. While the standard enamel coating is durable, American Industrial does not warranty it as a long-term finish coating. It is strongly suggested that a more durable final coating be applied after installation or prior to long-term storage in a corrosive environment to cover any accidental scratches, enhance esthetics, and further prevent corrosion. It is the responsibility of the customer to provide regular maintenance against chips, scratches, etc... and regular touch up maintenance must be provided for long-term benefits and corrosion prevention.

d) Special Coatings: American Industrial offers as customer options, Air-Dry Epoxy, and Heresite (Air-Dry Phenolic) coatings at additional cost. American Industrial offers special coatings upon request, however American Industrial does not warrantee coatings to be a permanent solution for any equipment against corrosion. It is the responsibility of the customer to provide regular maintenance against chips, scratches, etc... and regular touch up maintenance must be provided for long-term benefits and corrosion prevention.

e) American Industrial recommends that the equipment supplied should be installed by qualified personnel who have solid understanding of system design, pressure and temperature ratings, and piping assembly. Verify the service conditions of the system prior to applying any air cooled heat exchanger series cooler. If the system pressure or temperature does not fall within the parameters on model rating tag located on the heat exchanger, contact our factory prior to installation or operation.

g) Heat exchanger should be securely fastened using the mounting foot brackets (included). All mounting holes should be used to secure unit into place. Optional horizontal mounting with vertical airflow is allowable. Heat exchanger unit must be set into a fabricated channel type frame with provision for additional motor support for heavy motors. Since the units are normally operated in the vertical position (horizontal airflow) reinforced motor support is suggested.

h) Connections should be made in "one pass" or "Two Pass" configurations exactly as indicated in the "piping hook up" illustration above. The process flow entering the "Fluid IN" port and exiting the "Fluid OUT" port eliminates air pockets and assures that the unit will stay completely flooded. Flexible hose can be applied to reduce the risk of core failure due to thermal expansion or system vibration. Piping alignment and support is required for hoses longer than four feet in length and for piping exerting more than 20 lbs of dynamic force. It is recommended that filtration be located ahead of the heat exchanger to prevent excessive backpressure and clogging.

i) With respect to the heat exchangers nozzle size, flow

line sizes should be sized to handle the appropriate flow rate and system pressure drop requirements, normally flow line rates of about 8-12 feet per second and inlet pressure less than 100psig are experienced. If the flow line size is larger than the heat exchanger nozzle size, additional pressure loss beyond the published pressure loss data may occur.

j) Electric motors should be connected only to supply source of the same characteristics as indicated on the electric motor information plate. Prior to starting, verify that the motor and fan spin freely without obstruction. Check carefully that the fan turns in the correct rotation direction (normally counter clockwise) from the motor side (fan direction arrow). Failure to operate the fan in the proper direction could reduce performance or cause serious damage to the heat exchanger or other components.

k) It is important to apply the catalog recommended flow rate for the hydraulic motor that corresponds with the specific model being used. A case drain is required for hydraulic motor installation. Failure to connect case drain can result in motor failure. The proper flow rate and direction to the hydraulic motor are critical to ensure fan direction and RPM. Exceeding the recommended RPM could result in fan failure and cause severe damage to the heat exchanger. See fan rotation (page 178)

Maintenance

Regular maintenance intervals based upon the surrounding and operational conditions should be maintained to verify equipment performance and to prevent premature component failure. Since some of the components such as, motors, fans, fan guards, etc... are not manufactured by American Industrial, maintenance requirements provided by the manufacture must be followed.

a) Inspect the entire heat exchanger and motor/fan assembly for loosened bolts, loose connections, broken components, rust spots, corrosion, fin/coil clogging, or external leakage. Make immediate repairs to all affected areas prior to restarting and operating the heat exchanger or its components.

b) Heat exchangers operating in oily or dusty environments will often need to have the coil cooling fins cleaned. Oily or clogged fins should be cleaned by carefully brushing the fins and tubes with water or a non-aggressive degreasing agent mixture *(Note: Cleaning agents that are not compatible with copper, brass, aluminum, steel or stainless steel should not be used)*. A compressed air or a water stream can be used to dislodge dirt and clean the coil further. Any external dirt or oil on the electric motor and fan assembly should be removed. *Caution: Be sure to disconnect the electric motor from its power source prior to doing any maintenance.*

c) In most cases it is not necessary to internally flush the coil. In circumstances where the coil has become plugged or has a substantial buildup of material, flushing the coil with water or a solvent may be done. Flushing solvents should be non-aggressive suitable for the materials of construction. Serviceable Core® models can be disassembled and inspected or cleaned if required.

d) Most low horsepower electric motors do not require any additional lubrication. T.E.F.C. air ventilation slots should be inspected and cleaned regularly to prevent clogging and starving the motor of cooling air. To maintain the electric motor properly see the manufactures requirements and specifications.

e) Fan blades should be cleaned and inspected for tightness during the regular maintenance schedule when handling a fan blade care must be given to avoid bending or striking any of the blades. Fan blades are factory balanced and will not operate properly if damaged or unbalanced. Damaged fan blades can cause excessive vibration and severe damage to the heat exchanger or drive motor. Replace any damaged fan with an American industrial suggested replacement.

f) Air cooled exchanger cabinets are constructed using 7ga. through 18ga. steel that may be bent back into position if damaged. Parts that are not repairable can be purchased through American Industrial.

g) Coil fins that become flattened can be combed back into position. This process may require removal of the coil from the cabinet.

h) It is not advisable to attempt repairs to brazed joints of a brazed construction coil unless it will be done by an expert in silver solder brazing. Brazed coils are heated uniformly during the original manufacturing process to prevent weak zones from occurring. Uncontrolled reheating of the coil may result in weakening of the tube joints surrounding the repair area. In many instances brazed units that are repaired will not hold up as well to the rigors of the system as will a new coil. American Industrial will not warranty or be responsible for any repairs done by unauthorized sources. Manipulation in any way other than normal application will void the manufactures warranty.

i) Solely at the request of customers, American Industrial provides direct acting internal inlet port to outlet port bypass relief valves as an additional safe guard against surge flow and over pressurization of the heat exchanger. However, American Industrial does not specify, recommend, suggest, guarantee, or warrantee the internal relief valve or its performance to safe guard the heat exchanger from damage or prevent failure due to excessive flow or over pressurization. It is the ultimately the sole responsibility of the customer/user to verify with the original equipment manufacture all conditions associated with applying an additional system relief valve prior to application.

Serviceable Core® Maintenance
Units containing a Serviceable Core® have bolted manifold covers that can be removed for cleaning or repair purposes.

Servicing Sequence
American Industrial has gone to great lengths to provide components that are repairable. If the heat exchanger core requires internal cleaning or attention the following steps will explain what must be done to access the internal tubes. Be sure to order gasket kits or repair parts prior to removal and disassembly to minimize down time.

a) To clean the internal tubes first remove all connection plumbing from the unit.

b) Be sure the unit is drained of all water etc...

c) Place the heat exchanger in an area that it can be accessed from all sides. Remove the core from the cabinet if required. (EOC, AOCH, AOCS).
d) Mark the cover ① and tube-sheet ③ for both covers so that they can be replaced into the same position when finished. Remove the manifold cover bolts ② and hardware and place them into a secure place.

e) The manifold covers are tightly compressed and may need some prying to separate them from the gasket ⑥, physically remove the cover assemblies ① from both sides.

f) The tubes ④ and turbulators ⑤ are now accessible for cleaning. Note: turbulators are installed on EOC, AOCH & AOCS cores only. If you need to remove the turbulator that runs through the tubing, it will be necessary to first squeeze the flattened end of the protruding turbulator ⑤, so that on end will fit through the tube. From the opposite end pull the turbulator ⑤ out. You may need to use pliers to grip and pull the turbulators ⑤ out, especially if there is debris lodged inside. As the turbulators ⑤ come out, most of the dirt will too, so be prepared. *It is suggested that gloves be worn when handling the turbulators ⑤ as they may be sharp.*

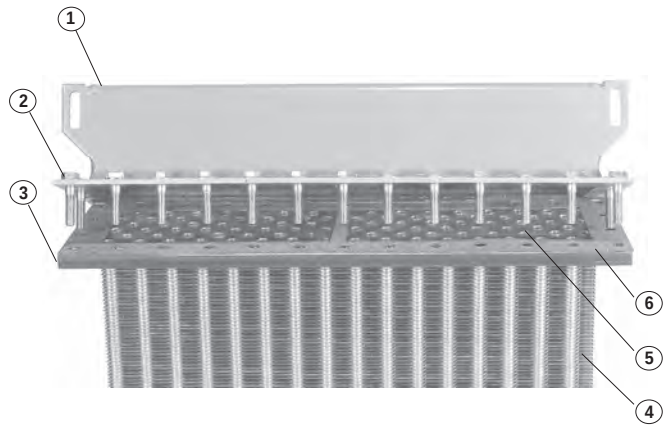
We suggest a mild water-soluble degreaser be used with a brush. Tubing I.D. is aproximatley .325 a plastic bristle brush on a rod will work best for cleaning the tubes ④. Steel brushes should be avoided since the steel is harder than the copper tubing and may heavily score the tubes ④ if used.

g) If there are any leaking tubes ④ you may plug them by carefully forcing a soft metal plug into the hole and tapping it tight. You may in some cases weld the leaking tube shut however, care should be taken since excessive heat may cause surrounding tube joints to loosen and leak.

h) When finished cleaning or repairing, be sure to replace ALL of the turbulators ⑤ back into any open tubes ④. When the turbulators ⑤ protrude from the opposite end flatten them again so they are tight and cannot be removed.

i) When finished reattach the manifold covers ① in the same position they were removed, using new gaskets ⑥, bolts ②, and hardware. We suggest using a torque wrench to final tighten the bolts ②.

j) *Torque Specifications: For 5/16" bolts 22-23 ft-lbs, for 3/8" bolts to 38-42 ft-lbs. Since bolts and hardware can physically fatigue during application we suggest new bolt kits be used when reassembling.*



website : www.aihti.com
general email : sales@aihti.com
technical email : engineering@aihti.com

Notes:

American Industrial Heat Transfer Inc.
Manufacturer of Quality Heat Exchangers

website : www.aihti.com
general email : sales@aihti.com
technical email : engineering@aihti.com

Air Cooled After-Cooler Application Request:

For ACA Series

Email form to: sales@aihti.com or engineering@aihti.com or fax to 434-757-1810

Contact Name _____ Telephone _____ Date _____

Company Name _____ Email _____

Address: _____ Fax _____

_____

Hot Side

Air / Gas Type _____

If available:
- Density _____ lb/ft3
- Viscosity _____ cP
- Thermal Conductivity _____ Btu/hr.ft.°F
- Specific Heat _____ Btu/lb.°F

1. Flow Rate _____
2. Temperature In _____
3. Desired Temperature Out _____
4. Heat Load _____

Cold Side

Ambient Air _____

Altitude _____

1. Inlet Pressure _____
2. Allowable Pressure Drop _____

ASME Code and Certified Yes ☐ No ☐

To properly size the heat exchanger we need 3 of the 4 perameters on the Hot Side.

Cabinet Material:

Standard : Steel ☐

Options: Galvanized Steel ☐ / Stainless Steel ☐

Tubing Material:

Standard : Copper ☐

Options: Stainless Steel ☐ / 90/10 Copper Nickel ☐

Motor

60Hz:
- 230/460 Volt, 3 Phase ☐
- 115/230 Volt, 1 Phase ☐
- 575 Volt, 3 Phase ☐

50Hz
- 230/400 Volt, 3 Phase ☐
- 110/220 Volt, 1 Phase ☐

Pneumatic Motor ☐

Coating

Standard Enameled Gray Paint ☐

Options: Epoxy Paint ☐

Fins

Standared Aluminum ☐

Options: Copper ☐

Optional Coating: Heresite ☐

Comment: _____

ACA SERIES

AIR COOLED

AFTERCOOLERS

For Compressed Gas or Vapor

- Low pressure drop available.
- Standard ports NPT, optional ANSI flange.
- Operating temperature of 300°F & pressure of 300PSI.
- Can be built to ASME Code and Certified as an option
- Computer generated data sheet available for any application
- Custom designs to fit your needs.
- Cools: Air, Compressors, Blowers, Steam vapors, Pneumatic systems, Vapor recovery systems etc...

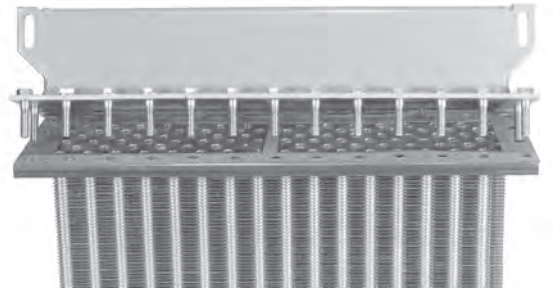
355 American Industrial Drive LaCrosse, VA 23950 tel: 434-757-1800 fax: 434-757-1810 email: sales@aihti.com

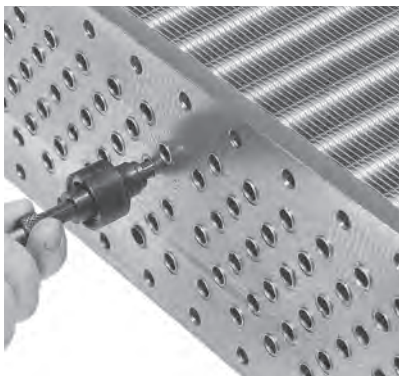
Serviceable Core® Construction

Air coolers are an essential part of any compressed air system, by cooling the air, and condensing water vapor into a liquid state for removal. When air is compressed, the compression induces heat into both the air and the water entrained in the air.
The American Industrial ACA series heat exchanger cools air with air, making it a simple inexpensive way to cool when compared to other water-cooled or refrigerant cooled systems. The unique compact *serviceable core®* design provides efficient cooling and low maintenance under the warmest environmental conditions. By using an ACA series air-cooled after cooler, machine tools will recieve cooler dryer air, provide longer trouble free life, experience less down time, and be cost effective to operate on a continuous basis.

SERVICEABLE CORE®

Core covers disassemble for easy access and cleaning. Repairable design for applications that require limited down time or in the event of a mishap requiring repair. Roller expanded tube to tube-sheet joint. 100% mechanical bond. Positive gasket seal is field replaceable for field maintenance or repair.





SUPERIOR COOLING FINS

Copper tubes are mechanically bonded to highly efficient aluminum cooling fins. Die-formed fin collars provide a durable precision fit for maximum heat transfer. Custom fin design forces air to become turbulent and carry heat away more efficiently than old flat fin designs.

Standard Construction Materials		Standard Unit Ratings	
Tubes	Copper	Operating Pressure	300 psig
Fins	Aluminum	Operating Temperature	300 °F
Cabinet & Pipes	Steel	Consult factory for optional materials and ratings.	
Fan Guard	Zinc Plated Steel		
Manifolds	Steel		

note: AIHTI reserves the right to make reasonable design changes without notice.

 355 American Industrial Drive LaCrosse, VA 23950 tel: 434-757-1800 fax: 434-757-1810 email: sales@aihti.com

Compressed Air

Normally air compressors have airflow rates based upon the horsepower. Rotary Screw compressors normally discharge air at 180 °f - 200 °f, prior to after-cooling. Reciprocating compressors normally discharge air at 250 °f - 275 °f, prior to after-cooling. Compressors are rated in CFM or cubic feet per minute of free air at inlet conditions. For practical purpose we will use sea level at 68 °f and 36% relative humidity as a norm. Altitude, differing ambient conditions with respect to temperature and humidity will all affect heat exchanger performance to a degree. Moisture content in air actually increases the Btu/hr load requirement for cooling air by adding an additional condensing load to the gas load requirement. As air rapidly cools, moisture in the compressed air stream will condense and separate into droplets, the more humidity present the more condensation will occur.

Sizing

The performance curves provided are for air. However, gases other than air may be applied to this cooler with respect to compatibility by applying a correction factor. Please take time to check the operating specifications thoroughly for material compatibility, pressure, and size before applying an American Industrial heat exchanger into your system.

Terms

Approach Temperature is the desired outlet temperature of the compressed gas minus the inlet ambient air temperature of the external air flowing over the coil.
SCFM (Standard Cubic Feet per Minute)
A cubic foot of air at 68 °f, 14.696 psia, & 36% relative humidity, per minute.
CFM (Cubic Feet per Minute)
Air at inlet atmospheric conditions.
ACFM (Actual Cubic Feet per Minute)
Air at current pressure, temperature, & humidity conditions without reference to a standard.

To Determine the Heat Load

If the heat load (Btu/hr) is unknown a value can be calculated based upon system operational requirements. To properly calculate the heat load (Btu/hr) to be rejected, several items must be known with certainty (see below).

- Flow rate SCFM (standard cubic feet pr minute)
- Type of gas and its makeup.
- System inlet pressure to the heat exchanger.
- Ambient temperature where the heat exchanger will be located (hotest condition).
- Temperature of the gas at the heat exchanger inlet.
- Temperature of the gas desired at heat exchanger outlet.
- Maximum acceptable pressure loss or cooled gas.

Using The Chart

American Industrial has created a quick reference chart for selecting ACA heat exchangers for Rotary Screw compressors (see page 214) [This chart offers basic information based upon compressor horsepower and average airflow rates. To properly use the chart, select the compressor horsepower at the left or the air flow rate. Next select the approach to ambient that is desired. Where the two columns intersect is shown the proper ACA model number.]

Using The Graphs

American Industrial provides performance graphs for ease of model selection. The following calculation examples (page 213), illustrate formulas to determine model selection sizes. It should be noted that there are some assumptions made when applying the basic principles for calculation in the formula. Altitude, humidity, materials, pressures, etc... all contribute to the final selection. Contact American Industrial for more detailed calculation.

Selection

The selection process is important, many considerations should be made when selecting a heat exchanger. Once the proper Fs requirement is calculated, it is time to apply the data to the graph and make a selection.
1) Find the Flow rate in SCFM located at the bottom of the graph. Follow the graph line up until it matches the calculated Fs from your calculations. If the point falls just above one of the model graphed lines, select the next larger size. If the point is on a line select it as your choice.
2) Check carefully the pressure differential. Units with operating pressures from 70+ psig will have no greater than 2.0 psid within the published flow range. For lower inlet pressure see the pressure drop curves for more detail.
3) Calculate a Nozzle size using the nozzle size calculation to verify your selection has the proper port sizes for your required inlet pressure.

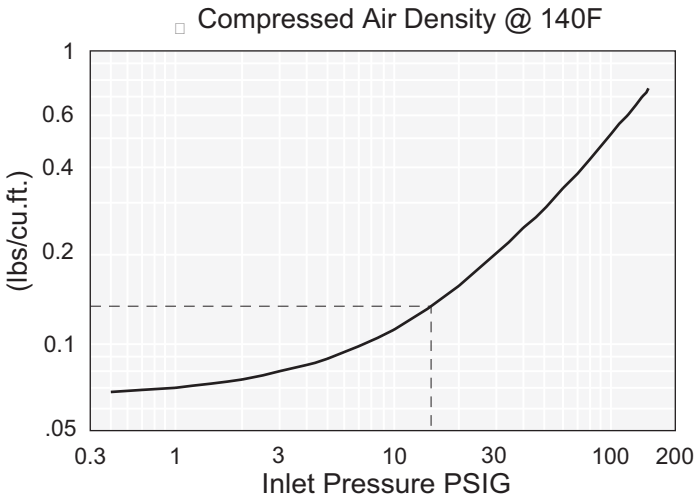
Formula: Nozzle Calculation

$$\text{Nozzle Size} = \sqrt{\left[\frac{(\text{SCFM} \times 4.512)}{(270{,}000 \times d)} \times 144\right]} \Big/ .7854$$

All numbers in equation are constants except for SCFM and (d) "density".

Example:
Flow rate = 200 SCFM
Pressure = 15 psig
Density = (d) from Compressed Air Density Graph

$$\sqrt{\left[\frac{(200 \times 4.512)}{(270{,}000 \times .14)} \times 144\right]} \Big/ .7854 = 2.09\text{" or (2" Nozzle)}$$



Examples: **(**Note: All air flow rates must be converted to SCFM)

Application 1 Air Rotary Screw Compressor

Determine the heat load "Q" =Btu/hr — $Q = [SCFM \times CF \times (T_1 - T_2)]$ or $[350 \times 1.13 \times 105^o] = 41{,}528$ Btu/hr

T_1 = Inlet gas temperature: 200°f

T_2 = Outlet gas temperature: Ambient + 10°f= (95°f) — Determine the Fs = $\frac{Btu/hr}{T_2 - T_a}$ or $\frac{41{,}528}{10}$ = **4,153 Fs** Refer to graph example on page 215

T_a = Ambient temperature: 85°f

Airflow rate: 350 SCFM

PSIG = Operating Pressure 100 psig

CF = Correction factor: 1.13 — $CF = (.0753 \times S \times C \times 60)$ or $(.0753 \times 1.0 \times .25 \times 60) = 1.13$

S = Specific gravity with air being 1.0

C = Specific heat (Btu/Lb °f): .25

Model Selection - ACA-4362

$$\sqrt{\frac{\left[\frac{(350 \times 4.512)}{(270{,}000 \times .50)} \times 144\right]}{.7854}} = 1.46\text{" or (1.5" minimum nozzle)}$$

Application 2 Methane Gas

Determine the heat load "Q" = Btu/hr — $Q = [SCFM \times CF \times (T_1 - T_2)]$ or $[500 \times 1.428 \times 210^o] = 149{,}940$ Btu/hr

T_1 = Inlet gas temperature: 300°f

T_2 = Outlet gas temperature: 90°f — Determine the Fs = $\frac{Btu/hr}{T_2 - T_a}$ or $\frac{149{,}940}{30}$ = **4,998 Fs** Refer to graph example on page 215

T_a = Ambient temperature: 60°f

Gas flow rate: 500 SCFM

PSIG = Operating pressure: 150 psig

CF = Correction factor: 1.428 — $CF = (.0753 \times S \times C \times 60)$ or $(.0753 \times .55 \times .575 \times 60) = 1.428$

S = Specific gravity with air being 1.0: .55

C = Specific heat (Btu/Lb °f)

Model Selection - ACA-6421

$$\sqrt{\frac{\left[\frac{(500 \times 4.512)}{(270{,}000 \times .74)} \times 144\right]}{.7854}} = 1.44\text{" or (1.5" minimum nozzle)}$$

Application 3 Low Pressure Blower

Determine the heat load "Q" = Btu/hr — $Q = [SCFM \times CF \times (T_1 - T_2)]$ or $[76 \times 1.13 \times 150^o] = 12{,}882$ Btu/hr

T_1 = Inlet gas temperature: 250°f

T_2 = Outlet gas temperature: 100°f — Determine the Fs = $\frac{Btu/hr}{T_2 - T_a}$ or $\frac{12{,}882}{10}$ = **1,288 Fs** Refer to graph example on page 215

T_a = Ambient temperature: 90°f

CF = Correction Factor: 1.13

PSIG = Operating pressure: 2 psig — To Convert

Airflow rate: 90 ACFM — ACFM to SCFM = $\frac{ACFM \times (PSIG + 14.7) \times 528}{(T_1 + 460) \times 14.7} = \frac{90 \times 16.7 \times 528}{710 \times 14.7} = 76$ SCFM

S = Specific gravity with air being 1.0

C = Specific heat (Btu/lb °f): .25

△P = 5" water column or less (example pg. 220)

Model Selection - ACA-3302

$$\sqrt{\frac{\left[\frac{(76 \times 4.512)}{(270{,}000 \times .075)} \times 144\right]}{.7854}} = 1.76\text{" or (2.0" minimum nozzle)}$$

Pressure Drop (see page 220 for graphs)

Since gas is compressible the density of the gas changes from one temperature or pressure to the next. While the mass flow rate may not change, the pressure differential across the heat exchanger will change dramatically from high (70-125 psig) to low (1-5 psig) pressure. A low pressure condition requires larger carrying lines to move flow than does the same gas rate under a higher pressure. At lower pressures the differential pressure across the heat exchanger can be quite high compared to the same flow rate at a higher pressure. For that reason it is suggested that the pressure differential graphs on page 220 be consulted prior to making your final selection.

The ACA series heat exchanger is designed to be easily modified to accept larger port sizes in the event your system pressure requires larger nozzles. Consult our engineering department for more exacting information regarding pressure differential issues.

ACA Series *selection*

ROTARY SCREW COMPRESSORS
(200°F @125 PSI & 36% relative humidity)

Compressor Horse Power (HP)	Average Air Discharge Cubic feet per minute (SCFM)	Model Size Selection			
		*Approach Temperature °F (T_2 - T_a)			
		5°F	10°F	15°F	20°F
15	60	ACA - 3302	ACA - 3242	ACA - 3242	ACA - 3182
20	80	ACA - 3302	ACA - 3242	ACA - 3242	ACA - 3182
30	130	ACA - 3362	ACA - 3302	ACA - 3242	ACA - 3242
40	165	ACA - 3362	ACA - 3302	ACA - 3302	ACA - 3242
60	250	ACA - 4362	ACA - 3362	ACA - 3302	ACA - 3302
75	350	ACA - 6362	ACA - 4362	ACA - 3362	ACA - 3302
100	470	ACA - 6362	ACA - 6362	ACA - 3362	ACA - 3362
125	590	ACA - 6422	ACA - 6362	ACA - 4362	ACA - 3362
150	710	ACA - 6422	ACA - 6362	ACA - 6362	ACA - 4362
200	945	ACA - 6482	ACA - 6422	ACA - 6362	ACA - 6362
250	1160	ACA - 6482	ACA - 6422	ACA - 6362	ACA - 6362
300	1450	ACA - 6542	ACA - 6482	ACA - 6422	ACA - 6362
350	1630	ACA - 6542	ACA - 6482	ACA - 6422	ACA - 6362
400	1830	ACA - 6602	ACA - 6482	ACA - 6422	ACA - 6422
500	2150	ACA - 6602	ACA - 6542	ACA - 6482	ACA - 6422

***Approach Temperature**
the desired outlet temperature of the compressed gas minus the inlet ambient air temperature of the external air flowing over the coil.

$\mathbf{T_2}$ - Outlet gas temperature

$\mathbf{T_a}$ - Ambient temperature

Example of a model:

ACA - 3242 - 3 - __ - ____ - ____

- **Model**: ACA
- **Number of Passes**: 1P = 1 pass; 2P = 2 pass
- **Size**
- **Drive Type**: N = no motor; 1 = single phase; 3 = three phase; 1EXP = single phase; 3EXP = three phase; 5 = 575 Volt
- **Connections**: Blank = NPT; A = ANSI 150#RF Flange
- **Tubing**: Blank = Copper; U = 90/10 Cu Ni; C = Carbon Steel; SS = Stainless Steel
- **Coating**: Blank = Enamel (standard); G = Galvanize (cabinet); T = Heresite (core); X = Epoxy (core & cabinet); STS = Stainless Steel

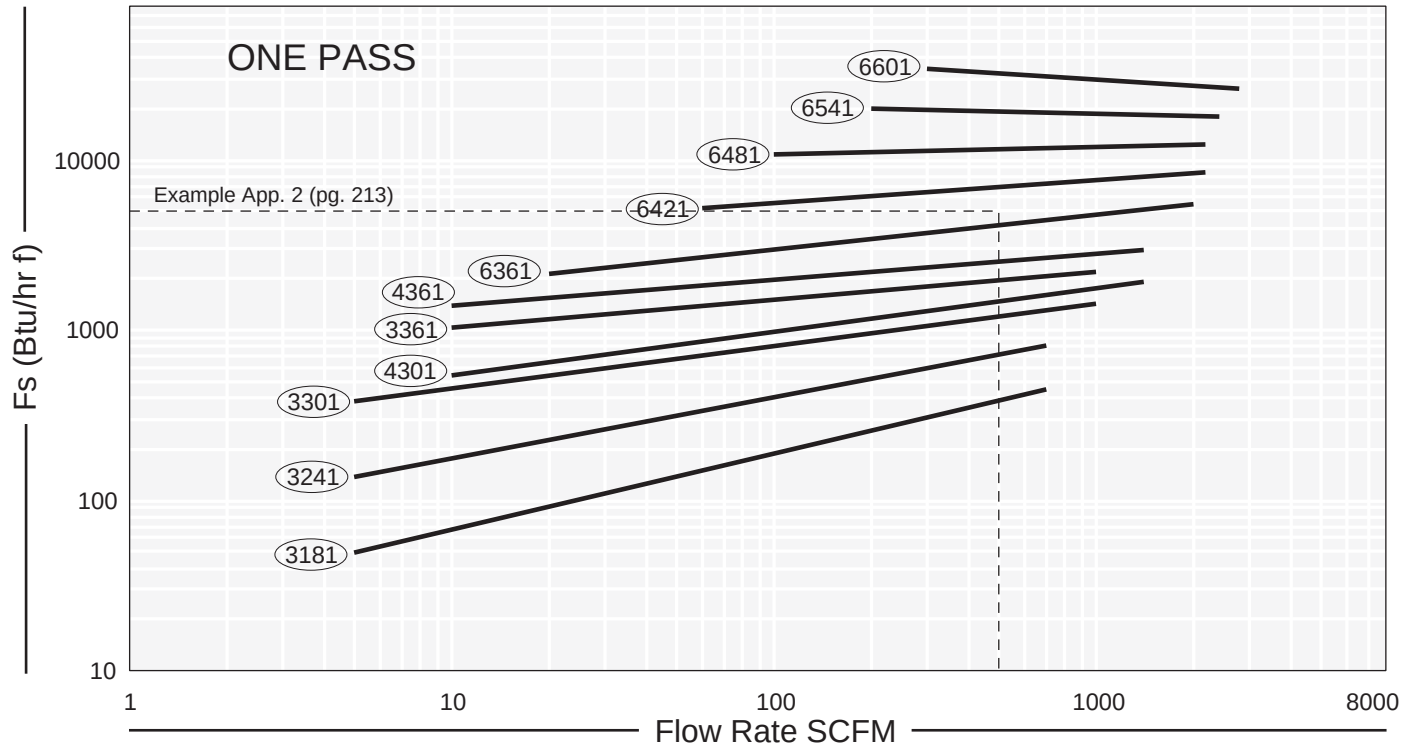
Using the performance graphs (see page 230)

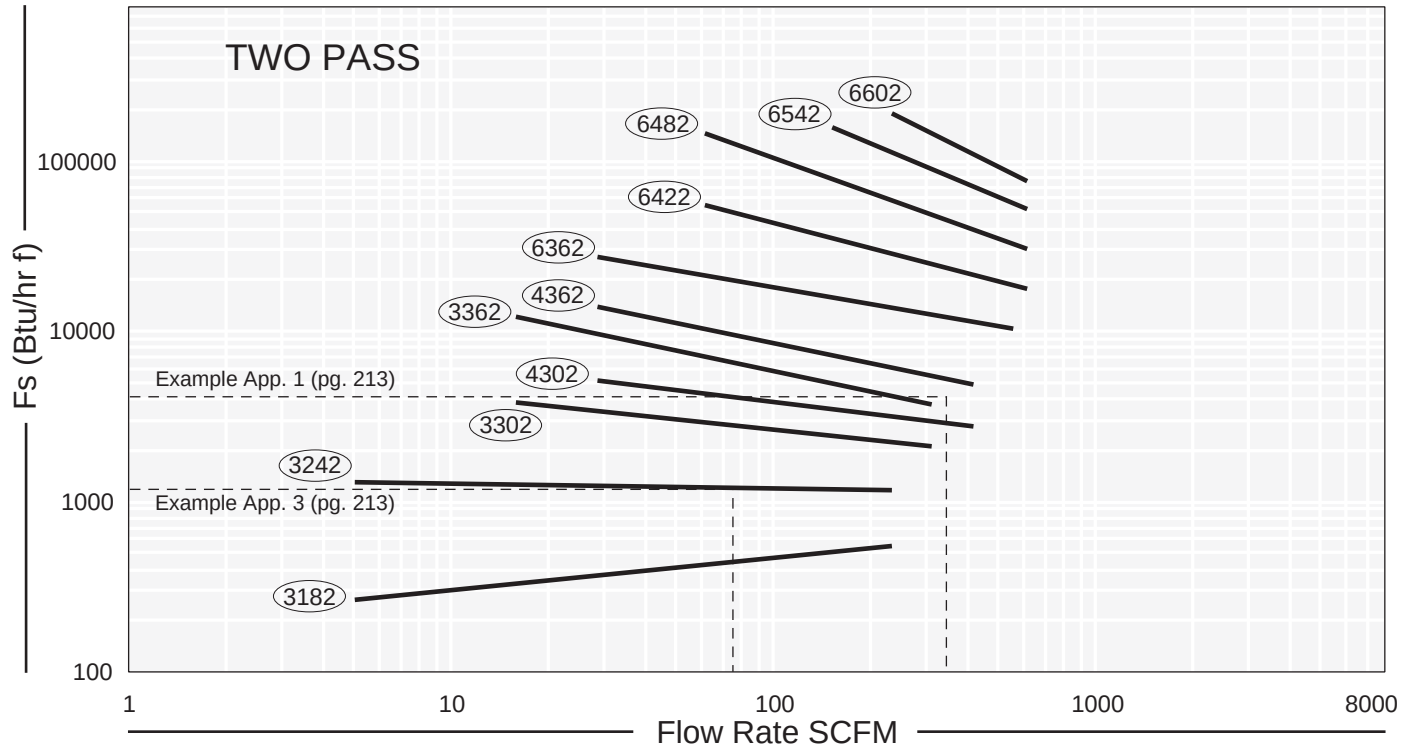
The Flow vs. Fs graph is calculated based upon SCFM units.

To convert volumetric Actual Cubic Feet per Minute (ACFM) into Standard Cubic Feet per Minute (SCFM) see page 213 application 3.

To select a model, locate the flow rate in SCFM located at the bottom of the graph. Proceed upward on the graph until the SCFM flow rate intersects with the calculated Fs. The curve closest, on or above the intersection point is the proper selection.

Using the one pass graph or two-pass graph depends upon pressure differential, flow, and performance requirements. The actual surface area for one or Two Pass units is the same. However, the airflow velocity in the tubes increases with the number of passes giving slightly higher pressure differentials and better cooling performance.





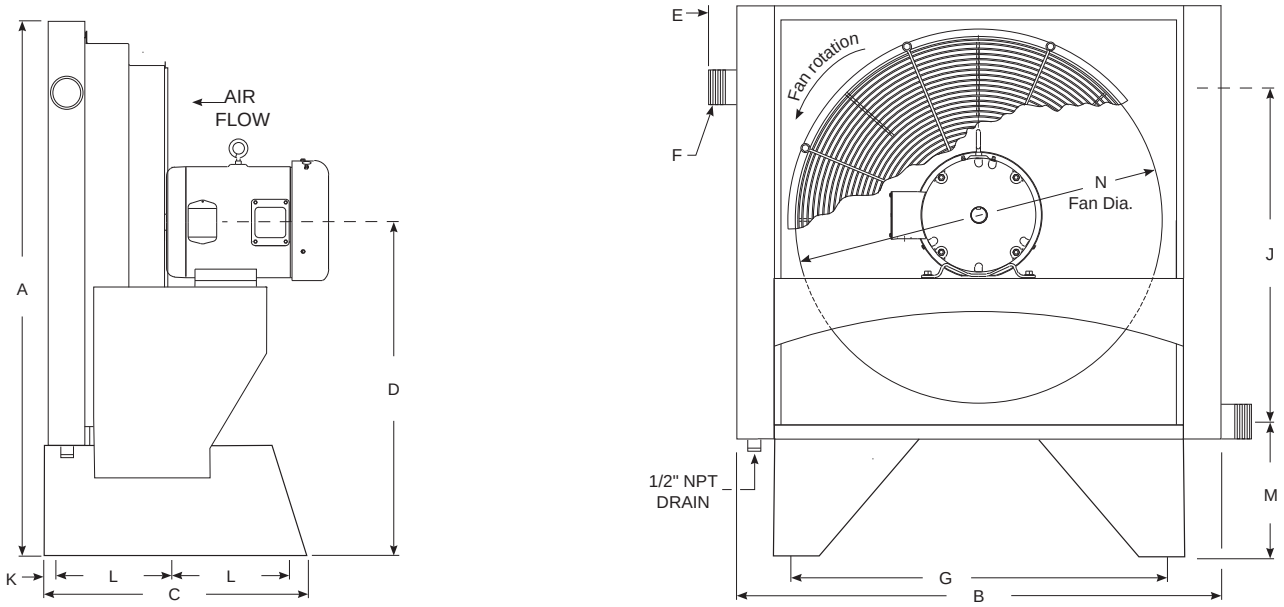
Example

Application #3 (p.5)

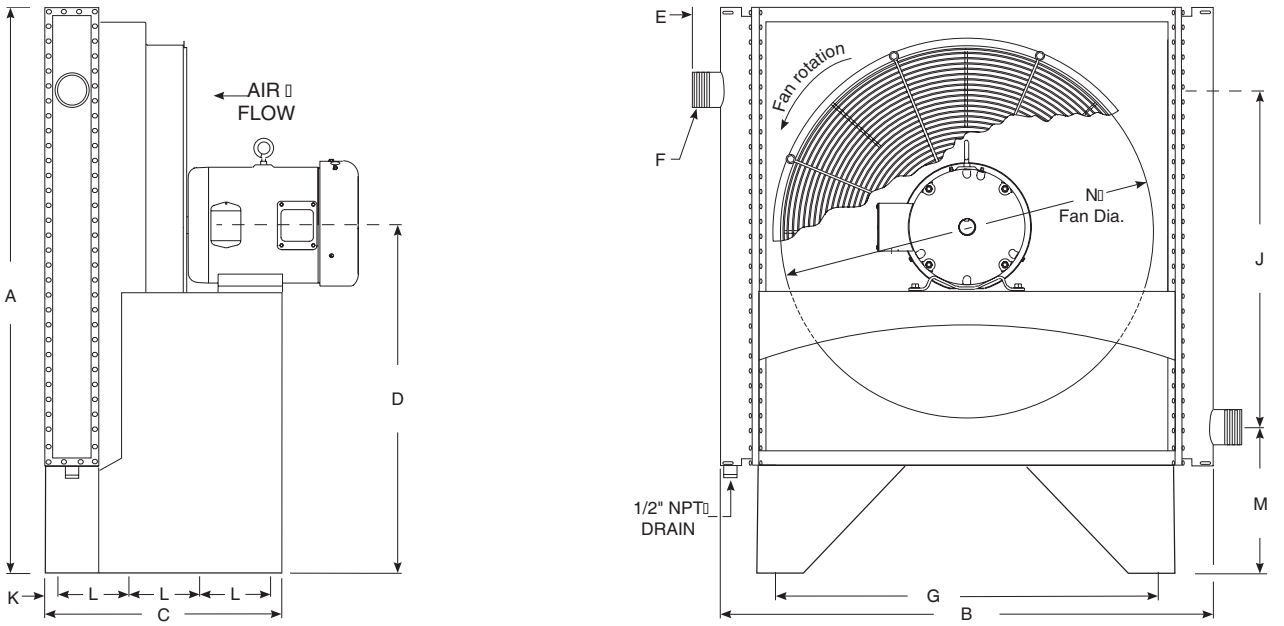
$$\mathbf{Fs} = \frac{\text{Heat Load (Btu/hr)}}{\text{Process exiting temperature } (T_2) \text{ from cooler} - \text{Ambient air entering the cooler } (T_a)}$$

SCFM = 76
ÐPSI required = 5" H2O
Model selection = ACA-6421-3
Fs = 1,288 Nozzle check (p.4) = 3.10 or 3"NPT

ACA Series *dimensions*



ACA - 3181 through ACA - 4361



ACA - 6301 through ACA - 6601

DIMENSIONS (inches)												
Model	A	B	C	D	E	F NPT	G	J	K	L	M	N
ACA - 3181	30.6	23.0	19.8	20.25	2.5	1.5	16.3	12.98	1.5	8.38	11.93	14.0
ACA - 3241	36.6	29.0	19.8	23.25	2.5	1.5	22.3	17.48	1.5	8.38	11.93	22.0
ACA - 3301	42.6	35.0	19.8	26.25	2.5	2.0	28.3	21.75	1.5	8.38	12.15	28.0
ACA - 4301	42.6	36.0	19.8	26.25	2.5	2.5	28.3	21.55	1.5	8.38	12.35	28.0
ACA - 6301	42.6	38.8	19.8	26.25	2.5	3.0	28.3	21.07	1.5	8.38	12.98	28.0
ACA - 3361	48.6	41.0	19.8	29.25	2.5	2.0	34.3	26.25	1.5	8.38	12.15	32.0
ACA - 4361	48.6	42.0	19.8	29.25	2.5	2.5	34.4	26.05	1.5	8.38	12.35	32.0
ACA - 6361	48.5	43.9	19.8	29.25	2.5	3.0	34.3	26.0	1.5	8.38	12.7	32.0
ACA - 6421	54.5	50.8	27.36	32.25	2.5	4.0	40.3	29.4	2.0	6.75	13.3	36.0
ACA - 6481	60.6	56.8	27.36	35.25	2.5	4.0	46.3	34.1	2.0	6.75	13.3	42.0
ACA - 6541	66.6	62.8	28.83	38.25	2.5	4.0	52.3	38.6	2.0	6.75	13.3	48.0
ACA - 6601	72.4	67.9	30.6	41.25	2.5	4.0	58.3	43.05	2.0	6.75	13.3	48.0

note: AIHTI reserves the right to make reasonable design changes without notice.

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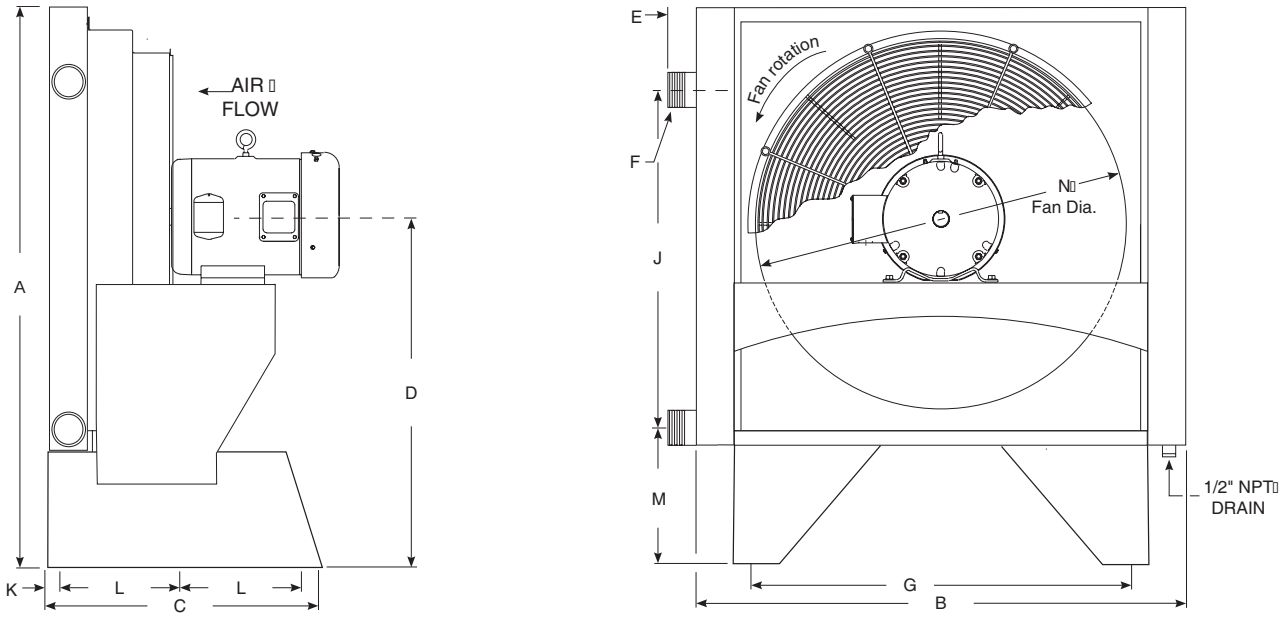
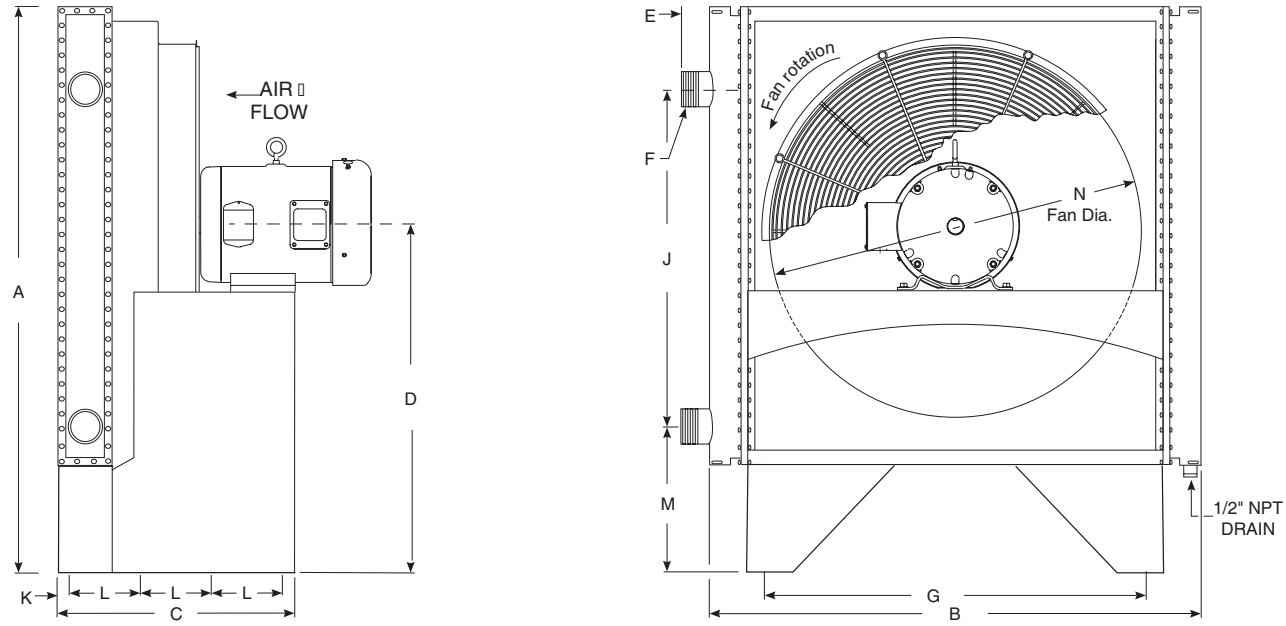


ACA - 3182 through ACA - 4362



ACA - 6302 through ACA - 6602

DIMENSIONS (inches)												
Model	A	B	C	D	E	F NPT	G	J	K	L	M	N
ACA - 3182	30.6	23.0	19.8	20.25	2.5	1.5	16.3	12.98	1.5	8.38	11.93	14.0
ACA - 3242	36.6	29.0	19.8	23.25	2.5	1.5	22.3	17.48	1.5	8.38	11.93	22.0
ACA - 3302	42.6	35.0	19.8	26.25	2.5	2.0	28.3	21.75	1.5	8.38	12.15	28.0
ACA - 4302	42.6	36.0	19.8	26.25	2.5	2.5	28.3	21.55	1.5	8.38	12.35	28.0
ACA - 6302	42.6	38.8	19.8	26.25	2.5	3.0	28.3	21.07	1.5	8.38	12.98	28.0
ACA - 3362	48.6	41.0	19.8	29.25	2.5	2.0	34.3	26.25	1.5	8.38	12.15	32.0
ACA - 4362	48.6	42.0	19.8	29.25	2.5	2.5	34.4	26.05	1.5	8.38	12.35	32.0
ACA - 6362	48.5	43.9	19.8	29.25	2.5	3.0	34.3	26.0	1.5	8.38	12.7	32.0
ACA - 6422	54.5	50.8	27.36	32.25	2.5	4.0	40.3	29.4	2.0	6.75	13.3	36.0
ACA - 6482	60.6	56.8	27.36	35.25	2.5	4.0	46.3	34.1	2.0	6.75	13.3	42.0
ACA - 6542	66.6	62.8	28.83	38.25	2.5	4.0	52.3	38.6	2.0	6.75	13.3	48.0
ACA - 6602	72.4	67.9	30.6	41.25	2.5	4.0	58.3	43.05	2.0	6.75	13.3	48.0

note: AIHTI reserves the right to make reasonable design changes without notice.

ACA Series *motor data*

ELECTRIC MOTOR DATA

Model	Horse Power	Phase	Hz	Volts	RPM	NEMA Frame	Enclosure Type	Full Load Amperes	Service Factor	Thermal Overload
ACA-3181/2	.25	1	60	115/230	1800	48	TEFC	2.6/1.3	1.15	NO
ACA-3181/2	.25	3	60	230/460	1800	48	TEFC	1.4/.07	1.15	NO
ACA-3181/2	.33	3	60	575	1800	56	TEFC	0.6	1.15	NO
ACA-3241/2	.25	1	60	115/230	1200	56	TEFC	5.2/2.6	1.15	NO
ACA-3241/2	.25	3	60	230/460	1200	56	TEFC	1.4/0.7	1.15	NO
ACA-3241/2	.50	3	60	575	1200	56	TEFC	2.0/1.0	1.15	NO
ACA-3301/2	.50	1	60	115/230	1200	56	TEFC	7.8/3.9	1.15	NO
ACA-3301/2	.50	3	60	230/460	1200	56	TEFC	2.4/1.2	1.15	NO
ACA-3301/2	.50	3	60	575	1200	56	TEFC	1.0	1.15	NO
ACA-4301/2	.50	1	60	115/230	1200	56	TEFC	7.8/3.9	1.15	NO
ACA-4301/2	.50	3	60	230/460	1200	56	TEFC	2.4/1.2	1.15	NO
ACA-4301/2	.50	3	60	575	1200	56	TEFC	1.0	1.15	NO
ACA-6301/2	1.0	3	60	230/460	1200	56	TEFC	3.6/1.8	1.15	NO
ACA-6301/2	1.0	3	60	575	1200	56	TEFC	1.5	1.15	NO
ACA-3361/2	1.0	3	60	230/460	1200	56	TEFC	3.6/1.8	1.15	NO
ACA-3361/2	1.0	3	60	575	1200	56	TEFC	1.5	1.15	NO
ACA-4361/2	1.0	3	60	230/460	1200	56	TEFC	3.6/1.8	1.15	NO
ACA-4361/2	1.0	3	60	575	1200	56	TEFC	1.5	1.15	NO
ACA-6361/2	3.0	3	60	230/460	1800	182T	TEFC	8.4/4.2	1.15	NO
ACA-6361/2	3.0	3	60	575	1800	182T	TEFC	3.05	1.15	NO
ACA-6421/2	5.0	3	60	230/460	1200	213T	TEFC	13.66/6.83	1.15	NO
ACA-6421/2	5.0	3	60	575	1200	213T	TEFC	5.39	1.15	NO
ACA-6481/2	5.0	3	60	230/460	1200	213T	TEFC	13.66/6.83	1.15	NO
ACA-6481/2	5.0	3	60	575	1200	213T	TEFC	5.39	1.15	NO
ACA-6541/2	7.5	3	60	230/460	1200	254T	TEFC	19.96/9.98	1.15	NO
ACA-6541/2	7.5	3	60	575	1200	254T	TEFC	7.99	1.15	NO
ACA-6601/2	10.0	3	60	230/460	1200	256T	TEFC	27.6/13.8	1.15	NO
ACA-6601/2	10.0	3	60	575	1200	256T	TEFC	10.6	1.15	NO

NOTE: All of the ACA Series are available in 50hz upon request as a special

ELECTRIC MOTOR NOTES:

1) All motors are NEMA, high efficiency

2) Motor electrical ratings are an approximate guide and may vary between motor manufacturers. Consult ratings on motor data plate prior to installation and operation.

3) Explosion proof, high temperature, severe duty, chemical, IEC, Canadian Standards Association, and Underwriters Laboratory recognized motors are available upon request.

4) American Industrial reserves the right to enact changes to motor brand, type and ratings regarding horsepower, RPM,FLA,and service factor for standard products without notice. All specific requirements will be honored without change.

5) Fan rotation is clockwise when facing the motor shaft.

6) The above motors contain factory lubricated shielded ball bearings (no additional lubrication is required).

7) **Abbreviation Index**

TEFC.....Totally Enclosed, Fan Cooled

EXP.....Explosion Proof

NOTE: Basic electric drive units are supplied with one of the corresponding above listed motors.

CLASS I,DIV.1, GROUP D or CLASS II,DIV.2, GROUP F & G EXPLOSION PROOF MOTOR DATA

Model	Horse Power	Phase	Hz	Volts	RPM	NEMA Frame	Enclosure Type	Full Load Amperes	Service Factor	Thermal Overload
ACA-3181/2-1	.25	1	60	115/230	1800	48	EXP	5.0/2.5	1.0	YES
ACA-3181/2-3	.25	3	60	230/460	1800	48	EXP	0.7/1.4	1.0	YES
ACA-3241/2-1	.33	1	60	115/230	1200	56	EXP	6.8/3.4	1.0	YES
ACA-3241/2-3	.33	3	60	230/460	1200	56	EXP	0.8/1.6	1.0	YES
ACA-3301/2-1	.75	1	60	115/230	1200	56	EXP	10.8/5.4	1.0	YES
ACA-3301/2-3	.75	3	60	230/460	1200	56	EXP	2.8/1.4	1.0	YES
ACA-4301/2-1	.75	1	60	115/230	1200	56	EXP	10.8/5.4	1.0	YES
ACA-4301/2-3	.75	3	60	230/460	1200	56	EXP	2.8/1.4	1.0	YES
ACA-6301/2-3	1.0	3	60	230/460	1200	56	EXP	3.8/1.9	1.0	YES
ACA-3361/2-3	1.0	3	60	230/460	1200	56	EXP	3.8/1.9	1.0	YES
ACA-4361/2-3	1.0	3	60	230/460	1200	56	EXP	3.8/1.9	1.0	YES
ACA-6361/2-3	3.0	3	60	230/460	1800	182T	EXP	7.82/3.91	1.0	YES
ACA-6421/2-3	5.0	3	60	230/460	1200	215T	EXP	13.66/6.83	1.0	YES
ACA-6481/2-3	5.0	3	60	230/460	1200	215T	EXP	13.66/6.83	1.0	YES
ACA-6541/2-3	7.5	3	60	230/460	1200	254T	EXP	19.46/9.73	1.0	YES
ACA-6601/2-3	10.0	3	60	230/460	1200	256T	EXP	26.6/13.3	1.0	YES

NOTE: All of our ACA Series are available in 50hz upon request as a special

COMMON DATA

Model	Air Flow		Sound Level dB(A) @ 7ft	Weight		Serviceable Core
	CFM	m^3/s		w/ motor	w/o motor	
ACA-3181/2	1550	0.731	72	131	111	NO
ACA-3241/2	2900	1.36	76	154	134	NO
ACA-3301/2	4450	2.10	76	184	160	NO
ACA-4301/2	4450	2.10	76	211	187	NO
ACA-6301/2	4450	2.10	76	343	305	YES
ACA-3361/2	6350	2.99	79	243	205	NO
ACA-4361/2	6350	2.99	79	289	251	NO
ACA-6361/2	10500	4.95	91	402	342	YES
ACA-6421/2	14300	6.75	87	636	443	YES
ACA-6481/2	18700	8.82	88	753	560	YES
ACA-6541/2	23350	11.02	91	938	691	YES
ACA-6601/2	29300	13.83	91	1104	835	YES

NOTES:

TEFC = Totally Enclosed, Fan Cooled

To estimate the sound level at distances other than 7 feet (2.1 meters) from the cooler, add 6 db for each halving of distance, or substract 6 db for each doubling of the distance.

Example:
The Sound Level of the ACA-3181/2 is 72 dB at 7ft. At 3.5ft (7ft x 0.5 = 3.5ft) the sound level is 66 dB (72dB - 6dB = 66dB). At 14ft (7ft x 2 = 14ft) the sound level is 78dB (72dB + 6dB = 78dB).

Pressure Drop Graphs (see page 237)

Each graph represents a specific pressure drop at differing flow rates and inlet pressures. The four graphs for each model series size represents the more popular milestone pressure differentials commonly applied.

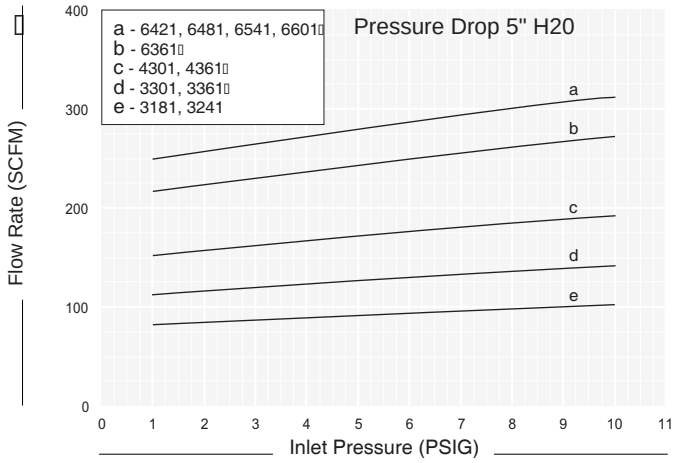
To use the graphs for selection purposes follw the steps below.

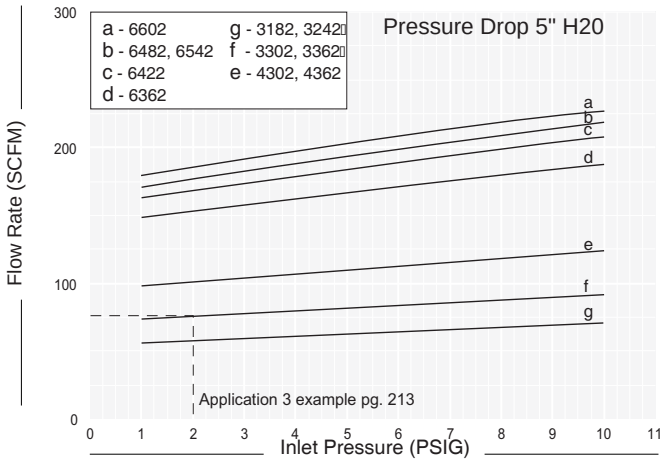
1) Locate the operating pressure at the bottom of the desired pressure drop chart.
2) Locate the flow rate in SCFM at the left end of the chart.
3) Follow the "Pressure" line vertically and the "Flow" line horizontally until they cross, note the location.
4) The curve on, or closest above will be exact or less pressure drop than requested and suitable for the application.
5) There may be several units shown above the intersection point, all of which will produce less than the desired pressure drop at the required flow.

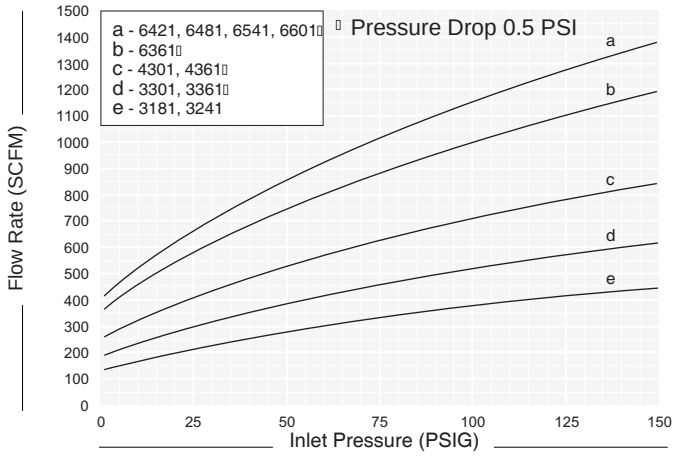
Example: Application 3 Low Pressure Blower

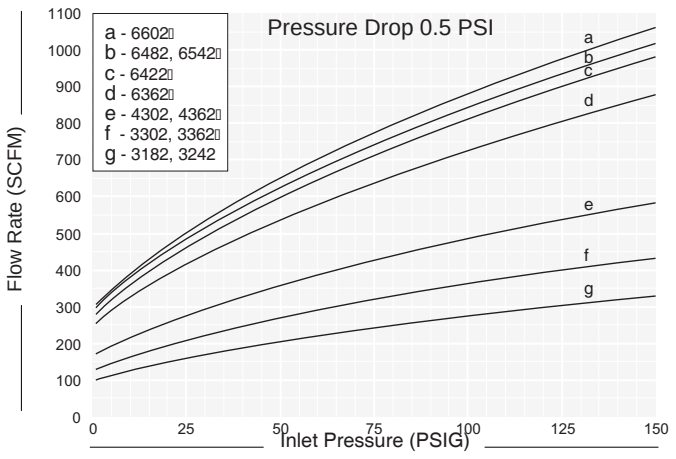
Flow = 76 SCFM • Operating pressure = 2 PSIG • Initial selection from graph page 215 = ACA-3302
Desired pressure drop = 5" H2O or less. (USE the "Pressure Drop 5" H20" curves page 237)
From the pressure drop graph, page 237. Acceptable choice - ACA-3302 is on the line, ACA-3242 is well below the line. The ACA-3302 meets the pressure drop requirement, but exceeds the capacity requirement. However, even though the ACA-3242 exceeds 5" of water pressure drop, other considerations should be made prior to selection such as unit physical size, cost, availability, and port size.

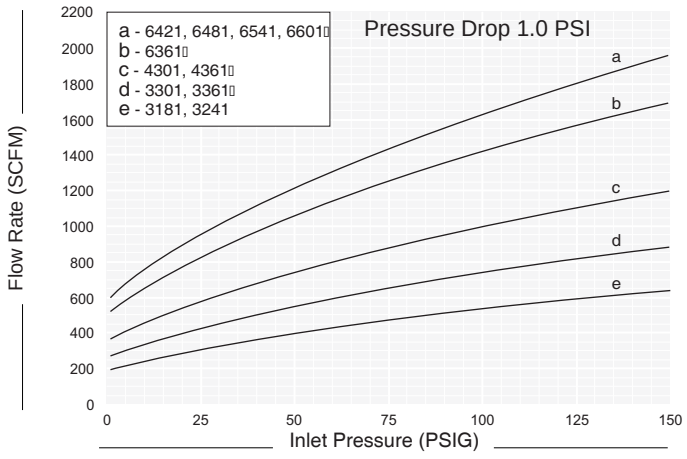
ACA Series *pressure drop graphs*

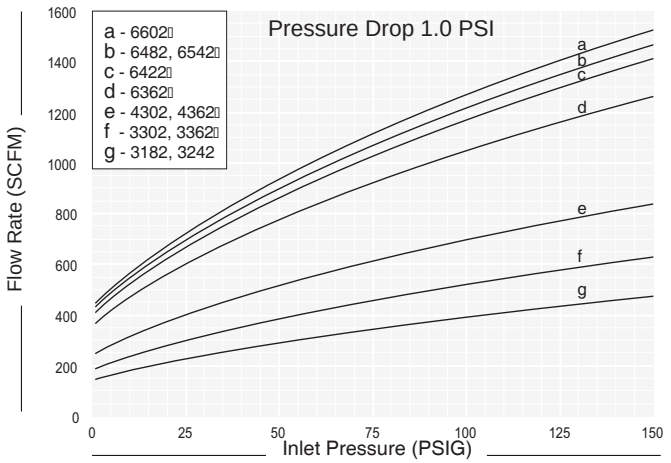


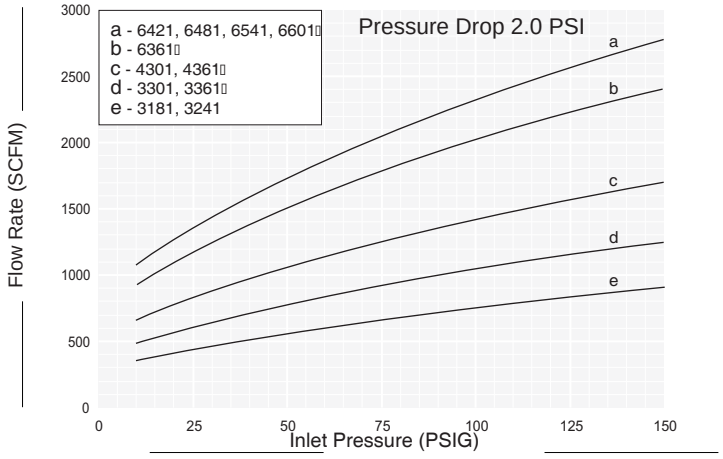


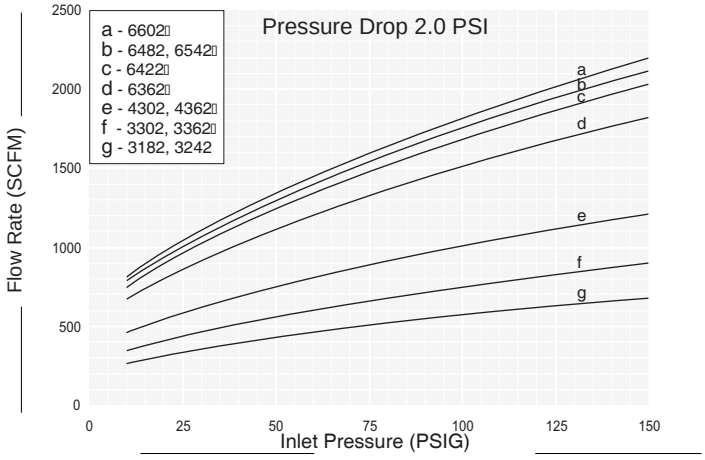












note: AIHTI reserves the right to make reasonable design changes without notice.

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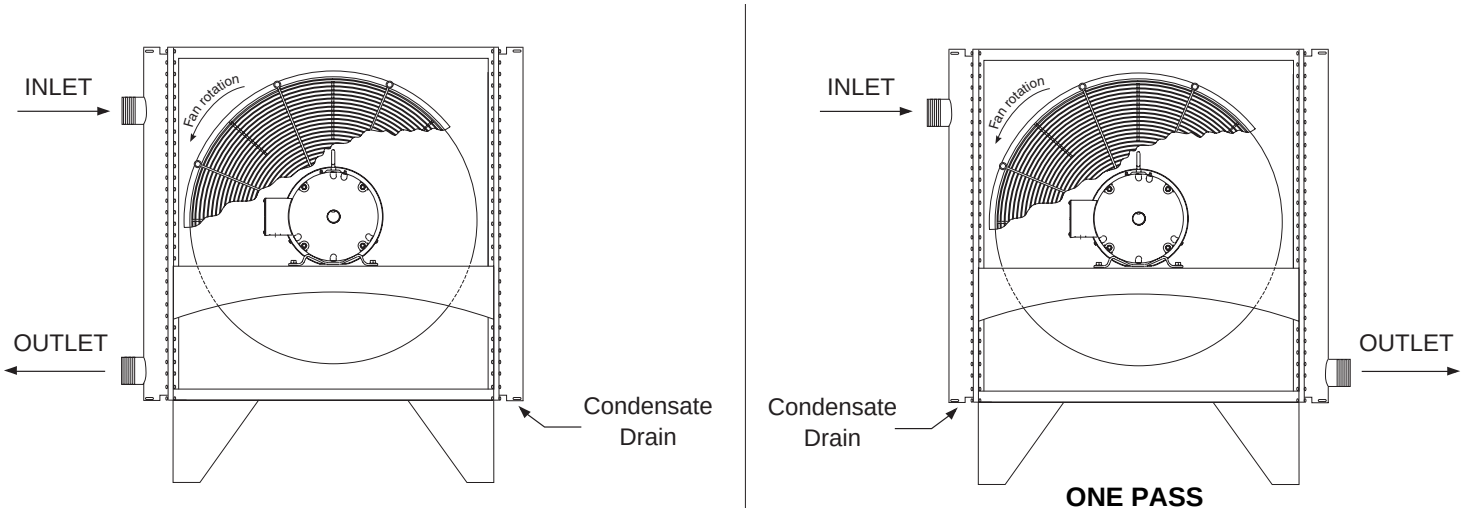
PIPING HOOK UP



Receiving:

a) Inspect unit for any shipping damage before uncrating. Indicate all damages to the trucking firms' delivery person and mark it on the receiving bill before accepting the freight. Make sure that the core and fan are not damaged. Rotate the fan blade to make sure that it moves freely. The published weight information located in this brochure is approximate. True shipment weights are determined at the time of shipping and may vary. Approximate weight information published herein is for engineering approximation purposes and should not be used for exact shipping weight. *Since the warranty is based upon the unit date code located on the model identification tag, removal or manipulation of the identification tag will void the manufacturers warranty.*

b) When handling the ACA heat exchanger, special care should be taken to avoid damage to the core and fan. All units are shipped with wood skids for easy forklift handling

c) Standard Enamel Coating: American Industrial provides its standard products with a normal base coat of oil base air cure enamel paint. The enamel paint is applied as a temporary protective and esthetic coating prior to shipment. While the standard enamel coating is durable, American Industrial does not warrantee it as a long-term finish coating. It is strongly suggested that a more durable final coating be applied after installation or prior to long-term storage in a corrosive environment to cover any accidental scratches, enhance esthetics, and further prevent corrosion. It is the responsibility of the customer to provide regular maintenance against chips, scratches, etc... and regular touch up maintenance must be provided for long-term benefits and corrosion prevention.

Installation:

a) American Industrial recommends that the equipment supplied should be installed by qualified personal who have solid understanding of system design, pressure and temperature ratings, and piping assembly. Verify the service conditions of the system prior to applying any ACA series cooler. If the system pressure or temperature does not fall within the parameters on ACA rating tag located on the heat exchanger, contact our factory prior to installation or operation.

b) In order for the heat exchanger to properly function, installation should be made with minimum airflow obstruction distance of not less than twenty (20) inches on both fan intake and exiting side of the heat exchanger.

c) Process piping should be as indicated above with the process flow entering into the upper port and exiting out the lower port (see illustration). This configuration will allow for condensate moisture to drain completely from the equipment. It is recommended that an air separator or automatic drip leg be applied to the outlet side of the heat exchanger to trap any moisture that develops.

d) Flow line sizes should be sized to handle the appropriate flow to meet the system pressure drop requirements. If the nozzle size of the heat exchanger is smaller than the process line size an increased pressure differential at the heat exchanger may occur.

e) ACA series coolers are produced with both brazed ACA-3181 through ACA-4362, and serviceable core® ACA-6301 through ACA-6602 style coils. A brazed construction coil does not allow internal tube access. A serviceable core® will allow full accessibility to the internal tubes for cleaning and maintenance. ACA series coolers are rated for 150 PSIG working pressure, and a 400ºf working temperature.

f) Special Coatings: American Industrial offers as customer options, Air-Dry Epoxy, and Heresite (Air-Dry Phenolic) coatings at additional cost. American Industrial offers special coatings upon request, however American Industrial does not warrantee coatings to be a permanent solution for any equipment against corrosion. It is the responsibility of the customer to provide regular maintenance against chips, scratches, etc... and regular touch up maintenance must be provided for long-term benefits and corrosion prevention.

g) Electric motors should be connected only to supply source of the same characteristics as indicated on the electric motor information plate. Prior to starting, verify that the motor and fan spin freely without obstruction. Check carefully that the fan turns in the correct rotation direction normally counter clockwise from the motor side (fan direction arrow). Failure to operate the fan in the proper direction could reduce performance or cause serious damage to the heat exchanger or other components. Fan blades should be rechecked for tightness after the first 100 hours of operation.

Maintenance

Regular maintenance intervals based upon the surrounding and operational conditions should be maintained to verify equipment performance and to prevent premature component failure. Since some of the components such as, motors, fans, load adapters, etc... are not manufactured by American Industrial maintenance requirements provided by the manufacture must be followed.

a) Inspect the entire heat exchanger and motor/fan assembly for loosened bolts, loose connections, broken components, rust spots, corrosion, fin/coil clogging, or external leakage. Make immediate repairs to all affected areas prior to restarting and operating the heat exchanger or its components.

b) Heat exchangers operating in oily or dusty environments will often need to have the coil cooling fins cleaned. Oily or clogged fins should be cleaned by carefully brushing the fins and tubes with water or a non-aggressive degreasing agent mixture (Note: Cleaning agents that are not compatible with copper, brass, aluminum, steel or stainless steel should not be used). A compressed air or a water stream can be used to dislodge dirt and clean the coil further. Any external dirt or oil on the electric motor and fan assembly should be removed. Caution: Be sure to disconnect the electric motor from its power source prior to doing any maintenance.

c) In most cases it is not necessary to internally flush the coil. In circumstances where the coil has become plugged or has a substantial buildup of material, flushing the coil with water or a solvent may be done. Flushing solvents should be non-aggressive suitable for the materials of construction. Serviceable Core® models can be disassembled and inspected or cleaned if required.

d) Most low horsepower electric motors do not require any additional lubrication. However, larger motors must be lubricated with good quality grease as specified by the manufacture at least once every 6-9 months or as directed by the manufacture. T.E.F.C. air ventilation slots should be inspected and cleaned regularly to prevent clogging and starving the motor of cooling air. To maintain the electric motor properly see the manufactures requirements and specifications.

e) Fan blades should be cleaned and inspected for tightness during the regular maintenance schedule when handling a fan blade care must be given to avoid bending or striking any of the blades. Fan blades are factory balanced and will not operate properly if damaged or unbalanced. Damaged fan blades can cause excessive vibration and severe damage to the heat exchanger or drive motor.

Replace any damaged fan with an American industrial suggested replacement.

f) ACA heat exchanger cabinets are constructed using 7ga. through 18ga. steel that may be bent back into position if damaged. Parts that are not repairable can be purchased through American Industrial.

g) Coil fins that become flattened can be combed back into position. This process may require removal of the coil from the cabinet.

h) It is not advisable to attempt repairs to brazed joints of a brazed construction coil unless it will be done by an expert in silver solder brazing. Brazed coils are heated uniformly during the original manufacturing process to prevent weak zones from occurring. Uncontrolled reheating of the coil may result in weakening of the tube joints surrounding the repair area. In many instances brazed units that are repaired will not hold up as well to the rigors of the system as will a new coil. American Industrial will not warranty or be responsible for any repairs done by unauthorized sources. Manipulation in any way other than normal application will void the manufactures warranty.

i) Units containing a Serviceable Core® have bolted manifold covers that can be removed for cleaning or repair purposes.

Servicing Sequence

American Industrial has gone to great lengths to provide components that are repairable. If the ACA unit requires internal cleaning or attention the following steps will explain what must be done to access the internal tubes. Be sure to order gasket kits or repair parts prior to removal and disassembly to minimize down time.

a) To clean the internal tubes first remove all connection pipes from the unit.

b) Be sure the unit is drained of all water etc...

c) Place the ACA unit in an area that it can be accessed from all sides.

d) Remove the manifold cover bolts and hardware and place them into a secure place.

e) The manifold covers are tightly compressed and may need some prying to separate them from the gasket, physically remove the cover assemblies from both sides.

f) The tubes are now accessible for cleaning. We suggest a mild water-soluble degreaser be used with a brush. Tubing I.D. is .325 a plastic bristle brush on a rod will work best for cleaning the tubes. Steel brushes should be avoided since the steel is harder than the copper tubing and may heavily score the tubes if used.

g) If there are any leaking tubes you may plug them be forcing a soft metal plug into the hole and tapping it tight. You may in some cases weld the leaking tube shut however, care should be taken since excessive heat may cause surrounding tube joints to loosen and leak.

American Industrial Heat Transfer Inc.
Manufacturer of Quality Heat Exchangers

website : www.aihti.com
general email : sales@aihti.com
technical email : engineering@aihti.com

Air Cooled Liquid Cooler Application Request:

For ACL Series

Email form to: sales@aihti.com or engineering@aihti.com or fax to 434-757-1810

Contact Name _____ Telephone _____ Date _____

Company Name _____ Email _____

Address: _____ Fax _____

_____

Hot Side

Fluid Type _____

If available:
Density _____ lb/ft3
Viscosity _____ cP
Thermal Conductivity _____ Btu/hr.ft.°F
Specific Heat _____ Btu/lb.°F

1. Flow Rate _____
2. Temperature In _____
3. Desired Temperature Out _____
4. Heat Load _____

Cold Side

Ambient Air _____

Altitude _____

1. Operating Pressure _____
2. Allowable Pressure Drop _____

ASME Code and Certified Yes ☐ No ☐

To properly size the heat exchanger we need 3 of the 4 perameters on the Hot Side.

Cabinet Material:
Standard : Steel ☐
Options: Galvanized Steel ☐
Stainless Steel ☐

Tubing Material:
Standard : Copper ☐
Options: Stainless Steel ☐
90/10 Copper Nickel ☐

Motor
60Hz: 230/460 Volt, 3 Phase ☐
115/230 Volt, 1 Phase ☐
575 Volt, 3 Phase ☐
50Hz 230/400 Volt, 3 Phase ☐
110/220 Volt, 1 Phase ☐
Hydraulic Motor ☐

Coating
Standard Enameled Gray Paint ☐
Options: Epoxy Paint ☐

Fins
Standared Aluminum ☐
Options: Copper ☐
Optional Coating: Heresite ☐

Comment: _____

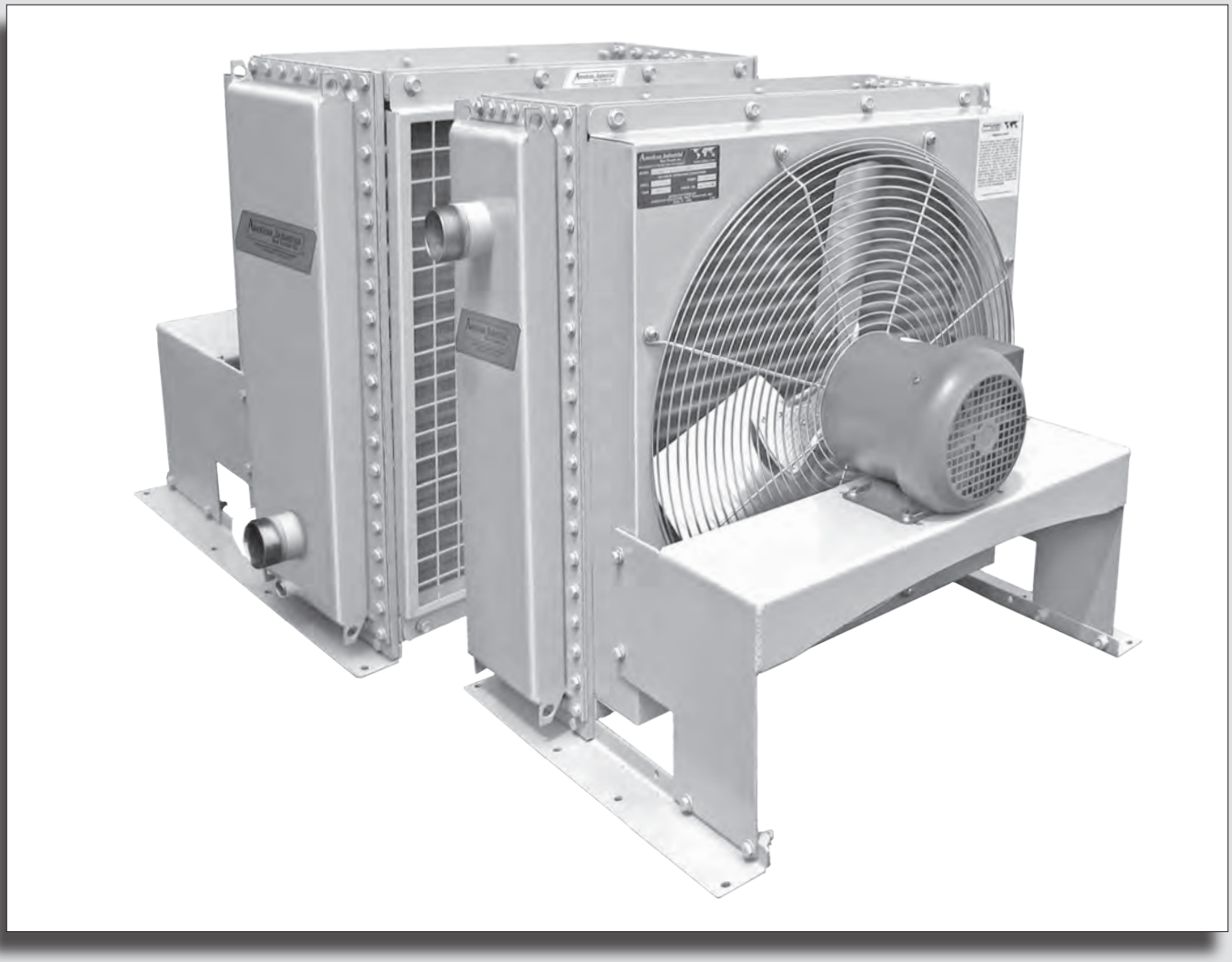
_____

American Industrial
Heat Transfer Inc.

Manufacturer of Quality Heat Exchangers

www.aihti.com

ACL SERIES



AIR COOLED

LIQUID COOLERS

- Severe duty construction with OSHA guard.
- Serviceable Core®.
- Thermal capacity to 1,400 hp (1,043 Kw).
- Operating temperature of 300°F at 300 PSI.
- Electric, hydraulic drive.
- Optional: built-in bypass valve.
- Can be customized to fit any applications.
- Computer generated data sheet available for any application
- Field changeable drive from electric to hydraulic.

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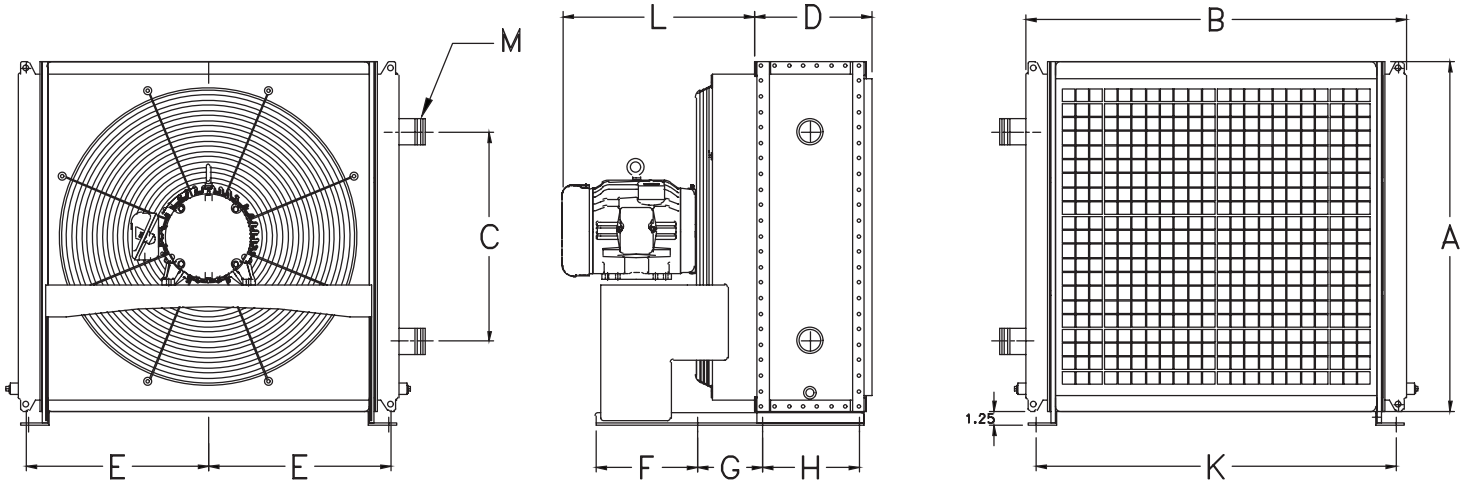
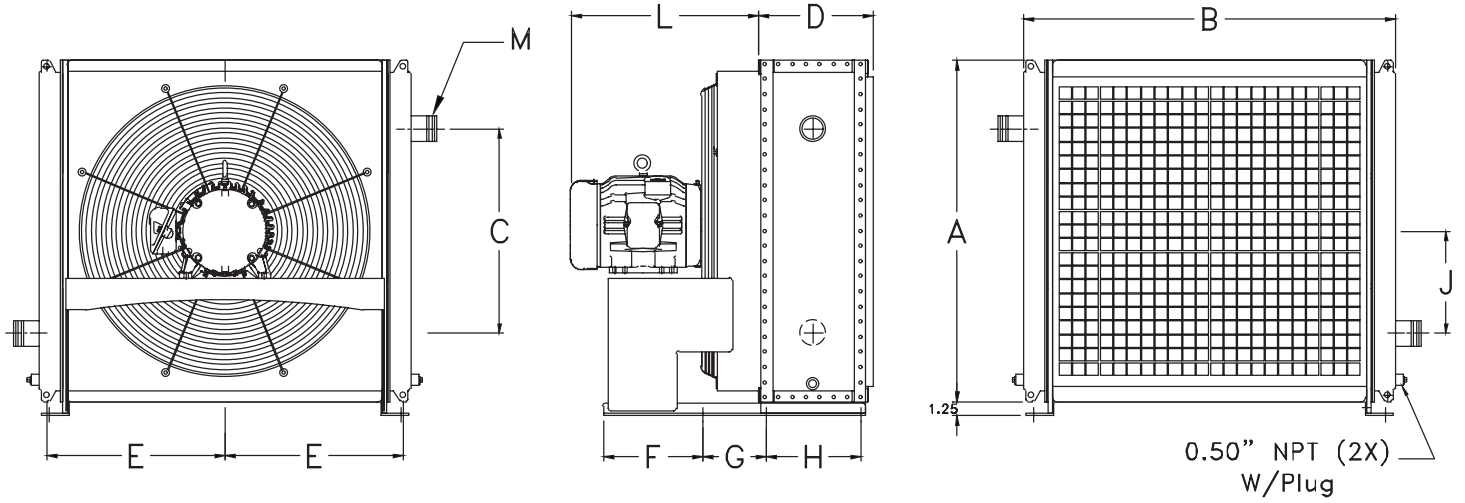


ACL - TWO Pass



ACL - SINGLE / THREE PASS

DIMENSIONS (inches)												
Model	A	B	C	D	E	F	G	H	J	K	L	M NPT
ACL - 1220	22.63	25.42	13.25	10.95	11.75	9.50	4.00	9.00	6.00	23.50	17.30	1.50
ACL - 1225	27.63	30.42	17.00	10.95	14.25	9.50	6.00	9.00	9.75	28.50	17.97	1.50
ACL - 1230	33.63	35.42	19.50	10.95	16.75	9.50	6.00	9.00	9.75	33.50	17.94	1.50
ACL - 1235	37.63	40.42	22.00	10.95	19.25	9.50	6.00	9.00	9.75	38.50	18.50	2.00
ACL - 1240	42.63	45.42	24.50	10.95	21.75	9.50	6.00	9.00	9.75	43.50	18.50	2.00
ACL - 1245	47.63	50.42	27.00	10.95	24.25	9.50	6.00	9.00	9.75	48.50	18.50	2.00
ACL - 1250	52.63	55.42	29.50	10.95	26.75	9.50	6.00	9.00	9.75	53.50	18.50	2.00
ACL - 1255	57.63	60.42	32.00	10.95	29.25	9.50	6.00	9.00	9.75	58.50	18.50	2.00

website : www.aihti.com
general email : sales@aihti.com
technical email : engineering@aihti.com

ACL Notes:

Notes: 1. The ACL Series are designed with heavy duty construction to remove an extreme amount of heat in a compact design for indoor and outdoor application

2. Servicable core, cover can be easily removed to have access to the tubes for service if required

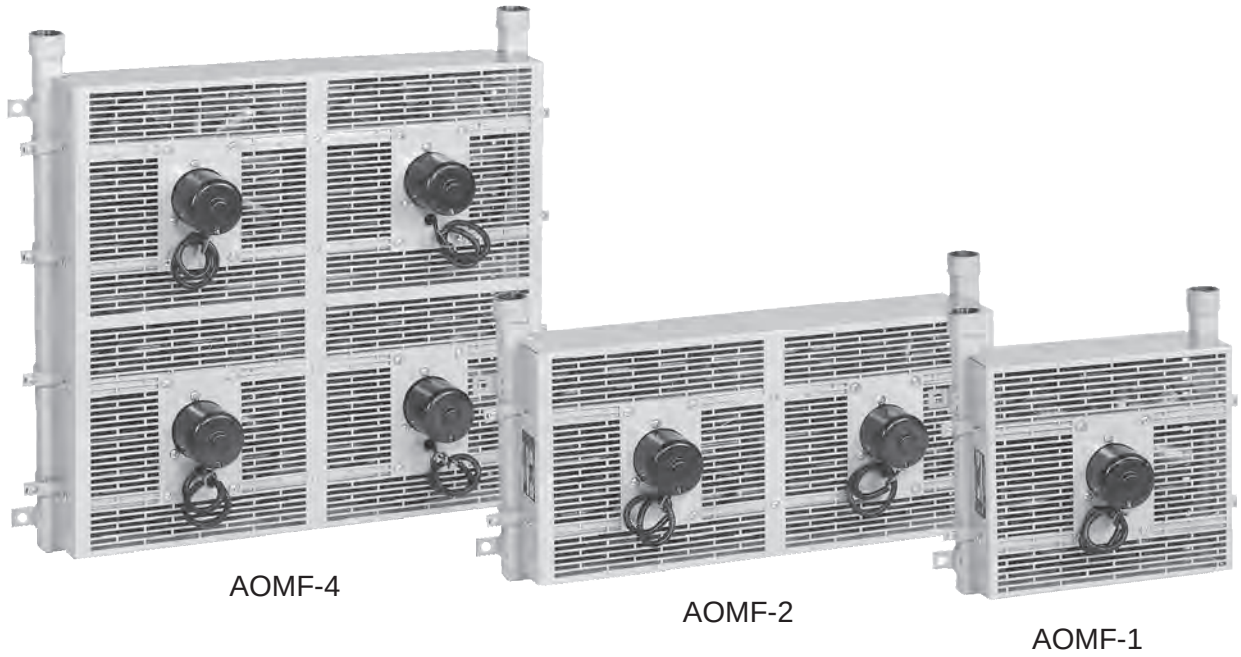
3. Will provide a detailed drawing and motor data based on the required application

4. Units are available in a Single Pass, Two Pass or three pass based on the required application

5. They are available in male and female, code 61 four bolt flange and ansi flange

6. Can be built in ASME code and certified

AOMF SERIES



MOBILE AIR COOLED

LIQUID COOLERS

12 volt & 24 volt DC motor

- Operating temperature of 300° F and pressure of 300PSI.
- Standard NPT or SAE connections.
- Cools: Fluid power systems, lubrication systems, hydraulic presses,gear drives, torque convertors, machine tools, etc...

AOMF Series *selection*

SIZING
To properly size a DC fan drive air-cooled oil cooler for mobile equipment, you should first determine some basic parameters associated with the system.

HEAT LOAD
In many instances the heat load must be determined by using a "total potential" method. This total potential or horse power method is the most common method, and is the simplest way to determine basic heat rejection requirements for mobile hydraulic systems. The total potential us equal to the maximum operating flow and pressure that are generated by the system under full load. To determine the total potential (HP) use the following formula.

HP = [System Pressure (PSI) x System flow (GPM)] / 1714

Example:
HP = (3000 PSI x 40 GPM) / 1714 = 70 HP or the total input potential

To determine the system heat load in BTU / HR we must use a percentage *(v)* of the system potential HP. The factor *(v)* can be calculated by adding up the actual inefficiencies of a system; however, for most applications a *(v)* value of 25% - 30% can be used.

Example:
20 HP x .25 = 5 HP heat

To convert the horsepower of heat into BTU/HR use the formula below:
HP x 2542 = BTU/HR

Example:
5 HP x 2545 = 12,725 BTU/HR

Applying into a return line
For most open loop systems with a vane or gear type fixed delivery pumps. To calculate the Fs value required when applying the air/oil cooler into a return line use the formula below.

$$Fs = \frac{\text{BTU/ HR x Cv}}{T - t_{ambient}}$$

T = Desired system oil temperature leaving the cooler °F
$t_{ambient}$ = Ambient air temperature entering the cooler °F
Cv = Correction factor for oil viscosity. Example: ISO68 oil @ 150°F = 1.13 *(see chart)*

APPLYING INTO A CASE DRAIN LINE
In circumstances where the system is a closed loop or when return line flow is not available, the case drain flow can be utilized to help cool the system However, in many instances, the case drain flow alone will not be enough to reject all of the heat generated by the system. Case drain lines should not be treated as a normal return lines since the pressure drop allowable usually can vary from 12 - 10 PSI max. Check with your pump manufacturer for the appropriate pressure drop tolerance before applying any cooler. To size the system for case flow or case flow plus any additional flushing loops, please use the following method.

Formula

T = System temperature entering

Tc_{exit} = { T - [Q / (case flow gpm x 210)]}

Example

Tc_{exit} = { 150 - [12,725 / (8 x 210)]} = 142.4

Tc_{exit} = The corrected temperature of the oil exiting the cooler.

$$Fs = \frac{Q \times Cv}{Tc_{exit} - t_{ambient}} \qquad \frac{12{,}725 \times 1.13}{142.4\text{-}100} = 300\ Fs$$

SELECTION
To select a model, locate the flow rate (GPM) at the bottom of the flow vs Fs graph. Proceed upward until the GPM intersects with the calculated Fs. The curve closest above the intersection point will meet these conditions.
Examples:

Return Line	Case Line
Fs = 318	Fs = 300
GPM = 10 "return line flow"	GPM = 8
Model = AOMF - 2	Model = AOMF - 2

PRESSURE DROP
Determine the oil pressure drop from the curves as indicated. For viscosities other than 50 ssu, multiply the actual indicated pressure drop (psi) for your GPM by the value in the pressure differential curve for your viscosity value.

Examples:	GPM = 10	GPM = 8
Indicated pressure drop	2.9PSI	1.9 PSI
Cp correction factor for *ISO 68 oil @ 150°F*	3.72	2.47

Average Liquid Temperature	Cv VISCOSITY CORRECTION FACTORS																
	SAE 5	SAE 10	SAE 20	SAE 30	SAE 40	ISO 22	ISO 32	ISO 46	ISO 68	ISO 100	ISO 150	ISO 220	ISO 320	MIL-L-7808	POLYGLYCOL	PHOSPHATE ESTER	50% ETHYLENE GLYCOL & WATER
100	1.11	1.15	1.25	1.38	1.45	1.08	1.14	1.18	1.26	1.37	1.43	1.56	1.84	1.19	0.92	0.83	0.85
110	1.09	1.12	1.20	1.32	1.40	1.06	1.13	1.16	1.25	1.31	1.39	1.48	1.67	1.14	0.89	0.80	0.84
120	1.06	1.10	1.17	1.27	1.35	1.04	1.11	1.14	1.20	1.27	1.35	1.40	1.53	1.09	0.88	0.79	0.84
130	1.04	1.08	1.13	1.24	1.29	1.03	1.09	1.13	1.17	1.24	1.30	1.34	1.44	1.05	0.85	0.77	0.83
140	1.03	1.05	1.11	1.19	1.25	1.02	1.08	1.10	1.16	1.20	1.26	1.30	1.39	1.03	0.84	0.76	0.82
150	1.01	1.04	1.09	1.16	1.22	1.02	1.06	1.09	1.13	1.17	1.22	1.27	1.33	1.01	0.83	0.74	0.82
200	0.98	0.99	1.01	1.04	1.07	0.98	0.99	1.00	1.01	1.02	1.08	1.09	1.14	0.98	0.79	0.71	0.80
250	0.95	0.96	0.97	0.98	0.99	0.95	0.96	0.96	0.96	0.97	0.99	1.01	1.02	0.97	0.76	0.69	0.79

Average Liquid Temperature	Cp PRESSURE DROP CORRECTION FACTORS																
	SAE 5	SAE 10	SAE 20	SAE 30	SAE 40	ISO 22	ISO 32	ISO 46	ISO 68	ISO 100	ISO 150	ISO 220	ISO 320	MIL-L-7808	POLYGLYCOL	PHOSPHATE ESTER	50% ETHYLENE GLYCOL & WATER
100	2.00	2.40	4.40	6.40	8.80	1.07	1.53	1.82	2.54	4.19	6.44	9.38	13.56	1.26	3.00	3.50	0.730
110	1.70	2.10	3.60	5.10	6.70	1.04	1.45	1.72	2.35	3.73	5.70	8.33	11.63	1.20	2.40	2.90	0.720
120	1.50	1.80	3.00	4.20	5.60	1.02	1.38	1.60	2.15	3.26	4.91	7.23	9.73	1.14	2.10	2.50	0.709
130	1.40	1.60	2.60	3.40	4.50	0.99	1.30	1.49	1.94	2.80	4.14	6.19	7.80	1.08	1.90	2.20	0.698
140	1.30	1.50	2.23	2.90	3.70	0.97	1.23	1.38	1.75	2.38	3.47	5.20	6.11	1.03	1.90	2.00	0.686
150	1.20	1.30	1.90	2.50	3.10	0.95	1.17	1.30	1.61	2.04	2.90	4.35	4.77	0.98	1.70	1.90	0.676
200	0.93	0.96	1.20	1.40	1.60	0.89	0.99	1.08	1.18	1.33	1.59	1.74	1.95	0.90	1.20	1.30	0.635
250	0.81	0.82	0.92	0.97	1.05	0.85	0.93	0.96	1.03	1.11	1.21	1.22	1.23	0.83	1.00	1.05	0.556

note: AIHTI reserves the right to make reasonable design changes without notice.
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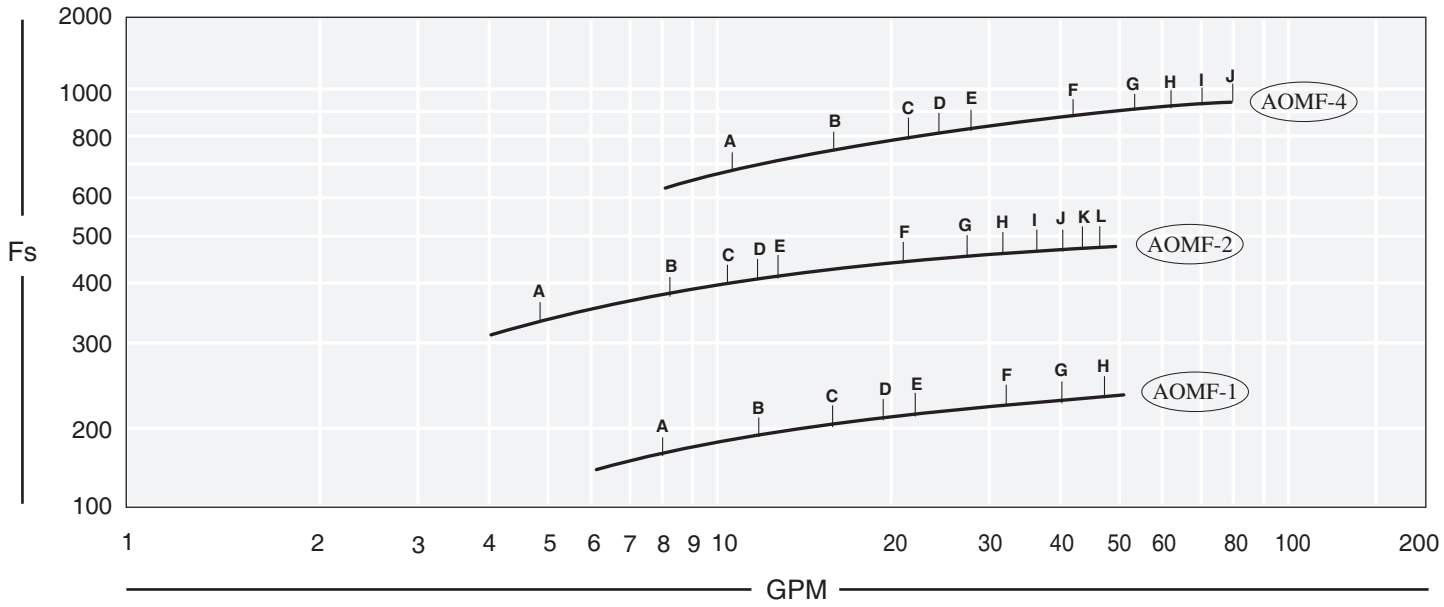
AOMF SERIES



PERFORMANCE CALCULATION	OIL PRESSURE DROP (PSI) CODE
$F_s = \frac{\text{Horsepower to be removed (HP) x 2545 x Cv}}{\text{°F (Oil Leaving* - Ambient Air Entering)}} = \frac{\text{BTU}}{\text{hr °F}}$	A = 1 PSI D = 4 PSI G = 15 PSI J = 30 PSI B = 2 PSI E = 5 PSI H = 20 PSI K = 35 PSI C = 3 PSI F = 10 PSI I = 25 PSI L = 40 PSI

*Represents desired fluid leaving the cooler.

AOMF ELECTRIC MOTOR DATA

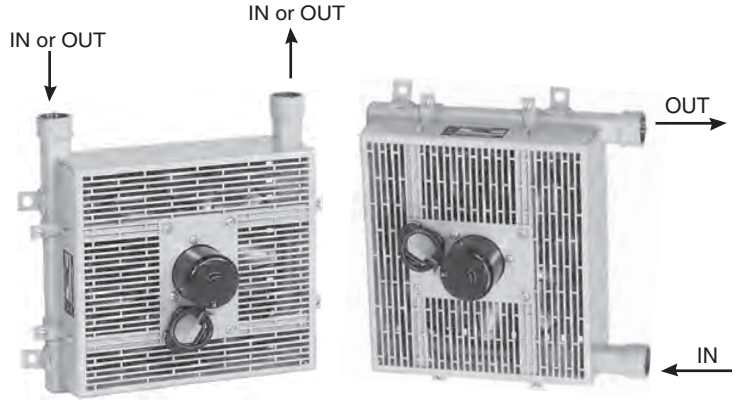
Model	Air Flow	No. of Motors	Volts	RPM	Per Motor Full Load Amperes
AOMF - 1	950	1	12V / 24V	2700	9 / 4.5
AOMF - 2	1900	2	12V / 24V	2700	9 / 4.5
AOMF - 4	3900	4	12V / 24V	2700	9 / 4.5

STANDARD CONSTRUCTION MATERIALS

Standard Construction Materials			
Tubes	Copper	Mount. bracket	Steel
Fins	Aluminum	Cabinet	Steel
Turbulators	Steel	Fan Blade	Aluminum
Manifold	Steel		

Standard Unit Ratings	
Operating Pressure	300 psig
Operating Temp.	300 °F

PIPING HOOK UP



EXAMPLE OF A MODEL

AOMF - 1 - S - 4

- Model
- Number of motors: 1 = 1 Motor; 2 = 2 Motors; 4 = 4 Motors
- Connections: Blank = NPT; S = SAE
- Motor Size: 4 = 12V Mtr.; 6 = 24V Mtr.

note: AIHTI reserves the right to make reasonable design changes without notice.

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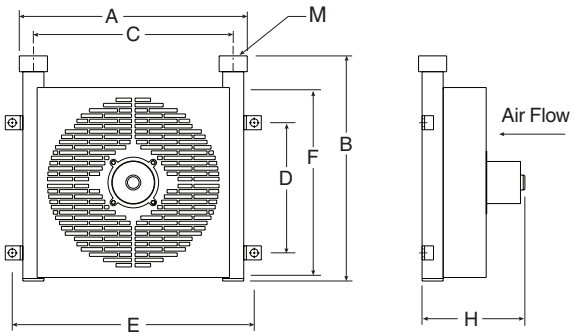
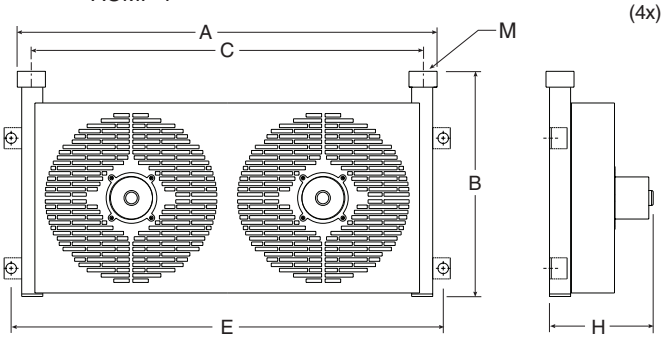
AOMF Series *dimensions*



AOMF-1



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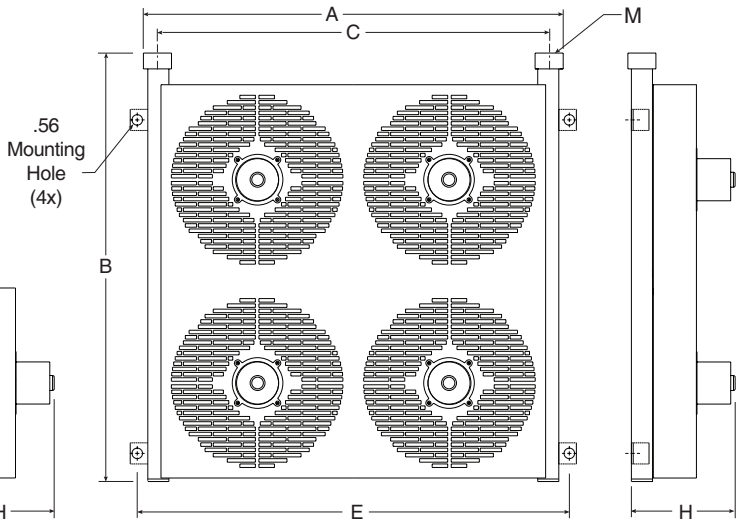
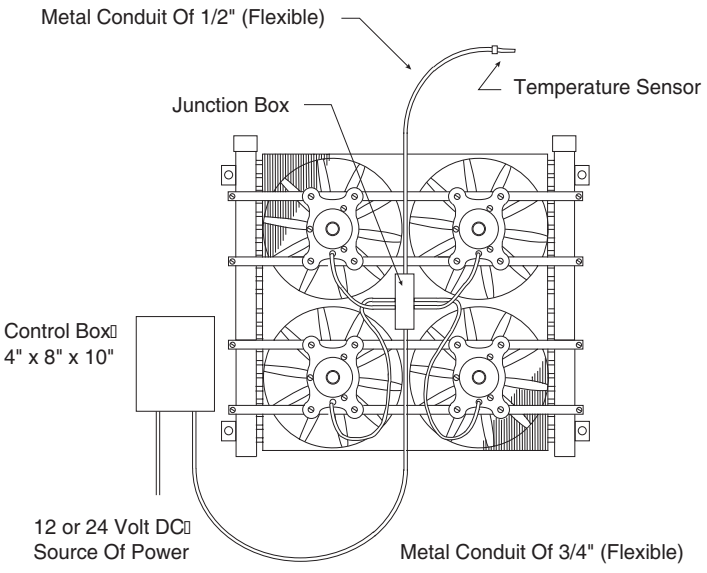


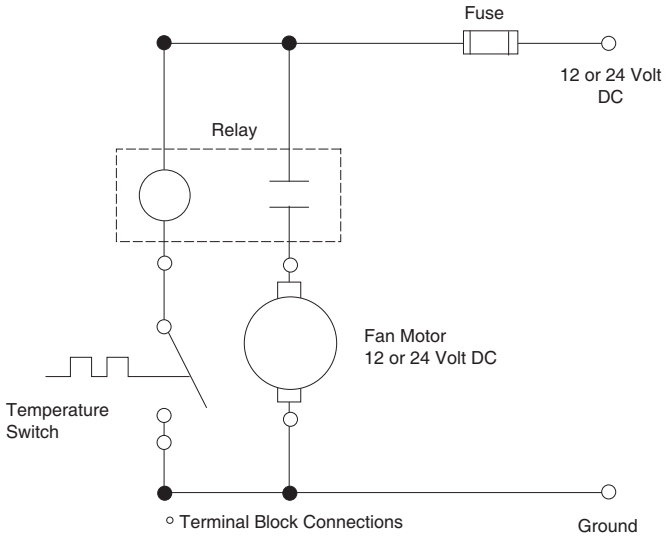
AOMF-4

DIMENSIONS (inches)												
Model	A	B	C	D	E	F	G	H	M NPT	M SAE	Weight	Model
AOMF - 1	15.72	16.00	14.22	9.25	17.22	13.00	11.00	7.75	1.25	#20 SAE 1 5/8 -12	41.00	AOMF - 1
AOMF - 2	29.63	16.00	28.88	9.25	30.75	13.00	24.75	7.75	1.25		69.00	AOMF - 2
AOMF - 4	29.63	29.00	27.88	23.25	30.75	26.00	24.75	7.75	1.25		109.00	AOMF - 4

INSTALLATION DIAGRAM



CONTROL BOX CIRCUIT



NOTE: Electrical Equipment Not Included. It Is Shown Here For Proper Installation.

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Receiving / Installation

a) Inspect unit for any shipping damage before uncrating. Indicate all damages to the trucking firms' delivery person and mark it on the receiving bill before accepting the freight. Make sure that the core and fan are not damaged. Rotate the fan blade to make sure that it moves freely. *Since the warranty is based upon the unit date code located on the model identification tag, removal or manipulation of the identification tag will void the manufacturers warranty.*

c) Standard Enamel Coating: American Industrial provides its standard products with a normal base coat of oil base air cure enamel paint. The enamel paint is applied as a temporary protective and esthetic coating prior to shipment. While the standard enamel coating is durable, American Industrial does not warranty it as a long-term finish coating. It is strongly suggested that a more durable final coating be applied after installation or prior to long-term storage in a corrosive environment to cover any accidental scratches, enhance esthetics, and further prevent corrosion. It is the responsibility of the customer to provide regular maintenance against chips, scratches, etc... and regular touch up maintenance must be provided for long-term benefits and corrosion prevention.

d) Special Coatings: American Industrial offers as customer options, Air-Dry Epoxy, and Heresite (Air-Dry Phenolic) coatings at additional cost. American Industrial offers special coatings upon request, however American Industrial does not warrantee coatings to be a permanent solution for any equipment against corrosion. It is the responsibility of the customer to provide regular maintenance against chips, scratches, etc... and regular touch up maintenance must be provided for long-term benefits and corrosion prevention.

e) American Industrial recommends that the equipment supplied should be installed by qualified personnel who have solid understanding of system design, pressure and temperature ratings, and piping assembly. Verify the service conditions of the system prior to applying any air cooled heat exchanger series cooler. If the system pressure or temperature does not fall within the parameters on model rating tag located on the heat exchanger, contact our factory prior to installation or operation.

g) Heat exchanger should be securely fastened using the mounting foot brackets (included). All mounting holes should be used to secure unit into place.

h) Connections should be made in configurations exactly as indicated in the "piping hook up" illustration. The process flow entering the "Fluid IN" port and exiting the "Fluid OUT" port eliminates air pockets and assures that the unit will stay completely flooded. Flexible hose can be applied to reduce the risk of core failure due to thermal expansion or system vibration. Piping alignment and support is required for hoses longer than four feet in length and for piping exerting more than 10 lbs of dynamic force. It is recommended that filtration be located ahead of the heat exchanger to prevent excessive backpressure and clogging.

i) With respect to the heat exchangers nozzle size, flow line sizes should be sized to handle the appropriate flow rate and system pressure drop requirements, normally flow line rates of about 8-12 feet per second and inlet pressure less than 100psig are experienced. If the flow line size is larger than the heat exchanger nozzle size, additional pressure loss beyond the published pressure loss data may occur.

j) Electric motors should be connected only to supply source of the same characteristics as indicated on the electric motor information plate. Prior to starting, verify that the motor and fan spin freely without obstruction. Check carefully that the fan turns in the correct rotation direction (normally counter clockwise) from the motor side (fan direction arrow). Failure to operate the fan in the proper direction could reduce performance or cause serious damage to the heat exchanger or other components.

k) Solely at the request of customers, American Industrial provides direct acting internal inlet port to outlet port bypass relief valves as an additional safe guard against excessive flow and over pressurization of the heat exchanger. American Industrial purchases and applies high quality hydraulic system cartridge valves and components made available for hydraulic system use. However, American Industrial does not specify, recommend, suggest, guarantee, or warrantee the internal relief valve or its performance to safe guard the heat exchanger from damage or prevent failure due to excessive flow or over pressurization. It is the ultimately the sole responsibility of the customer/user to verify with the original equipment manufacture all conditions associated with applying an additional system relief valve prior to application.

Maintenance

Regular maintenance intervals based upon the surrounding and operational conditions should be maintained to verify equipment performance and to prevent premature component failure. Since some of the components such as, motors, fans, etc... are not manufactured by American Industrial, maintenance requirements provided by the manufacture must be followed.

a) Inspect the entire heat exchanger and motor/fan assembly for loosened bolts, loose connections, broken components, rust spots, corrosion, fin/coil clogging, or external leakage. Make immediate repairs to all affected areas prior to restarting and operating the heat exchanger or its components.

b) Heat exchangers operating in oily or dusty environments will often need to have the coil cooling fins cleaned. Oily or clogged fins should be cleaned by carefully brushing the fins and tubes with water or a non-aggressive degreasing agent mixture *(Note: Cleaning agents that are not compatible with copper, brass, aluminum, steel or stainless steel should not be used)*. A compressed air or a water stream can be used to dislodge dirt and clean the coil further. Any external dirt or oil on the electric motor and fan assembly should be removed. *Caution: Be sure to disconnect the electric motor from its power source prior to doing any maintenance.*

c) In most cases it is not necessary to internally flush the coil. In circumstances where the coil has become plugged or has a substantial buildup of material, flushing the coil with water or a solvent may be done. Flushing solvents should be non-aggressive suitable for the materials of construction. Serviceable Core® models can be disassembled and inspected or cleaned if required.

e) Fan blades should be cleaned and inspected for tightness during the regular maintenance schedule when handling a fan blade care must be given to avoid bending or striking any of the blades. Fan blades are factory balanced and will not operate properly if damaged or unbalanced. Damaged fan blades can cause excessive vibration and severe damage to the heat exchanger or drive motor. Replace any damaged fan with an American industrial suggested replacement.

f) Air cooled exchanger cabinets are constructed using 7ga. through 18ga. steel that may be bent back into position if damaged. Parts that are not repairable can be purchased through American Industrial.

g) Coil fins that become flattened can be combed back into position. This process may require removal of the coil from the cabinet.

h) It is not advisable to attempt repairs to brazed joints of a brazed construction coil unless it will be done by an expert in silver solder brazing. Brazed coils are heated uniformly during the original manufacturing process to prevent weak zones from occurring. Uncontrolled reheating of the coil may result in weakening of the tube joints surrounding the repair area. In many instances brazed units that are repaired will not hold up as well to the rigors of the system as will a new coil. American Industrial will not warranty or be responsible for any repairs done by unauthorized sources. Manipulation in any way other than normal application will void the manufactures warranty.

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American Industrial Heat Transfer Inc.®

Manufacturer of Quality Heat Exchangers

www.aihti.com

M and ME SERIES

MOBILE AIR COOLED

OIL COOLERS

12 volt & 24 volt DC motor

- Mobile design.
- Aluminum construction.
- Operating temperature of 250° F and pressure of 250PSI.
- Standard SAE connections.
- Cools: Fluid power systems, lubrication systems, hydraulic presses,gear drives, torque convertors, machine tools, etc...

note: AIHTI reserves the right to make reasonable design changes without notice.

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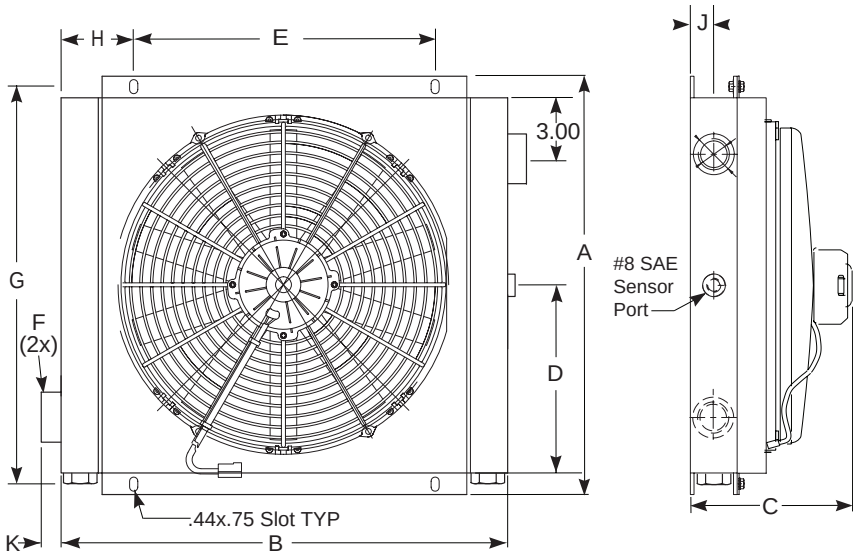
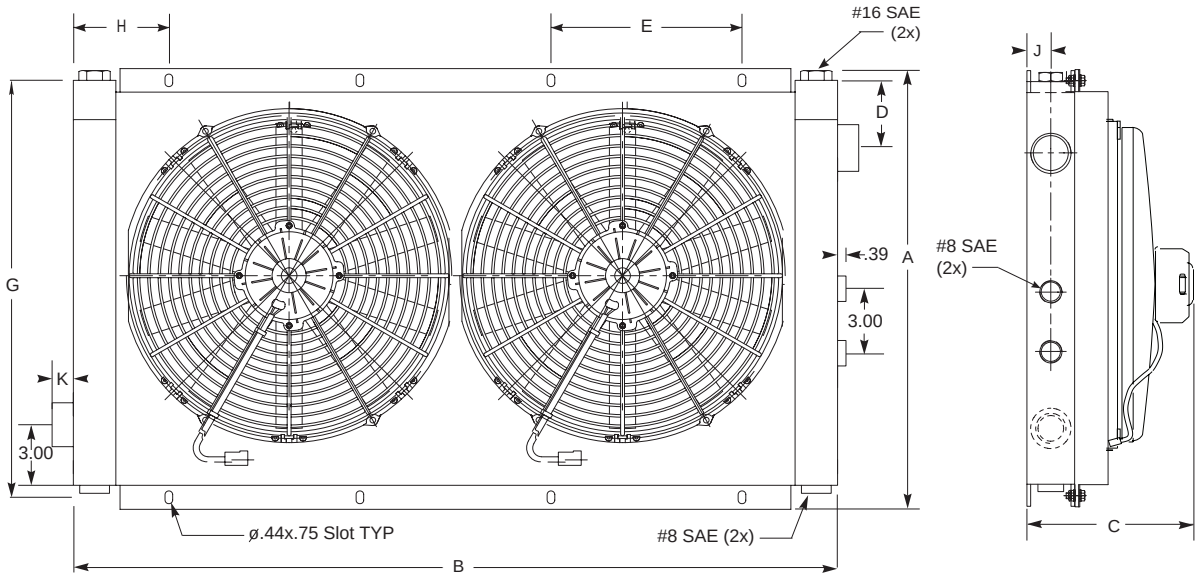
ME - 120 through M - 480





ME - 2320 through M - 2480

DIMENSIONS (inches)

Model	A	B	C	D	E	F	G	H	J	K	Weight
ME - 120	11.73	13.97	6.5	5.00	4.96	#12 SAE	10.86	4.50	1.24	.98	15
ME - 180	13.50	15.94	6.5	5.91	5.86	#16 SAE	12.75	5.04	1.24	1.18	18
ME - 320	18.42	19.68	7	8.08	12.00	#20 SAE	17.32	3.84	1.24	1.57	28
ME - 480	22.12	23.62	7	9.92	15.94	#20 SAE	21.02	3.84	1.24	1.57	41
ME - 2320	19.44	33.46	7.5	3.00	7.87	#20 SAE	18.38	4.93	1.28	.98	55
ME - 2480	23.18	35.43	7.5	3.22	8.5	#20 SAE	22.20	4.44	1.28	.98	80

EXAMPLE OF A MODEL

ME - 120 - 4

Model
ME = unit with motor

Size
180, 320, 480, 2320, 2480

Motor
4 = 12v motor
6 = 24v motor

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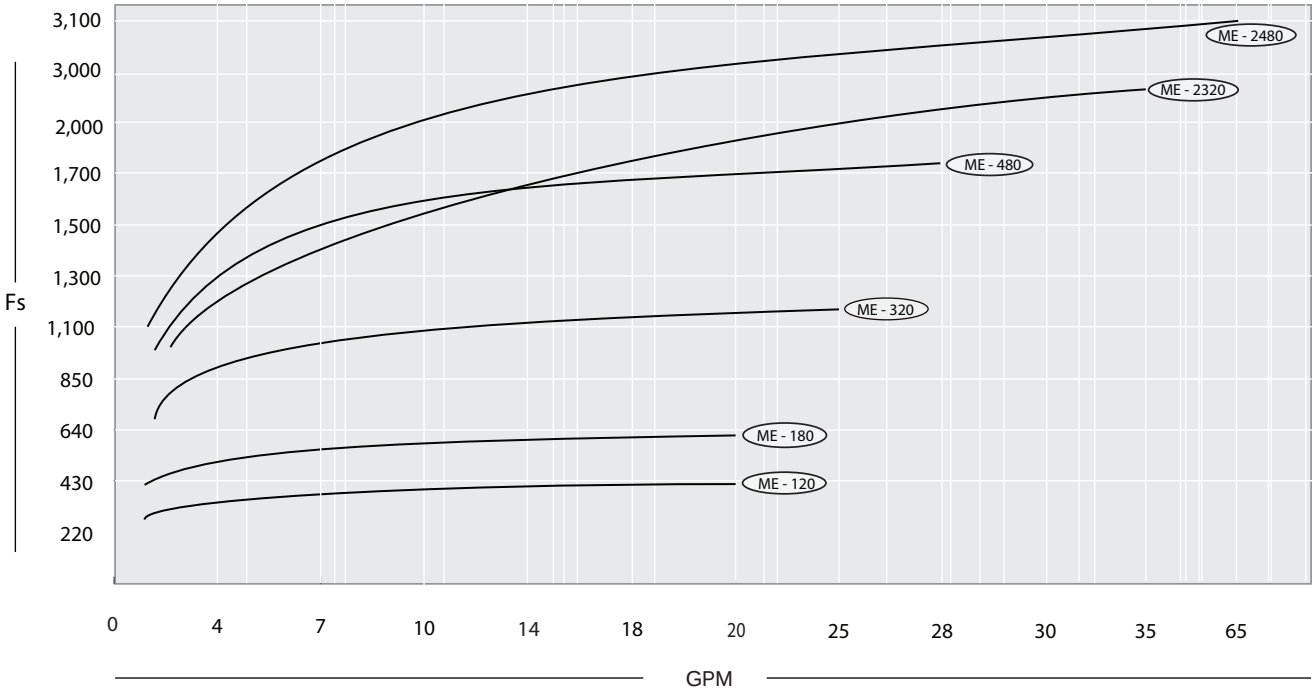
ME Series *dimensions*

ME Models with DC Fan Assemblies



Model	Volts	Per Motor Full Load Amperes	Total CFM
ME - 120	12 / 24	12.5 / 6.3	14.75
ME - 180	12 / 24	10.6 / 5.3	22.17
ME - 320	12 / 24	22.2 / 11.1	38.74
ME - 480	12 / 24	22.2 / 11.1	46.40
ME - 2320	12 / 24	19.3 / 9.7	63.23
ME - 2480	12 / 24	19.3 / 9.7	82.75

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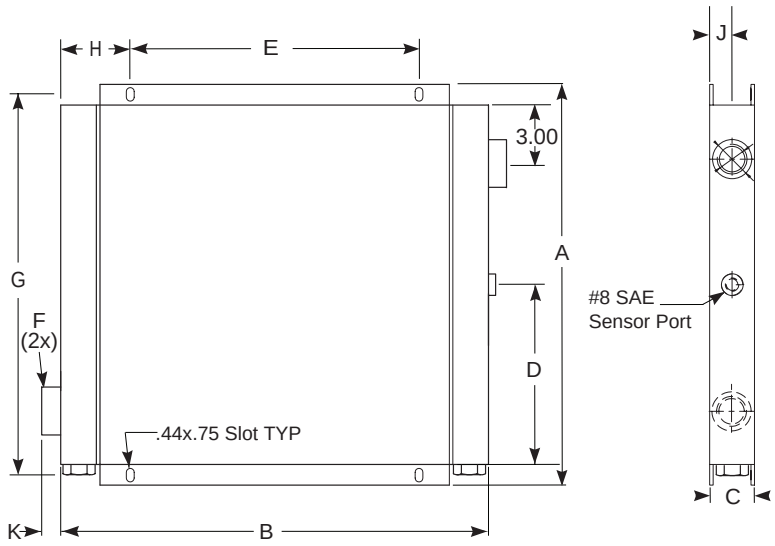
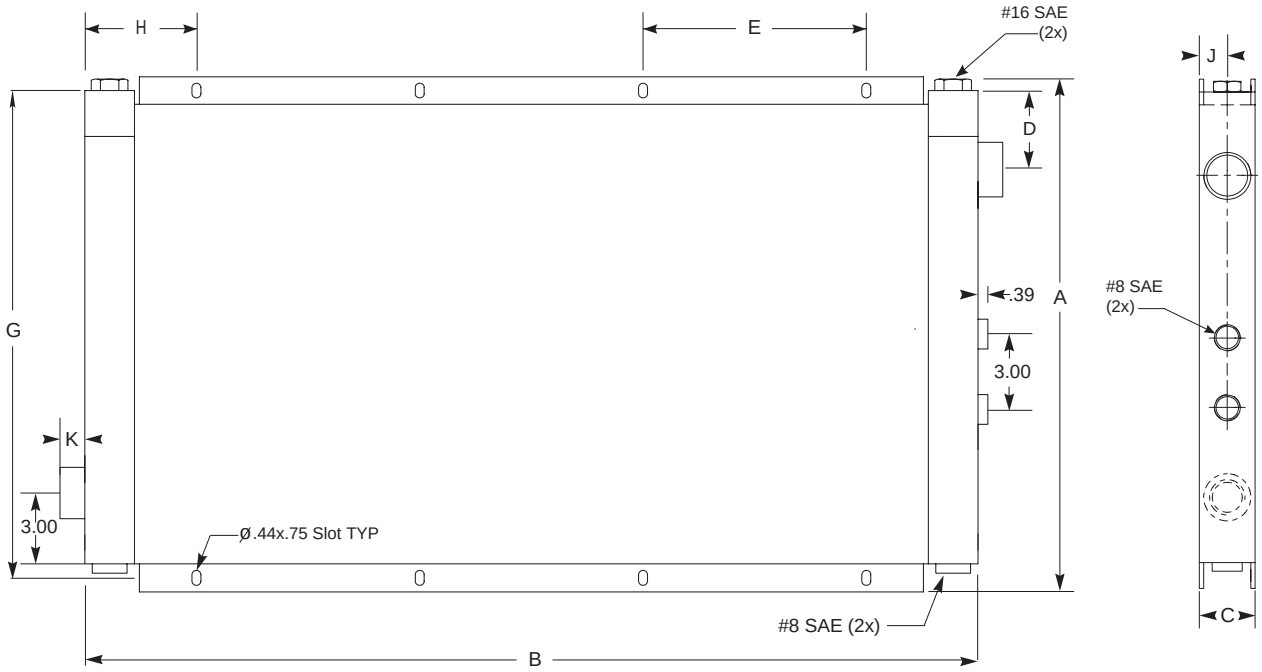
M - 120 through M - 480





M - 2320 through M - 2480

DIMENSIONS (inches)

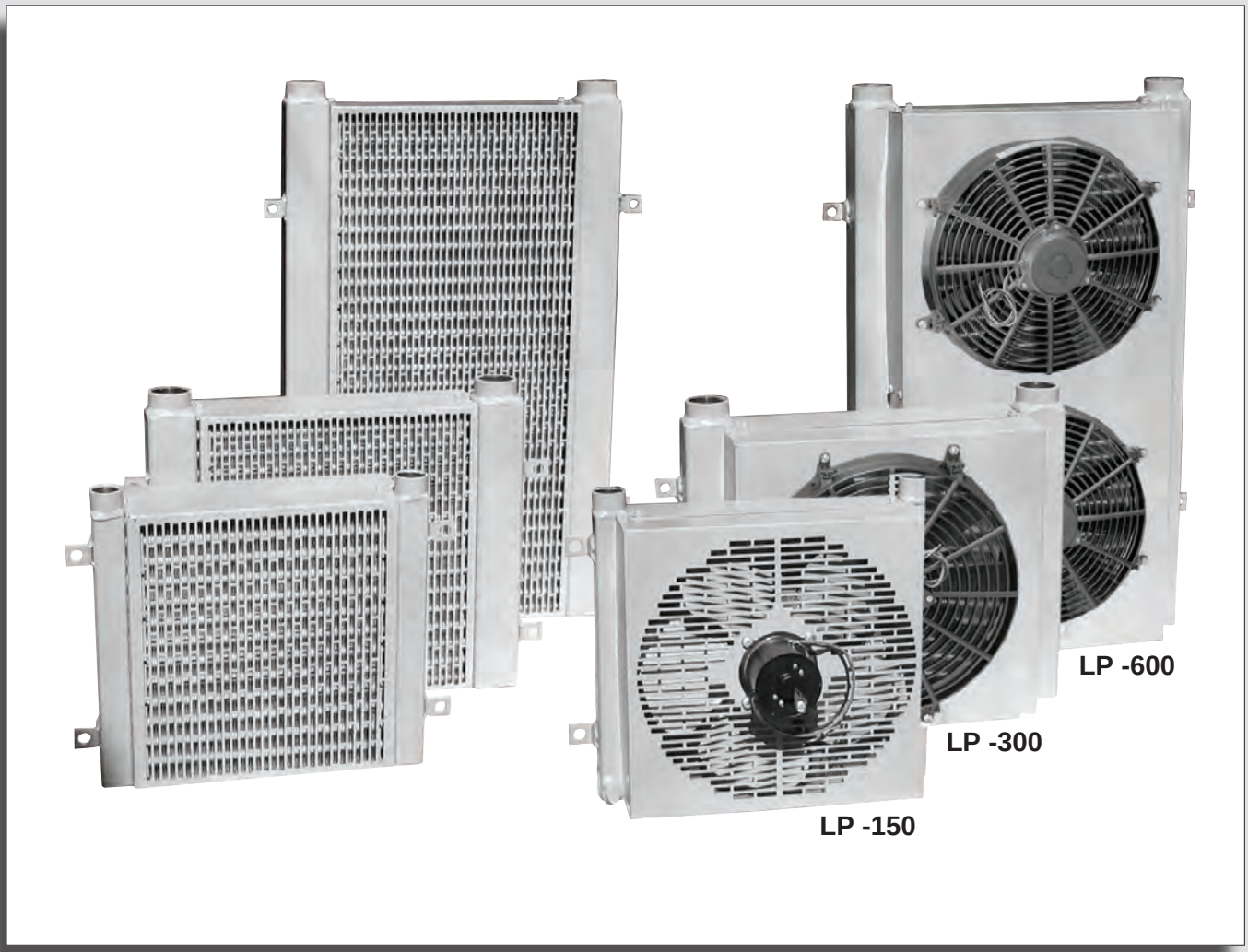
Model	A	B	C	D	E	F	G	H	J	K	Weight
M - 120	11.73	13.97	2.48	5.00	4.96	#12 SAE	10.86	4.50	1.24	.98	15
M - 180	13.50	15.94	2.48	5.91	5.86	#16 SAE	12.75	5.04	1.24	1.18	18
M - 320	18.42	19.68	2.48	8.08	12.00	#20 SAE	17.32	3.84	1.24	1.57	28
M - 480	22.12	23.62	2.48	9.92	15.94	#20 SAE	21.02	3.84	1.24	1.57	41
M - 2320	19.44	33.46	2.56	3.00	7.87	#20 SAE	18.38	4.93	1.28	.98	55
M - 2480	23.18	35.43	2.56	3.22	8.5	#20 SAE	22.20	4.44	1.28	.98	80

EXAMPLE OF A MODEL

M - 120

Model — M = unit without motor

Size — 180, 320, 480, 2320, 2480



MOBILE AIR COOLED

LIQUID COOLERS

12 volt & 24 volt DC motor

- Mobile design.
- Operating temperature of 300° F and pressure of 300PSI.
- Standard NPT or SAE connections.
- Cools: Fluid power systems, lubrication systems, hydraulic presses,gear drives, torque convertors, machine tools, etc...

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SIZING
To properly size a DC fan drive air-cooled oil cooler for mobile equipment, you should first determine some basic parameters associated with the system.

HEAT LOAD
In many instances the heat load must be determined by using a "total potential" method. This total potential or horse power method is the most common method, and is the simplest way to determine basic heat rejection requirements for mobile hydraulic systems. The total potential us equal to the maximum operating flow and pressure that are generated by the system under full load. To determine the total potential (HP) use the following formula.

HP = [System Pressure (PSI) x System flow (GPM)] / 1714

Example:
HP = (3000 PSI x 6.0 GPM) / 1714 = 10.5 HP or the total input potential

To determine the system heat load in BTU / HR we must use a percentage *(v)* of the system potential HP. The factor *(v)* can be calculated by adding up the actual inefficiencies of a system; however, for most applications a *(v)* value of 25% - 30% can be used.

Example:
10.5 HP x .25 = 2.63 HP heat

To convert the horsepower of heat into BTU/HR use the formula below:
HP x 2542 = BTU/HR

Example:
2.63 HP x 2545 = 6,681 BTU/HR

Applying into a return line
For most open loop systems with a vane or gear type fixed delivery pumps. To calculate the Fs value required when applying the air/oil cooler into a return line use the formula below.

$$Fs = \frac{BTU/\ HR \times Cv}{T - t_{ambient}} \qquad Fs = \frac{6{,}681 \times 1.13}{140°F - 100°F} = 189$$

T = Desired system oil temperature leaving the cooler °F (140°F)
$t_{ambient}$ = Ambient air temperature entering the cooler °F
Cv = Correction factor for oil viscosity. Example: ISO68 oil @ 150°F = 1.13 *(see chart)*

APPLYING INTO A CASE DRAIN LINE
In circumstances where the system is a closed loop or when return line flow is not available, the case drain flow can be utilized to help cool the system However, in many instances, the case drain flow alone will not be enough to reject all of the heat generated by the system. Case drain lines should not be treated as a normal return lines since the pressure drop allowable usually can vary from 12 - 10 PSI max. Check with your pump manufacturer for the appropriate pressure drop tolerance before applying any cooler. To size the system for case flow or case flow plus any additional flushing loops, please use the following method.

Formula

T = System temperature entering

$Tc_{exit} = \{ T - [Q / (\text{case flow gpm} \times 210)] \}$

Example

$Tc_{exit} = \{ 150 - [6{,}681 / (4 \times 210)] \} = 142$

Tc_{exit} = The corrected temperature of the oil exiting the cooler.

$$Fs = \frac{Q \times Cv}{Tc_{exit} - t_{ambient}} \qquad \frac{6{,}681 \times 1.13}{142\text{-}100} = 180\ Fs$$

SELECTION
To select a model, locate the flow rate (GPM) at the bottom of the flow vs Fs graph. Proceed upward until the GPM intersects with the calculated Fs. The curve closest above the intersection point will meet these conditions.
Examples:

Return Line	Case Line
Fs = 189	Fs = 180
GPM = 6 "return line flow"	GPM = 4
Model = LP - 300	Model = LP - 300

PRESSURE DROP
Determine the oil pressure drop from the curves as indicated. For viscosities other than 50 ssu, multiply the actual indicated pressure drop (psi) for your GPM by the value in the pressure differential curve for your viscosity value.

Examples:	GPM = 6	GPM = 4
Indicated pressure drop	.2 PSI	.1 PSI
Cp correction factor for *ISO 68 oil @ 150°F*	.213	.113

Average Liquid Temperature	Cv VISCOSITY CORRECTION FACTORS																
	SAE 5	SAE 10	SAE 20	SAE 30	SAE 40	ISO 22	ISO 32	ISO 46	ISO 68	ISO 100	ISO 150	ISO 220	ISO 320	MIL-L-7808	POLYGLYCOL	PHOSPHATE ESTER	50% ETHYLENE GLYCOL & WATER
100	1.11	1.15	1.25	1.38	1.45	1.08	1.14	1.18	1.26	1.37	1.43	1.56	1.84	1.19	0.92	0.83	0.85
110	1.09	1.12	1.20	1.32	1.40	1.06	1.13	1.16	1.25	1.31	1.39	1.48	1.67	1.14	0.89	0.80	0.84
120	1.06	1.10	1.17	1.27	1.35	1.04	1.11	1.14	1.20	1.27	1.35	1.40	1.53	1.09	0.88	0.79	0.84
130	1.04	1.08	1.13	1.24	1.29	1.03	1.09	1.13	1.17	1.24	1.30	1.34	1.44	1.05	0.85	0.77	0.83
140	1.03	1.05	1.11	1.19	1.25	1.02	1.08	1.10	1.16	1.20	1.26	1.30	1.39	1.03	0.84	0.76	0.82
150	1.01	1.04	1.09	1.16	1.22	1.02	1.06	1.09	1.13	1.17	1.22	1.27	1.33	1.01	0.83	0.74	0.82
200	0.98	0.99	1.01	1.04	1.07	0.98	0.99	1.00	1.01	1.02	1.08	1.09	1.14	0.98	0.79	0.71	0.80
250	0.95	0.96	0.97	0.98	0.99	0.95	0.96	0.96	0.96	0.97	0.99	1.01	1.02	0.97	0.76	0.69	0.79

Average Liquid Temperature	Cp PRESSURE DROP CORRECTION FACTORS																
	SAE 5	SAE 10	SAE 20	SAE 30	SAE 40	ISO 22	ISO 32	ISO 46	ISO 68	ISO 100	ISO 150	ISO 220	ISO 320	MIL-L-7808	POLYGLYCOL	PHOSPHATE ESTER	50% ETHYLENE GLYCOL & WATER
100	2.00	2.40	4.40	6.40	8.80	1.07	1.53	1.82	2.54	4.19	6.44	9.38	13.56	1.26	3.00	3.50	0.730
110	1.70	2.10	3.60	5.10	6.70	1.04	1.45	1.72	2.35	3.73	5.70	8.33	11.63	1.20	2.40	2.90	0.720
120	1.50	1.80	3.00	4.20	5.60	1.02	1.38	1.60	2.15	3.26	4.91	7.23	9.73	1.14	2.10	2.50	0.709
130	1.40	1.60	2.60	3.40	4.50	0.99	1.30	1.49	1.94	2.80	4.14	6.19	7.80	1.08	1.90	2.20	0.698
140	1.30	1.50	2.23	2.90	3.70	0.97	1.23	1.38	1.75	2.38	3.47	5.20	6.11	1.03	1.90	2.00	0.686
150	1.20	1.30	1.90	2.50	3.10	0.95	1.17	1.30	1.61	2.04	2.90	4.35	4.77	0.98	1.70	1.90	0.676
200	0.93	0.96	1.20	1.40	1.60	0.89	0.99	1.08	1.18	1.33	1.59	1.74	1.95	0.90	1.20	1.30	0.635
250	0.81	0.82	0.92	0.97	1.05	0.85	0.93	0.96	1.03	1.11	1.21	1.22	1.23	0.83	1.00	1.05	0.556

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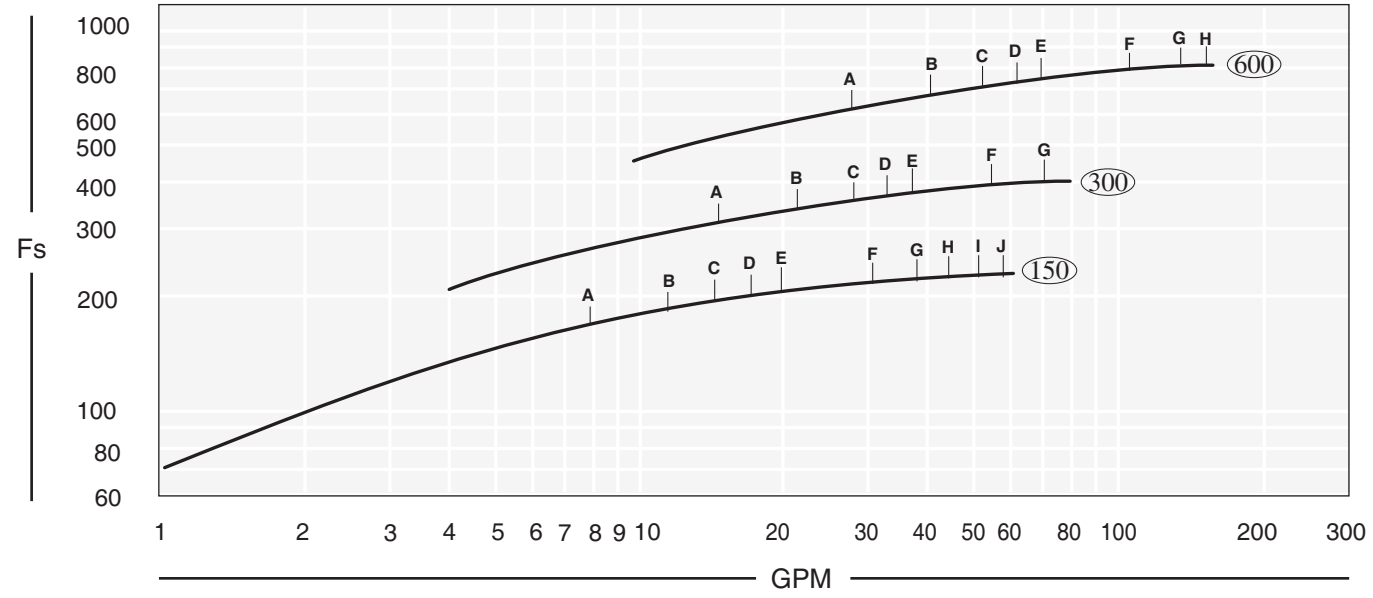
LP & LPR Series *motor data*



PERFORMANCE CALCULATION
$F_s = \frac{\text{Horsepower to be removed (HP) x 2545 x Cv}}{\text{°F (Oil Leaving* - Ambient Air Entering)}} = \frac{\text{BTU}}{\text{hr °F}}$

OIL PRESSURE DROP (PSI) CODE			
A = 1 PSI	D = 4 PSI	G = 15 PSI	J = 30 PSI
B = 2 PSI	E = 5 PSI	H = 20 PSI	
C = 3 PSI	F = 10 PSI	I = 25 PSI	

*Represents desired fluid leaving the cooler.

LP MOTOR DATA

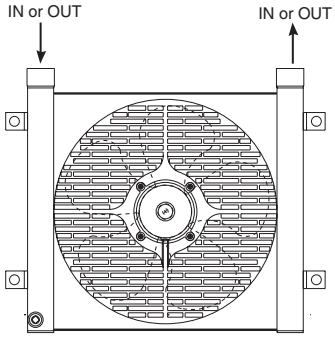
Model	Volts	FLA Per Motor	RPM	Total CFM
LP - 150	12 / 24	9.0 / 4.5	2700	950
LPR - 150	12 / 24	9.0 / 4.5	2700	950
LP - 300	12 / 24	13.7 / 6.6	3000	950
LPR - 300	12 / 24	13.7 / 6.6	2300	950
LP - 600	12 / 24	13.7 / 6.6	3000	1900
LPR - 600	12 / 24	13.7 / 6.6	3000	1900

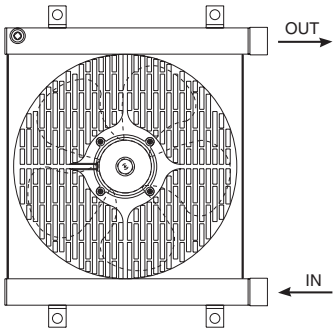
STANDARD CONSTRUCTION MATERIALS

Standard Construction Materials			
Tubes	Copper	Mount. bracket	Steel
Fins	Aluminum	Cabinet	Steel
Turbulators	Steel	Fan Blade	Aluminum
Manifold	Steel		

Standard Unit Ratings	
Operating Pressure	300 psig
Operating Temp.	300 °F

PIPING HOOK-UP





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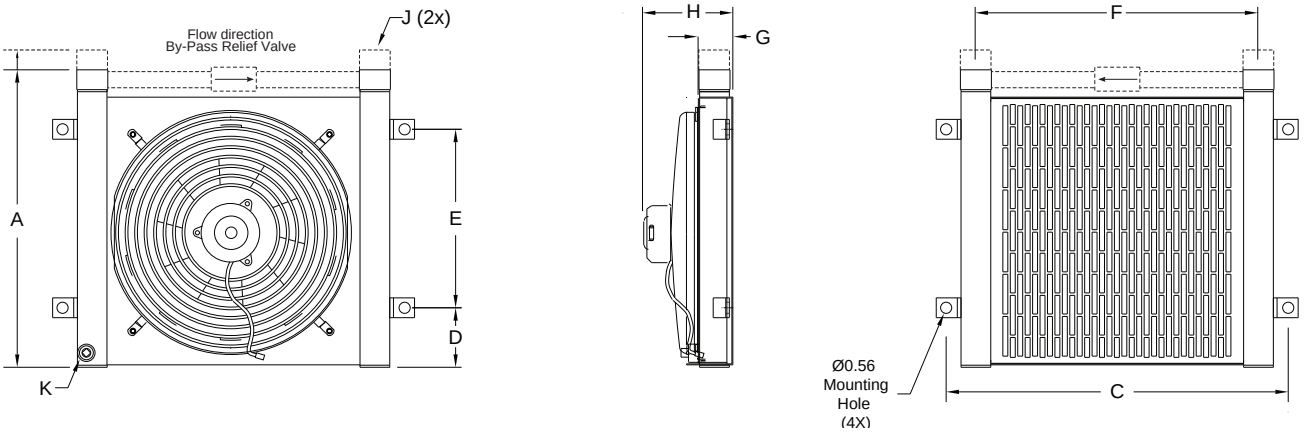
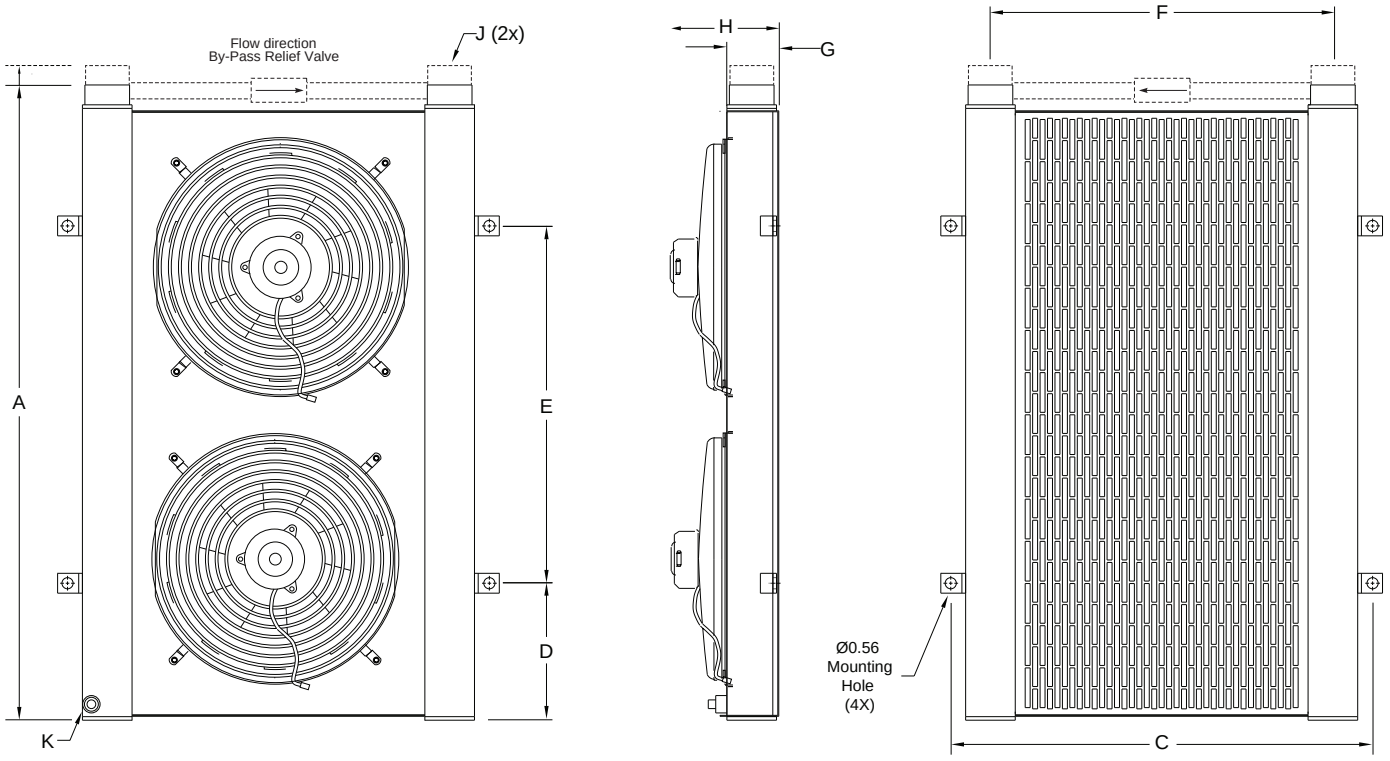
MODELS LP-150 *and* LP-300



MODEL LP-600



COMMON DIMENSIONS & WEIGHTS

Model	A	C	D	E	F	G	H	J NPT	J SAE	K NPT	Weight	Model
LP-150	15.00	17.25	3.00	9.00	14.25	4.90	7.68	1.00	#16 1 5/16-12	.375	28	LP-150
LPR-150	17.50										31	LPR-150
LP-300	17.00	21.25	3.13		17.25	3.25	6.50	1.50	#24 1 7/8-12		37	LP-300
LPR-300	19.50										40	LPR-300
LP-600	32.00		6.90	18.00							69	LP-600
LPR-600	34.50										73	LPR-600

EXAMPLE OF A MODEL

LP - 300 - 4 - S - ___

- **Model**: LP = unit without relief valve; LPR = unit with relief valve
- **Size**: 150, 300, 600
- **Motor**: 4 = 12v motor; 6 = 24v motor
- **Connections**: Blank = NPT; S = SAE
- **Relief Valve**: R30 = 30psi; R65 = 65psi

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Receiving / Installation

a) Inspect unit for any shipping damage before uncrating. Indicate all damages to the trucking firms' delivery person and mark it on the receiving bill before accepting the freight. Make sure that the core and fan are not damaged. Rotate the fan blade to make sure that it moves freely. *Since the warranty is based upon the unit date code located on the model identification tag, removal or manipulation of the identification tag will void the manufacturers warranty.*

c) Standard Enamel Coating: American Industrial provides its standard products with a normal base coat of oil base air cure enamel paint. The enamel paint is applied as a temporary protective and esthetic coating prior to shipment. While the standard enamel coating is durable, American Industrial does not warranty it as a long-term finish coating. It is strongly suggested that a more durable final coating be applied after installation or prior to long-term storage in a corrosive environment to cover any accidental scratches, enhance esthetics, and further prevent corrosion. It is the responsibility of the customer to provide regular maintenance against chips, scratches, etc... and regular touch up maintenance must be provided for long-term benefits and corrosion prevention.

d) Special Coatings: American Industrial offers as customer options, Air-Dry Epoxy, and Heresite (Air-Dry Phenolic) coatings at additional cost. American Industrial offers special coatings upon request, however American Industrial does not warrantee coatings to be a permanent solution for any equipment against corrosion. It is the responsibility of the customer to provide regular maintenance against chips, scratches, etc... and regular touch up maintenance must be provided for long-term benefits and corrosion prevention.

e) American Industrial recommends that the equipment supplied should be installed by qualified personnel who have solid understanding of system design, pressure and temperature ratings, and piping assembly. Verify the service conditions of the system prior to applying any air cooled heat exchanger series cooler. If the system pressure or temperature does not fall within the parameters on model rating tag located on the heat exchanger, contact our factory prior to installation or operation.

g) Heat exchanger should be securely fastened using the mounting foot brackets (included). All mounting holes should be used to secure unit into place.

h) Connections should be made in configurations exactly as indicated in the "piping hook up" illustration. The process flow entering the "Fluid IN" port and exiting the "Fluid OUT" port eliminates air pockets and assures that the unit will stay completely flooded. Flexible hose can be applied to reduce the risk of core failure due to thermal expansion or system vibration. Piping alignment and support is required for hoses longer than four feet in length and for piping exerting more than 10 lbs of dynamic force. It is recommended that filtration be located ahead of the heat exchanger to prevent excessive backpressure and clogging.

i) With respect to the heat exchangers nozzle size, flow line sizes should be sized to handle the appropriate flow rate and system pressure drop requirements, normally flow line rates of about 8-12 feet per second and inlet pressure less than 100psig are experienced. If the flow line size is larger than the heat exchanger nozzle size, additional pressure loss beyond the published pressure loss data may occur.

j) Electric motors should be connected only to supply source of the same characteristics as indicated on the electric motor information plate. Prior to starting, verify that the motor and fan spin freely without obstruction. Check carefully that the fan turns in the correct rotation direction (normally counter clockwise) from the motor side (fan direction arrow). Failure to operate the fan in the proper direction could reduce performance or cause serious damage to the heat exchanger or other components.

k) Solely at the request of customers, American Industrial provides direct acting internal inlet port to outlet port bypass relief valves as an additional safe guard against excessive flow and over pressurization of the heat exchanger. American Industrial purchases and applies high quality hydraulic system cartridge valves and components made available for hydraulic system use. However, American Industrial does not specify, recommend, suggest, guarantee, or warrantee the internal relief valve or its performance to safe guard the heat exchanger from damage or prevent failure due to excessive flow or over pressurization. It is the ultimately the sole responsibility of the customer/user to verify with the original equipment manufacture all conditions associated with applying an additional system relief valve prior to application.

Maintenance

Regular maintenance intervals based upon the surrounding and operational conditions should be maintained to verify equipment performance and to prevent premature component failure. Since some of the components such as, motors, fans, etc... are not manufactured by American Industrial, maintenance requirements provided by the manufacture must be followed.

a) Inspect the entire heat exchanger and motor/fan assembly for loosened bolts, loose connections, broken components, rust spots, corrosion, fin/coil clogging, or external leakage. Make immediate repairs to all affected areas prior to restarting and operating the heat exchanger or its components.

b) Heat exchangers operating in oily or dusty environments will often need to have the coil cooling fins cleaned. Oily or clogged fins should be cleaned by carefully brushing the fins and tubes with water or a non-aggressive degreasing agent mixture *(Note: Cleaning agents that are not compatible with copper, brass, aluminum, steel or stainless steel should not be used)*. A compressed air or a water stream can be used to dislodge dirt and clean the coil further. Any external dirt or oil on the electric motor and fan assembly should be removed. *Caution: Be sure to disconnect the electric motor from its power source prior to doing any maintenance.*

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f) Air cooled exchanger cabinets are constructed using 7ga. through 18ga. steel that may be bent back into position if damaged. Parts that are not repairable can be purchased through American Industrial.

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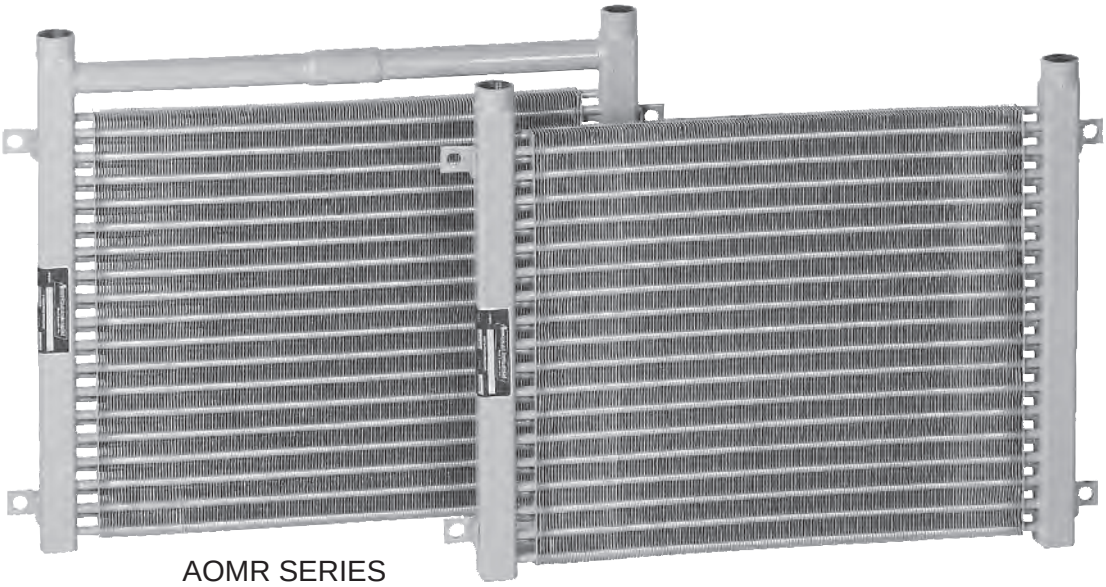
h) It is not advisable to attempt repairs to brazed joints of a brazed construction coil unless it will be done by an expert in silver solder brazing. Brazed coils are heated uniformly during the original manufacturing process to prevent weak zones from occurring. Uncontrolled reheating of the coil may result in weakening of the tube joints surrounding the repair area. In many instances brazed units that are repaired will not hold up as well to the rigors of the system as will a new coil. American Industrial will not warranty or be responsible for any repairs done by unauthorized sources. Manipulation in any way other than normal application will void the manufactures warranty.

AOM & AOMR SERIES



AOMR SERIES
with by-pass relief valve

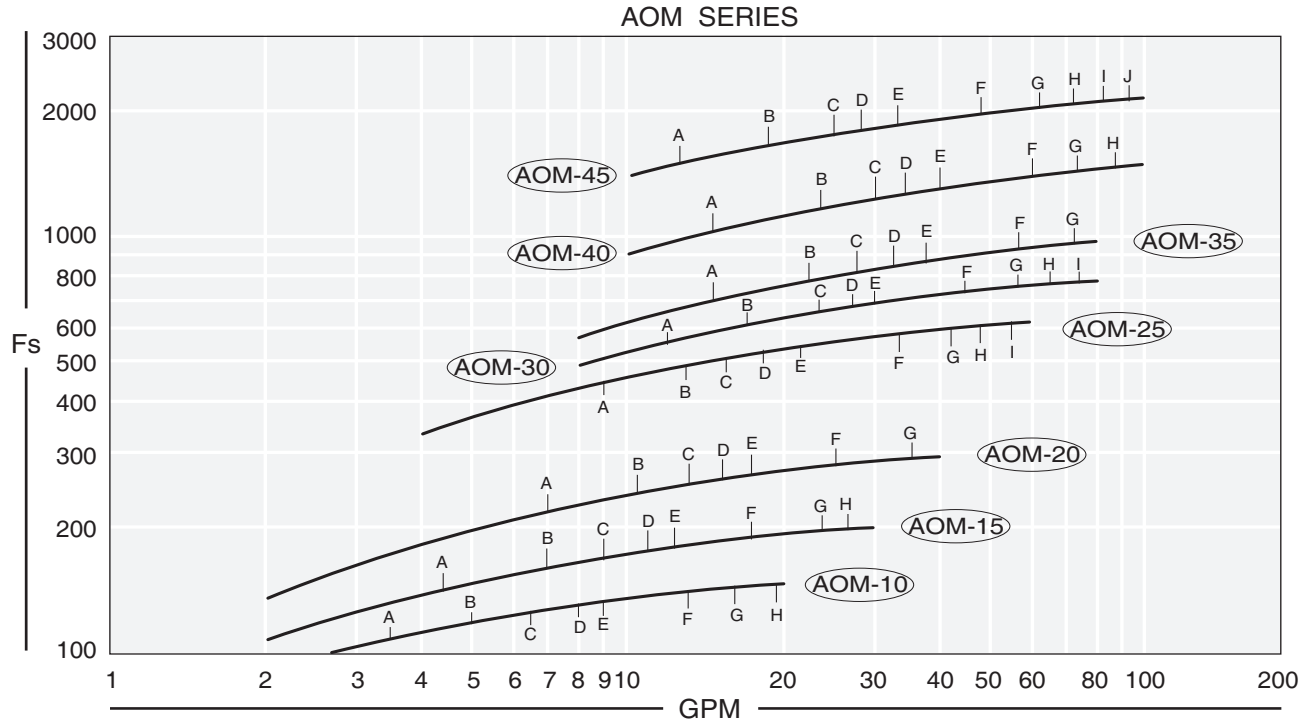
AOM SERIES

AIR COOLED MOBILE

LIQUID COOLERS

- Operating temperature of 300°F.
- Operating pressure 300PSI.
- For mobile applications
- Standard NPT or SAE connections.
- Optional 30 PSI or 65 PSI bypass relief valve.
- Can be customized to fit any applications.

AOM & AOMR Series *selection*



SELECTION GUIDE
The performance curves are based on 50 sus oil & 1000 Standard Feet Per Minute air velocity. If your air velocity is other than 1000 SFPM, please use the correction curve located on this page before choosing a model.

SIZING
To properly size a AOM air-cooled oil cooler for mobile equipment, first determine some basic parameters associated with your system.

HEAT LOAD
In many instances the heat load must be determined by using the following method. The total potential or horse power method is the most common method, and is the simplest way to determine basic heat rejection requirements for mobile hydraulic systems. The total potential is equal to the maximum operating flow and pressure that are generated by the system under full load. To determine the total potential (HP) use the following formula.

HP = [System Pressure (PSI) x System flow (GPM)] / 1714

Example:
HP = (3000 PSI x 40 GPM) / 1714 = 70 HP or the total input potential

To determine the system heat load in BTU / HR use a percentage *(v)* of the system potential HP. The factor *(v)* can be calculated by adding up the actual inefficiencies of a system; however, for most applications a *(v)* value of 25% - 30% can be used.

Example:
70 HP x .25 = 17.5 HP heat

To convert the horsepower of heat into BTU/HR use the formula below:
HP x 2542 = BTU/HR

Example:
17.5 HP x 2545 = 44,538 BTU/HR

Applying into a return line
For most open loop systems with a vane or gear type fixed delivery pumps. To calculate the Fs value required when applying the air/oil cooler into a return line use the formula below.

$$Fs = \frac{\text{BTU/ HR x Cv}}{T - t_{ambient}}$$

T = Desired system oil temperature leaving the cooler °F
$t_{ambient}$ = Ambient air temperature entering the cooler °F
Cv = Correction factor for oil viscosity. Example: ISO32 oil @ 150°F = 1.06

APPLYING INTO A CASE DRAIN LINE
In circumstances where the system is closed loop or when return line flow is not available, the case drain flow can be utilized to help cool the system. However, in many instances, the case drain flow alone will not be enough to reject all of the heat generated by the system. Case drain lines should not be treated as a normal return lines since the pressure drop allowable usually can vary from 2 - 10 PSI max. Check with your pump manufacturer for the appropriate pressure drop tolerance before applying any cooler. To size the system for case flow or case flow plus any additional fluching loops, please use the following method.

Formula

Tc_{exit} = { T - [Q / (case flow gpm x 210)]}

Example

Tc_{exit} = { 150 - [44,538 / (10 x 210)]} = 128.8

Tc_{exit} = The corrected temperature of the oil exiting the cooler.

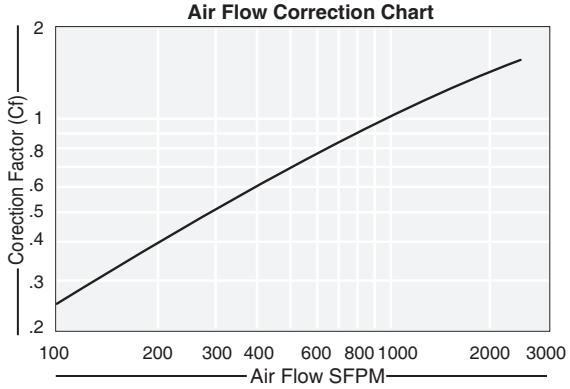
$$Fs = \frac{Q \times Cv}{Tc_{exit} - t_{ambient}} \qquad \frac{44{,}538 \times 1.06}{128.8\text{-}100} = 1{,}639$$

CORRECTING FOR ALTERNATE AIR VELOCITY
If your air velocity is other than 1000SFPM, you must correct to achieve the proper capacity required.

Formula : CFs = Fs / Cf *see chart*

	Example 1	Example 2
Air velocity	500 SFPM	1800 SFPM
CFs =	944 Fs / .68 Cf = 1,388	1,639 / 1.35 = 1,214

Air Flow Correction Chart



SELECTION
To select a model, locate the flow rate (GPM) through the cooler at the bottom of the flow vs Fs graph. Proceed upward until the GPM intersects with the calculated Fs. The curve closest above the intersection point will meet these conditions.

Examples:	Return Line	Case Line
	Fs = 1,388	Fs = 1,214
	GPM = 40 "return line flow"	GPM = 10
	Model = AOM - 45	Model = AOM - 45

PRESSURE DROP
Determine the oil pressure drop from the curves as indicated. For viscosities other than 50 sus at operating, multiply the actual indicated pressure drop (psi) for your GPM by the value in the pressure differential chart for your viscosity.

Examples:	GPM = 40	GPM = 10
Indicated pressure drop	5 PSI	1 PSI
Cp correction factor for *ISO 32 oil @ 150°F*	1.17	1.17

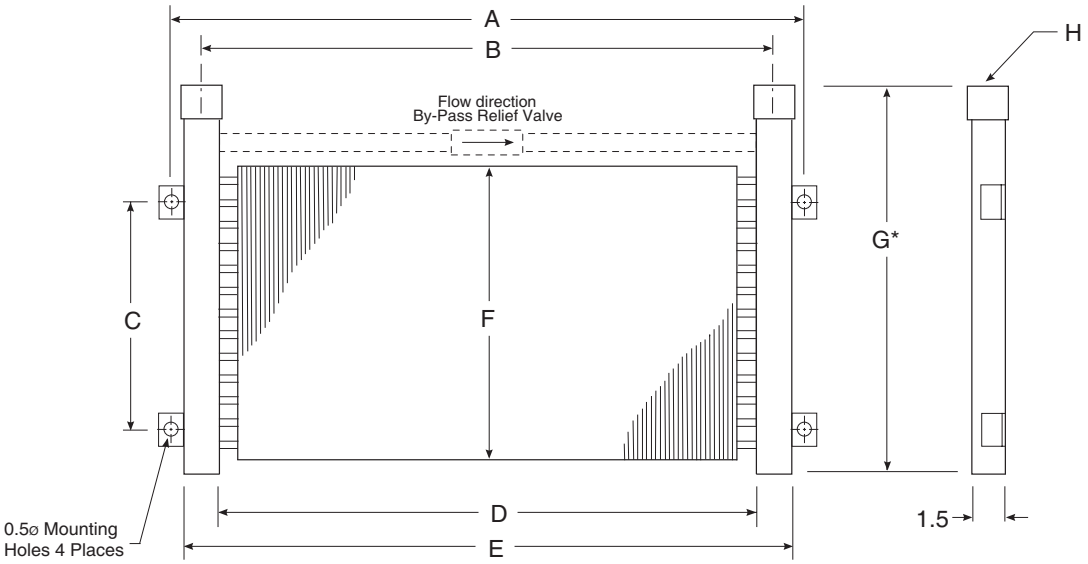
PERFORMANCE CALCULATION

$$F_s = \frac{\text{Horsepower to be removed (HP)} \times 2545 \times Cv}{\text{°F (Oil Leaving*} - \text{Ambient Air Entering)}} = \frac{BTU}{hr\ °F}$$

*Represents desired fluid leaving the cooler.

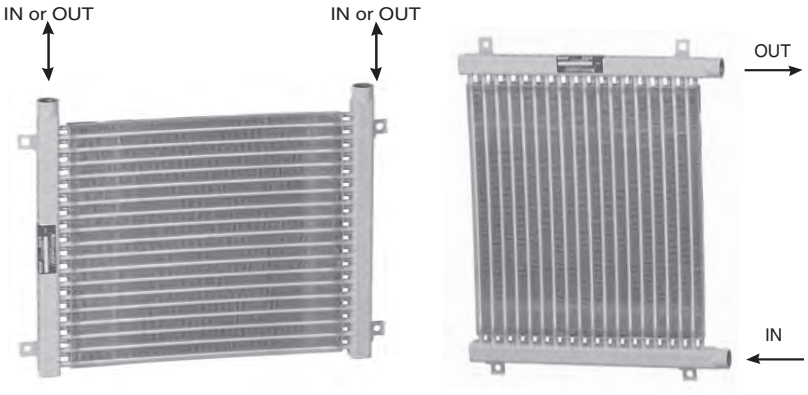
OIL PRESSURE DROP (PSI) CODE

A = 1 PSI	D = 4 PSI	G = 15 PSI	J = 30 PSI
B = 2 PSI	E = 5 PSI	H = 20 PSI	
C = 3 PSI	F = 10 PSI	I = 25 PSI	



AOM & AOMR DIMENSIONS & WEIGHTS

STANDARD DIMENSIONS (inches)												
Model	A	B	C	D	E	F	G AOM	G AOMR	H NPT	H SAE	Face Area	Weight LBS
AOM & AOMR-10-#	19.72	16.72	3.50	14.50	18.22	6.00	8.62	10.06	1.00		.60	20
AOM & AOMR-15-#	19.72	16.72	5.50	14.50	18.22	8.00	10.62	12.06	1.00	16 SAE 1-5/16-12 UN-2B	.81	25
AOM & AOMR-20-#	19.72	16.72	9.50	14.50	18.22	12.00	14.62	16.06	1.00		1.21	35
AOM & AOMR-25-#	25.72	22.72	15.50	20.50	24.22	18.00	20.62	22.06	1.00		2.56	40
AOM & AOMR-30-#	24.72	21.72	21.50	19.50	23.22	24.00	26.56	28.06	1.25		3.25	45
AOM & AOMR-35-#	24.72	21.72	27.50	19.50	23.22	30.00	32.56	34.06	1.25	20 SAE 1-5/8-12 UN-2B	1.06	55
AOM & AOMR-40-#	30.22	27.22	33.50	25.00	28.72	36.00	38.31	40.38	1.25		6.25	65
AOM & AOMR-45-#	40.72	37.72	33.50	35.50	39.22	36.00	38.31	40.38	1.25		8.88	75



EXAMPLE OF A MODEL

AOM - 25 - N
- Model
- Size
- Connections: N = NPT, S = SAE

AOMR - 25 - S - R - 65
- Model
- Size
- Connections: N = NPT, S = SAE
- Relief Valve
- PSI Relief: 30 = 30psi, 65 = 65psi

note: AIHTI reserves the right to make reasonable design changes without notice.

 355 American Industrial Drive LaCrosse, VA 23950 tel: 434-757-1800 fax: 434-757-1810 email: sales@aihti.com

Receiving / Installation

a) Inspect unit for any shipping damage before uncrating. Indicate all damages to the trucking firms' delivery person and mark it on the receiving bill before accepting the freight. Make sure that the core and fan are not damaged. Rotate the fan blade to make sure that it moves freely. *Since the warranty is based upon the unit date code located on the model identification tag, removal or manipulation of the identification tag will void the manufacturers warranty.*

c) Standard Enamel Coating: American Industrial provides its standard products with a normal base coat of oil base air cure enamel paint. The enamel paint is applied as a temporary protective and esthetic coating prior to shipment. While the standard enamel coating is durable, American Industrial does not warranty it as a long-term finish coating. It is strongly suggested that a more durable final coating be applied after installation or prior to long-term storage in a corrosive environment to cover any accidental scratches, enhance esthetics, and further prevent corrosion. It is the responsibility of the customer to provide regular maintenance against chips, scratches, etc... and regular touch up maintenance must be provided for long-term benefits and corrosion prevention.

d) Special Coatings: American Industrial offers as customer options, Air-Dry Epoxy, and Heresite (Air-Dry Phenolic) coatings at additional cost. American Industrial offers special coatings upon request, however American Industrial does not warrantee coatings to be a permanent solution for any equipment against corrosion. It is the responsibility of the customer to provide regular maintenance against chips, scratches, etc... and regular touch up maintenance must be provided for long-term benefits and corrosion prevention.

e) American Industrial recommends that the equipment supplied should be installed by qualified personnel who have solid understanding of system design, pressure and temperature ratings, and piping assembly. Verify the service conditions of the system prior to applying any air cooled heat exchanger series cooler. If the system pressure or temperature does not fall within the parameters on model rating tag located on the heat exchanger, contact our factory prior to installation or operation.

g) Heat exchanger should be securely fastened using the mounting foot brackets (included). All mounting holes should be used to secure unit into place.

h) Connections should be made in "one pass" or "Two Pass" configurations exactly as indicated in the "piping hook up" illustration. The process flow entering the "Fluid IN" port and exiting the "Fluid OUT" port eliminates air pockets and assures that the unit will stay completely flooded. Flexible hose can be applied to reduce the risk of core failure due to thermal expansion or system vibration. Piping alignment and support is required for hoses longer than four feet in length and for piping exerting more than 10 lbs of dynamic force. It is recommended that filtration be located ahead of the heat exchanger to prevent excessive backpressure and clogging.

i) With respect to the heat exchangers nozzle size, flow line sizes should be sized to handle the appropriate flow rate and system pressure drop requirements, normally flow line rates of about 8-12 feet per second and inlet pressure less than 100psig are experienced. If the flow line size is larger than the heat exchanger nozzle size, additional pressure loss beyond the published pressure loss data may occur.

j) Electric motors should be connected only to supply source of the same characteristics as indicated on the electric motor information plate. Prior to starting, verify that the motor and fan spin freely without obstruction. Check carefully that the fan turns in the correct rotation direction (normally counter clockwise) from the motor side (fan direction arrow). Failure to operate the fan in the proper direction could reduce performance or cause serious damage to the heat exchanger or other components.

k) Solely at the request of customers, American Industrial provides direct acting internal inlet port to outlet port bypass relief valves as an additional safe guard against excessive flow and over pressurization of the heat exchanger. American Industrial purchases and applies high quality hydraulic system cartridge valves and components made available for hydraulic system use. However, American Industrial does not specify, recommend, suggest, guarantee, or warrantee the internal relief valve or its performance to safe guard the heat exchanger from damage or prevent failure due to excessive flow or over pressurization. It is the ultimately the sole responsibility of the customer/user to verify with the original equipment manufacture all conditions associated with applying an additional system relief valve prior to application.

Maintenance

Regular maintenance intervals based upon the surrounding and operational conditions should be maintained to verify equipment performance and to prevent premature component failure. Since some of the components such as, motors, fans, etc... are not manufactured by American Industrial, maintenance requirements provided by the manufacture must be followed.

a) Inspect the entire heat exchanger and motor/fan assembly for loosened bolts, loose connections, broken components, rust spots, corrosion, fin/coil clogging, or external leakage. Make immediate repairs to all affected areas prior to restarting and operating the heat exchanger or its components.

b) Heat exchangers operating in oily or dusty environments will often need to have the coil cooling fins cleaned. Oily or clogged fins should be cleaned by carefully brushing the fins and tubes with water or a non-aggressive degreasing agent mixture *(Note: Cleaning agents that are not compatible with copper, brass, aluminum, steel or stainless steel should not be used)*. A compressed air or a water stream can be used to dislodge dirt and clean the coil further. Any external dirt or oil on the electric motor and fan assembly should be removed. *Caution: Be sure to disconnect the electric motor from its power source prior to doing any maintenance.*

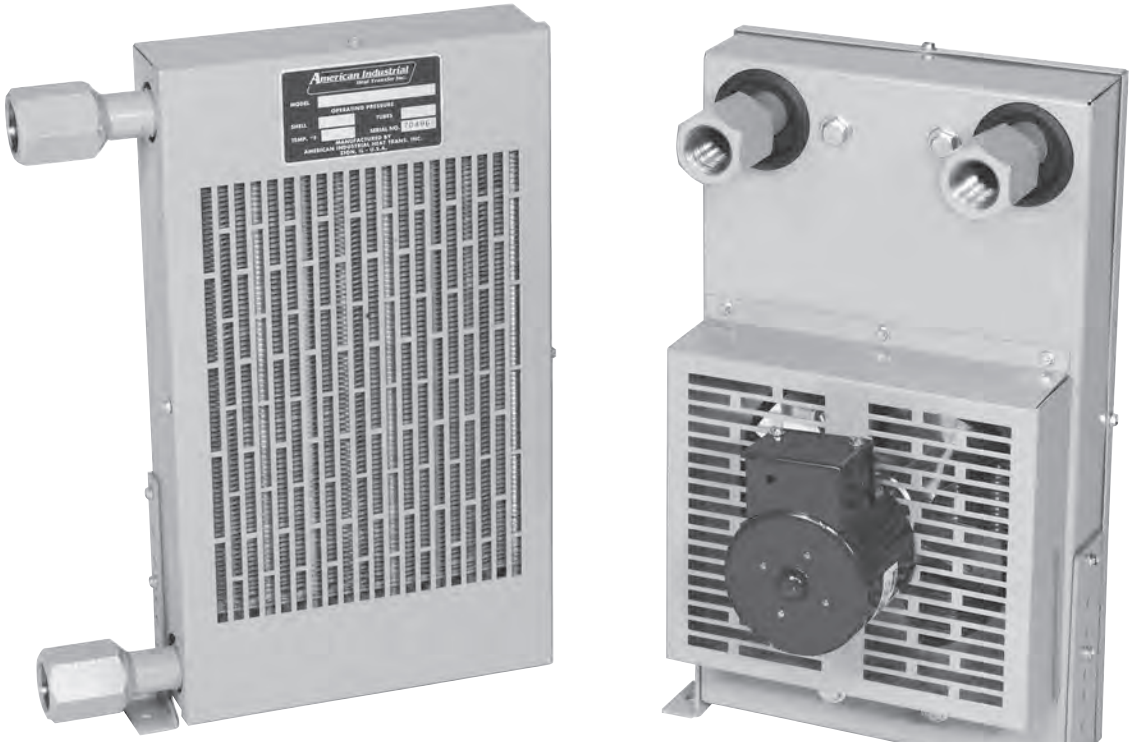
c) In most cases it is not necessary to internally flush the coil. In circumstances where the coil has become plugged or has a substantial buildup of material, flushing the coil with water or a solvent may be done. Flushing solvents should be non-aggressive suitable for the materials of construction. Serviceable Core® models can be disassembled and inspected or cleaned if required.

e) Fan blades should be cleaned and inspected for tightness during the regular maintenance schedule when handling a fan blade care must be given to avoid bending or striking any of the blades. Fan blades are factory balanced and will not operate properly if damaged or unbalanced. Damaged fan blades can cause excessive vibration and severe damage to the heat exchanger or drive motor. Replace any damaged fan with an American industrial suggested replacement.

f) Air cooled exchanger cabinets are constructed using 7ga. through 18ga. steel that may be bent back into position if damaged. Parts that are not repairable can be purchased through American Industrial.

g) Coil fins that become flattened can be combed back into position. This process may require removal of the coil from the cabinet.

h) It is not advisable to attempt repairs to brazed joints of a brazed construction coil unless it will be done by an expert in silver solder brazing. Brazed coils are heated uniformly during the original manufacturing process to prevent weak zones from occurring. Uncontrolled reheating of the coil may result in weakening of the tube joints surrounding the repair area. In many instances brazed units that are repaired will not hold up as well to the rigors of the system as will a new coil. American Industrial will not warranty or be responsible for any repairs done by unauthorized sources. Manipulation in any way other than normal application will void the manufactures warranty.



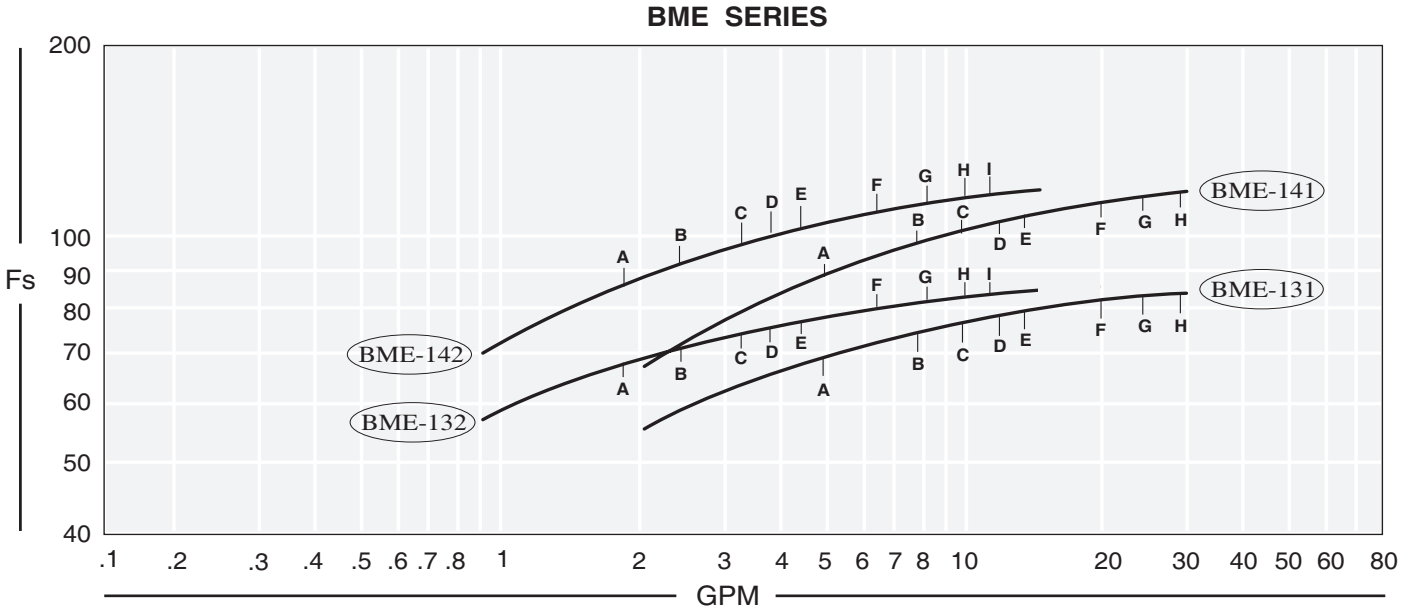
BME - 131 thru BME - 142
SERIES

AIR COOLED

LIQUID COOLERS

- 1/40 HP 115v electric motor.
- Compact design in single or Two Pass.
- Standard NPT or SAE connections.
- Operating temperature of 300°F & pressure of 300PSI.
- Cools case drains, hydraulic presses, bearings gear boxes, hydraulic tools, etc…

BME Series *selection*



PERFORMANCE CALCULATION
$F_s = \frac{\text{Horsepower to be removed (HP) x 2545 x Cv}}{\text{°F (Oil Leaving* - Ambient Air Entering)}} = \frac{\text{BTU}}{\text{hr °F}}$

OIL PRESSURE DROP (PSI) CODE		
A = 1 PSI	D = 4 PSI	G = 15 PSI
B = 2 PSI	E = 5 PSI	H = 20 PSI
C = 3 PSI	F = 10 PSI	I = 25 PSI

*Represents desired fluid leaving the cooler.

Sizing
The performance curves provided are for petroleum oil at 50 ssu viscosity. However, fluids with characteristics other than the above mentioned may be used by applying a correction factor.

Heat Load
If the heat load is unknown, a horsepower value can be calculated by first determining the systems total potential. For a basic hydraulic system, it is helpful to know whether the system is open loop (with a large reservoir) or closed loop (normally on mobile equipment, with a very small reservoir). System potentials may be calculated quickly by using one of the two methods below.

There are some system parameters that will be required to properly accomplish the sizing calculations. Without system parameters it is difficult to determine the optimal heat exchanger size. Normally many of the system parameters can be found on hydraulic schematics or on tags located on the actual equipment. Follow are some basic parameters that you should try to acquire before attempting the sizing calculations. However, it is not necessary to have every parameter listed below.

- Main system flow rate (gpm) & operating pressure (psi).
- Electric motor HP driving hydraulic pump (if more than one add up the Hp for all).
- Desired temperature (°F).
- Fluid type (SAE 10, 20, 30, etc....).
- Ambient air temperature (warmest day).
- Desired fan drive (hydraulic, electric, 12-24V DC, etc...).
- BTU's or HP to be cooled (normally given for lubrication systems).
- Maximum pressure drop allowed through the heat exchanger.
- Space available for heat exchanger (LxWxH).
- External air condition (dirty, papers,etc.)

Method 1
Normally used for open loop circuits. Multiply the main hydraulic systems Electric Motor Name plate Horsepower by a heat removal factor (normally 30-50%).

Example: 5 HP motor x .25 = 1.25 HP heat load

Method 2
Normally used when the HP input potential is unknown or for mobile applications where diesel engines operate the entire system.

Multiply system pressure by the flow rate of the main system divided by 1714 equals system potential (HP). Multiply the system HP by a heat removal factor (Normally 25-35%). Note: In some closed loop systems only a portion of the total system flow is directed through the heat exchanger, this may affect the cooler selection process substantially. You may contact our factory for additional technical assistance.

Example: $\frac{(1700 \text{ psi} \times 5 \text{ gpm})}{1714} = [5 \text{ HP} \times .25] = 1.25 \text{ HP heat load}$

Determining Fs value
To determine the proper size heat exchanger for your application, use the following equation to first determine the (Fs) factor.

$$Fs = \frac{\{\text{heat load (HP) x 2545 x Cv}\}}{\text{°F (oil leaving - air entering)}\}}$$

Example:
Heat load = 1.25 HP
Cv = 1.11 (SAE 20) determined from chart. [Located on page 3.]
Desired operating temperature = 10 ºF
Ambient air temp. = 100 ºF

$$Fs = \frac{\{1.25 \times 2545 \times 1.11\}}{\{140 \text{ °F} - 100 \text{ °F}\}} = 88.3$$

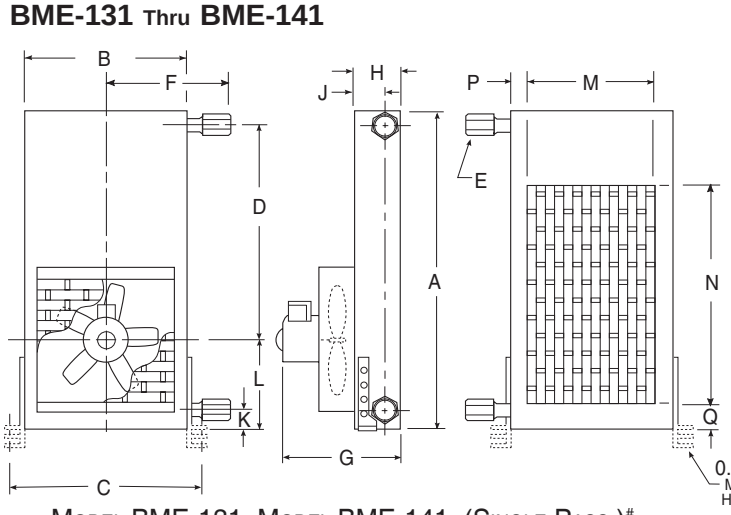
Selection
To select a model, locate the flow rate (GPM) at the bottom of the flow vs Fs graph (on page 4). Proceed upward until the GPM flow rate intersects with the calculated Fs. The curve closest above the intersection point will meet these conditions.

Example: Fs = 88.3 = Model = BME-141
GPM = 5

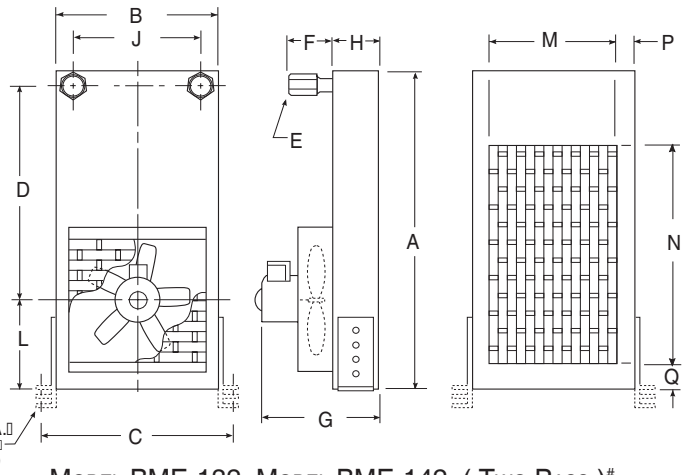
Pressure differentials
Determine the oil pressure drop from the curves as indicated. For viscosities other than 50 ssu, multiply the actual indicated pressure drop for your GPM flow by the value shown in the pressure differential curve for your viscosity value.

Example: Model 141 @ 5 gpm & 50 ssu -curve-
Indicated pressure drop 1 psi (Approx)
{ 1 psi x 2.23Cp (for SAE-20 oil,page 3) } = 2.23 corrected

BME-131 Thru BME-141



MODEL BME-131, MODEL BME-141 (SINGLE PASS)#



MODEL BME-132, MODEL BME-142 (TWO PASS)#

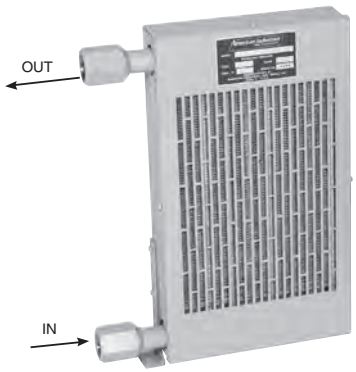
STANDARD DIMENSIONS (inches)																
Model	A	B	C	D	E NPT	E SAE	F	G Dia.	H	J	K	L	M	N	P	Q	Weight LBS
BME - 131	15.75	9.00	10.25	8.50	.75	#12; 1-1/16-12	7.75	7.00	2.22	.94	1.13	5.88	7.50	10.50	0.75	2.31	18.50
BME - 141							2.69			6.00	–						
BME - 132							7.75			94	1.13						
BME - 142							2.69			6.00	–						

STANDARD CONSTRUCTION MATERIALS

Standard Construction Materials			
Tubes	Copper	Mount. bracket	Steel
Fins	Aluminum	Cabinet	Steel
Turbulators	Steel	Fan Blade	Aluminum
Manifold	Steel		

Standard Unit Ratings	
Operating Pressure	300 psig
Operating Temp.	300 °F

Model	Horse Power	Phase	Hz	Volts	RPM	Enclosure Type	Full Load Amperes
BME - 131	1 / 40	1	60	115	1550	T.E.A.O.	1.0
BME - 132	1 / 40	1	60	115	1550	T.E.A.O.	1.0
BME - 141	1 / 40	1	60	115	3000	T.E.A.O.	1.2
BME - 142	1 / 40	1	60	115	3000	T.E.A.O.	1.2



BM-131 & BM-141
(Side Ports)
(Single Pass)

BM-132 & BM-142
(Back Ports)
(Two Pass)

EXAMPLE OF A MODEL

BME - 142 - S

Series — Model — Connections

N = NPT
S = SAE

Receiving / Installation

a) Inspect unit for any shipping damage before uncrating. Indicate all damages to the trucking firms' delivery person and mark it on the receiving bill before accepting the freight. Make sure that the core and fan are not damaged. Rotate the fan blade to make sure that it moves freely. *Since the warranty is based upon the unit date code located on the model identification tag, removal or manipulation of the identification tag will void the manufacturers warranty.*

c) Standard Enamel Coating: American Industrial provides its standard products with a normal base coat of oil base air cure enamel paint. The enamel paint is applied as a temporary protective and esthetic coating prior to shipment. While the standard enamel coating is durable, American Industrial does not warranty it as a long-term finish coating. It is strongly suggested that a more durable final coating be applied after installation or prior to long-term storage in a corrosive environment to cover any accidental scratches, enhance esthetics, and further prevent corrosion. It is the responsibility of the customer to provide regular maintenance against chips, scratches, etc... and regular touch up maintenance must be provided for long-term benefits and corrosion prevention.

d) Special Coatings: American Industrial offers as customer options, Air-Dry Epoxy, and Heresite (Air-Dry Phenolic) coatings at additional cost. American Industrial offers special coatings upon request, however American Industrial does not warrantee coatings to be a permanent solution for any equipment against corrosion. It is the responsibility of the customer to provide regular maintenance against chips, scratches, etc... and regular touch up maintenance must be provided for long-term benefits and corrosion prevention.

e) American Industrial recommends that the equipment supplied should be installed by qualified personnel who have solid understanding of system design, pressure and temperature ratings, and piping assembly. Verify the service conditions of the system prior to applying any air cooled heat exchanger series cooler. If the system pressure or temperature does not fall within the parameters on model rating tag located on the heat exchanger, contact our factory prior to installation or operation.

g) Heat exchanger should be securely fastened using the mounting foot brackets (included). All mounting holes should be used to secure unit into place.

h) Connections should be made in "one pass" or "Two Pass" configurations exactly as indicated in the "piping hook up" illustration. The process flow entering the "Fluid IN" port and exiting the "Fluid OUT" port eliminates air pockets and assures that the unit will stay completely flooded. Flexible hose can be applied to reduce the risk of core failure due to thermal expansion or system vibration. Piping alignment and support is required for hoses longer than four feet in length and for piping exerting more than 10 lbs of dynamic force. It is recommended that filtration be located ahead of the heat exchanger to prevent excessive backpressure and clogging.

i) With respect to the heat exchangers nozzle size, flow line sizes should be sized to handle the appropriate flow rate and system pressure drop requirements, normally flow line rates of about 8-12 feet per second and inlet pressure less than 100psig are experienced. If the flow line size is larger than the heat exchanger nozzle size, additional pressure loss beyond the published pressure loss data may occur.

j) Electric motors should be connected only to supply source of the same characteristics as indicated on the electric motor information plate. Prior to starting, verify that the motor and fan spin freely without obstruction. Check carefully that the fan turns in the correct rotation direction (normally counter clockwise) from the motor side (fan direction arrow). Failure to operate the fan in the proper direction could reduce performance or cause serious damage to the heat exchanger or other components.

k) Solely at the request of customers, American Industrial provides direct acting internal inlet port to outlet port bypass relief valves as an additional safe guard against excessive flow and over pressurization of the heat exchanger. American Industrial purchases and applies high quality hydraulic system cartridge valves and components made available for hydraulic system use. However, American Industrial does not specify, recommend, suggest, guarantee, or warrantee the internal relief valve or its performance to safe guard the heat exchanger from damage or prevent failure due to excessive flow or over pressurization. It is the ultimately the sole responsibility of the customer/user to verify with the original equipment manufacture all conditions associated with applying an additional system relief valve prior to application.

Maintenance

Regular maintenance intervals based upon the surrounding and operational conditions should be maintained to verify equipment performance and to prevent premature component failure. Since some of the components such as, motors, fans, etc... are not manufactured by American Industrial, maintenance requirements provided by the manufacture must be followed.

a) Inspect the entire heat exchanger and motor/fan assembly for loosened bolts, loose connections, broken components, rust spots, corrosion, fin/coil clogging, or external leakage. Make immediate repairs to all affected areas prior to restarting and operating the heat exchanger or its components.

b) Heat exchangers operating in oily or dusty environments will often need to have the coil cooling fins cleaned. Oily or clogged fins should be cleaned by carefully brushing the fins and tubes with water or a non-aggressive degreasing agent mixture *(Note: Cleaning agents that are not compatible with copper, brass, aluminum, steel or stainless steel should not be used)*. A compressed air or a water stream can be used to dislodge dirt and clean the coil further. Any external dirt or oil on the electric motor and fan assembly should be removed. *Caution: Be sure to disconnect the electric motor from its power source prior to doing any maintenance.*

c) In most cases it is not necessary to internally flush the coil. In circumstances where the coil has become plugged or has a substantial buildup of material, flushing the coil with water or a solvent may be done. Flushing solvents should be non-aggressive suitable for the materials of construction. Serviceable Core® models can be disassembled and inspected or cleaned if required.

e) Fan blades should be cleaned and inspected for tightness during the regular maintenance schedule when handling a fan blade care must be given to avoid bending or striking any of the blades. Fan blades are factory balanced and will not operate properly if damaged or unbalanced. Damaged fan blades can cause excessive vibration and severe damage to the heat exchanger or drive motor. Replace any damaged fan with an American industrial suggested replacement.

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g) Coil fins that become flattened can be combed back into position. This process may require removal of the coil from the cabinet.

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BM SERIES

BM - 201 thru BM - 322
SERIES

BM - 101 & BM - 102
SERIES

AIR COOLED

LIQUID COOLERS

- Mounts directly to TEFC electric motor.
- Fits NEMA frame sizes 48 through 365.
- Standard NPT or SAE connections.
- Operating temperature of 300°F & pressure of 300PSI.
- Cools case drains, hydraulic presses, bearings gear boxes, hydraulic tools, etc…

MODELS TO ACCOMMODATE
ELECTRIC MOTOR NEMA FRAME SIZES

48 - 184	213 - 256	254 - 286	324 - 365
BM - 101	BM - 201	BM - 301	BM - 321
BM - 102	BM - 202	BM - 302	BM - 322

note: AIHTI reserves the right to make reasonable design changes without notice.

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BM Series *selection*

SIZING
To properly size a BM TEFC Motor air-cooled oil cooler for industrial equipment, you should first determine some basic parameters associated with your system.

HEAT LOAD
In many instances the heat load must be determined by using a "total potential" method. This total potential or horse power method is the most common method, and is the simplest way to determine basic heat rejection requirements for hydraulic systems. The total potential is equal to the maximum operating flow and pressure that are generated by the system under full load. To determine the total potential (HP) use the following formula. Note: If the electric motor horsepower of the system prime mover is known, use it as your system potential.

HP = [System Pressure (PSI) x System flow (GPM)] / 1714

Examples:
(1) 7.5 HP 254T frame electric motor driving a pump = 7.50 HP potential
(1) HP = (1250 PSI x 10 GPM) / 1714 = 7.30 HP or the total input potential

To determine the system heat load in BTU / HR we must use a percentage (v) of the system potential HP. The factor (v) can be calculated by adding up the actual inefficencies of a system; however, for most applications a (v) value of 25% - 30% can be used.

Example: 7.50 HP x .30 = 2.25 HP heat

To convert the horsepower of heat into BTU/HR use the formula below:
HP x 2542 = BTU/HR

Example: 2.25 HP Heat x 2545 = 5,729 BTU/HR

Applying into a return line
For most open loop systems with vane or gear type fixed delivery pumps. To calculate the Fs value required when applying the air/oil cooler into a return line use the formula below:

$$Fs = \frac{BTU/\ HR \times Cv}{T - t_{ambient}} \qquad \text{Example} = \frac{5729 \times 1.08}{140 - 90} = 123.7\ Fs$$

T = Desired system oil temperature leaving the cooler °F

$t_{ambient}$ = Ambient air temperature entering the cooler °F

Cv = Correction factor for oil viscosity. Example: ISO32 oil @140°F = 1.08

(see chart)

APPLYING INTO A CASE LINE
In circumstances where the system is a closed loop, or when return line flow is not available, the case drain flow can be utilized to help cool the system. However, in many instances, the case drain flow alone will not be enough to reject all of the heat generated by the system. Case drain lines should not be treated as a normal return lines since the pressure drop allowable usually can vary from 2 - 10 PSI max. Check with your pump manufacturer for the appropriate pressure drop tolerance before applying any cooler. To size the system for case flow or case flow plus any additional flushing loops, please use the following method. Closed loop case drain operating temperatures are normally higher than open loop circuit return line temperatures.

Formula
Tc_{exit} = { T - [Q / (case flow gpm x 210)]}

Example
Tc_{exit} = { 155 - [5,729 / (3 x 210)]} = 145.9

Tc_{exit} = The corrected temperature of the oil exiting the cooler.

$$Fs = \frac{Q \times Cv}{Tc_{exit} - t_{ambient}} \qquad \frac{5{,}729 \times 1.08}{145.9 - 90} = 101.6$$

SELECTION
To select a model, locate the flow rate (GPM) at the bottom of the flow vs Fs graph. Proceed upward until the GPM intersects with the calculated Fs. The curve closest above the intersection point will meet these conditions.

Examples:

Return Line	Case Drain
Fs = 123.7	Fs = 101.6
GPM = 10 "return line flow"	GPM = 3.0
Motor size = 324 frame	Motor size = 254T frame
Model = BM - 321	Model = BM - 302

PRESSURE DROP
Determine the oil pressure drop from the curves as indicated. For viscosities other than 50 sus at operating, multiply the actual indicated pressure drop (psi) for your GPM by the value in the pressure differential chart for your viscosity.

Examples:	GPM = 10	GPM = 3
Indicated pressure drop	1.4 PSI	1 PSI
Cp correction factor for ISO 32 oil @ 140°F	1.23	1.23
Pressure drop correction	1.4x1.23 = 1.72 psi	1.0x1.23 = 1.23 psi

AIR FLOW CORRECTION CHART
In some instances our units are applied to motors or application where additional or less air flow is available than the flows used for our performance curves. In these instances you can use our air flow correction curves to determine if one of the existing models will work for your application.

Example:
Follow the preceding examples to properly determine your required Fs. Use the following formula to correct for the difference in air-flow rate. If the calculated Fs = 123.7 and the electric motor were a 1800 rpm 326 frame motor with 250 cfm of air flow, correct as shown. Select the correction factor Cf only from the curve that matches to your electric motor frame size properly. Note: Using a unit that is to small may damage your electric motor due to lack adequate of air flow.

Formula	Example
Fs x Cf = CFs (corrected)	CFs = 123.7 x 1.50 (from curve) = 185.6 CFs

Average Liquid Temperature	Cv VISCOSITY CORRECTION FACTORS																
	SAE 5	SAE 10	SAE 20	SAE 30	SAE 40	ISO 22	ISO 32	ISO 46	ISO 68	ISO 100	ISO 150	ISO 220	ISO 320	MIL-L 7808	POLY-GLYCOL	PHOS-PHATE ESTER	50% ETHY-LENE GLYCOL &WATER
100	1.11	1.15	1.25	1.38	1.45	1.08	1.14	1.18	1.26	1.37	1.43	1.56	1.84	1.19	0.92	0.83	0.85
110	1.09	1.12	1.20	1.32	1.40	1.06	1.13	1.16	1.25	1.31	1.39	1.48	1.67	1.14	0.89	0.80	0.84
120	1.06	1.10	1.17	1.27	1.35	1.04	1.11	1.14	1.20	1.27	1.35	1.40	1.53	1.09	0.88	0.79	0.84
130	1.04	1.08	1.13	1.24	1.29	1.03	1.09	1.13	1.17	1.24	1.30	1.34	1.44	1.05	0.85	0.77	0.83
140	1.03	1.05	1.11	1.19	1.25	1.02	1.08	1.10	1.16	1.20	1.26	1.30	1.39	1.03	0.84	0.76	0.82
150	1.01	1.04	1.09	1.16	1.22	1.02	1.06	1.09	1.13	1.17	1.22	1.27	1.33	1.01	0.83	0.74	0.82
200	0.98	0.99	1.01	1.04	1.07	0.98	0.99	1.00	1.01	1.02	1.08	1.09	1.14	0.98	0.79	0.71	0.80
250	0.95	0.96	0.97	0.98	0.99	0.95	0.96	0.96	0.96	0.97	0.99	1.01	1.02	0.97	0.76	0.69	0.79

Average Liquid Temperature	Cp PRESSURE DROP CORRECTION FACTORS																
	SAE 5	SAE 10	SAE 20	SAE 30	SAE 40	ISO 22	ISO 32	ISO 46	ISO 68	ISO 100	ISO 150	ISO 220	ISO 320	MIL-L 7808	POLY-GLYCOL	PHOS-PHATE ESTER	50% ETHY-LENE GLYCOL &WATER
100	2.00	2.40	4.40	6.40	8.80	1.07	1.53	1.82	2.54	4.19	6.44	9.38	13.56	1.26	3.00	3.50	0.730
110	1.70	2.10	3.60	5.10	6.70	1.04	1.45	1.72	2.35	3.73	5.70	8.33	11.63	1.20	2.40	2.90	0.720
120	1.50	1.80	3.00	4.20	5.60	1.02	1.38	1.60	2.15	3.26	4.91	7.23	9.73	1.14	2.10	2.50	0.709
130	1.40	1.60	2.60	3.40	4.50	0.99	1.30	1.49	1.94	2.80	4.14	6.19	7.80	1.08	1.90	2.20	0.698
140	1.30	1.50	2.23	2.90	3.70	0.97	1.23	1.38	1.75	2.38	3.47	5.20	6.11	1.03	1.90	2.00	0.686
150	1.20	1.30	1.90	2.50	3.10	0.95	1.17	1.30	1.61	2.04	2.90	4.35	4.77	0.98	1.70	1.90	0.676
200	0.93	0.96	1.20	1.40	1.60	0.89	0.99	1.08	1.18	1.33	1.59	1.74	1.95	0.90	1.20	1.30	0.635
250	0.81	0.82	0.92	0.97	1.05	0.85	0.93	0.96	1.03	1.11	1.21	1.22	1.23	0.83	1.00	1.05	0.556

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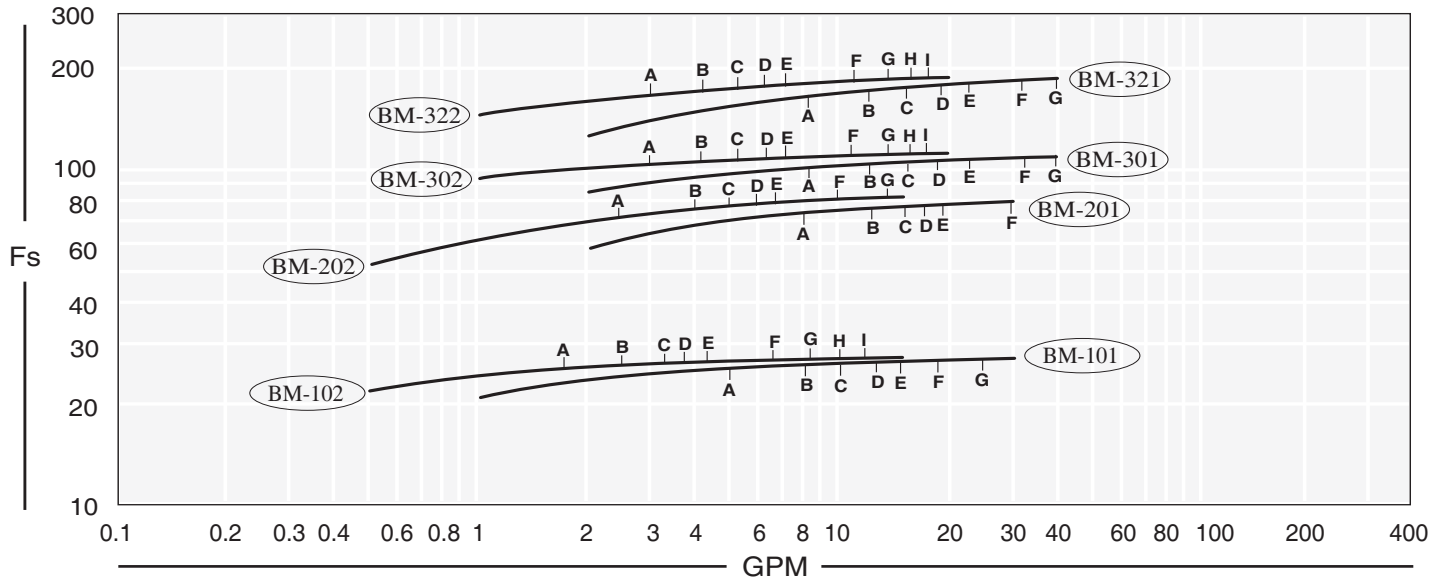
BM SERIES



PERFORMANCE CALCULATION
$F_s = \frac{\text{Horsepower to be removed (HP) x 2545 x Cv}}{\text{°F (Oil Leaving* - Ambient Air Entering)}} = \frac{\text{BTU}}{\text{hr °F}}$

*Represents desired fluid leaving the cooler.

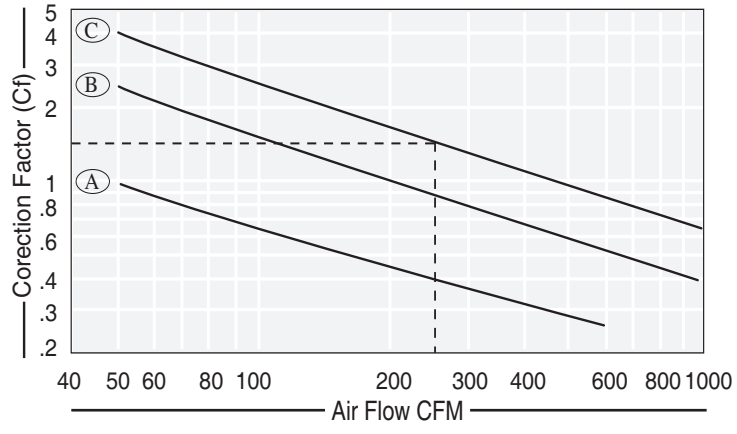
OIL PRESSURE DROP (PSI) CODE		
A = 1 PSI	D = 4 PSI	G = 15 PSI
B = 2 PSI	E = 5 PSI	H = 20 PSI
C = 3 PSI	F = 10 PSI	I = 25 PSI

Note:
Performance curves are based upon petroleum oil at 50 sus. For average oil viscosities other than 50 sus, use the correction factors Cv & Cp located on page 3. If the above models can not meet your cooling needs, please refer to our fan cooled models.

Standard Construction Materials			
Tubes	Copper	Manifold	Steel
Fins	Aluminum	Mount. bracket	Steel
Turbulators	Steel	Cabinet	Steel

Standard Unit Ratings	
Operating Pressure	300 psig
Operating Temp.	400 °F

Air Flow Correction Chart



ELECTRIC MOTOR NEMA FRAME SIZES

Curve A	Curve B		Curve C
48 - 184	213 - 256	254 - 286	324 - 365
BM - 101	BM - 201	BM - 301	BM - 321
BM - 102	BM - 202	BM - 302	BM - 322

EXAMPLE OF A MODEL

BM - 302 - S

Series — Model — Connections

N = NPT
S = SAE

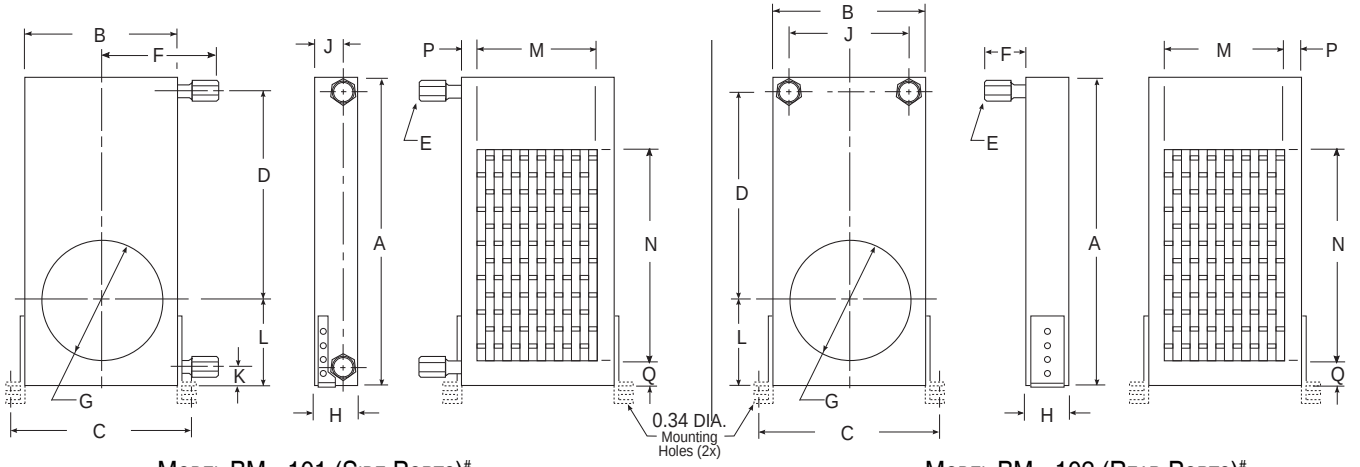
Use the following formula to correct for airflow rates for the given curves A,B, or C (as it is shown in the above dotted line graph).

Formula
Fs x C*f* = CFs (corrected Fs)

Example
123.7 x 1.50 (from curve) = 185.6 CFs

BM Series *dimensions*

BM-101 or BM-102 can be used for electric motor NEMA frame size 48-184

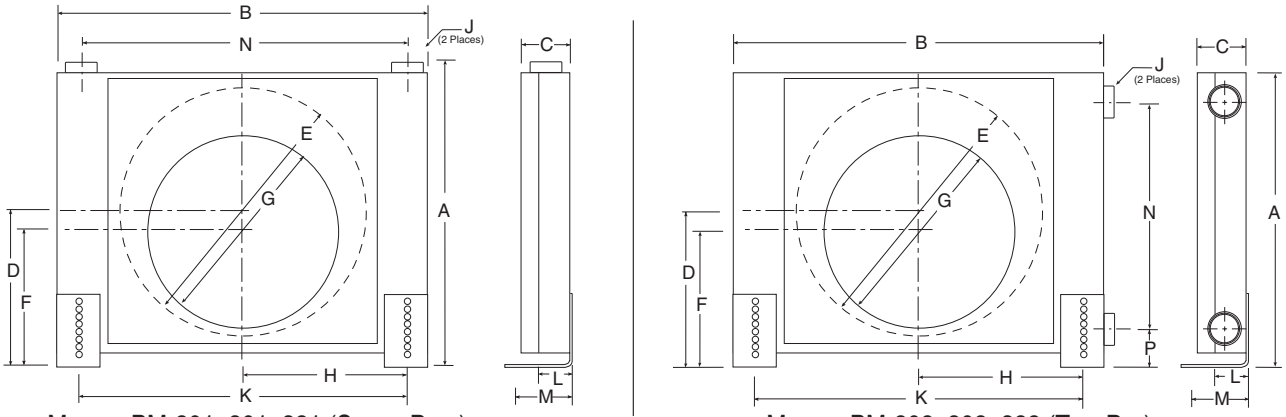


MODEL BM - 101 (SIDE PORTS)#

MODEL BM - 102 (REAR PORTS)#

STANDARD DIMENSIONS (inches)																	
Model	A	B	C	D	E NPT	E SAE	F	G Dia.	H	J	K	L	M	N	P	Q	Weight LBS
BM - 101	15.75	9.00	10.25	8.50	.75	#12	7.75	7.00	2.22	.94	1.13	5.88	7.50	10.50	0.75	2.31	14.50
BM - 102							2.69			6.00	–						14.50

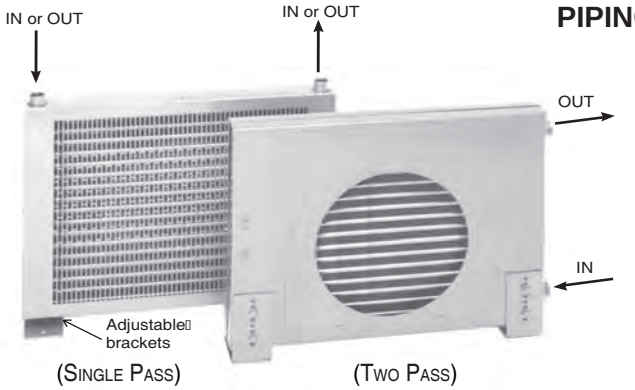
BM-201 thru BM-322 can be used for electric motor NEMA frame size 213-365



MODELS BM-201, 301, 321 (SINGLE PASS)

MODELS BM-202, 302, 322 (TWO PAS)

STANDARD DIMENSIONS (inches)																
Model	A	B	C	D	E Dia.	F	G Dia.	H	J NPT	J SAE	K	L	M	N	P	Weight LBS
BM - 201	14.90	16.50	2.75	7.33	12.62	5.13	8.00	7.38	.75	#12;1-1/16-12	14.75	.50	1.94	14.62	–	14
BM - 202	13.75	16.50	2.75	7.33	12.62	5.13	8.00	7.38	.75	#12;1-1/16-12	14.75	.50	1.94	8.00	3.19	14
BM - 301	19.50	24.80	2.75	9.75	14.62	8.19	12.00	10.72	.75	#12;1-1/16-12	21.44	.88	3.38	22.88	–	30
BM - 302	18.69	24.80	2.75	9.75	14.62	8.19	12.00	10.72	.75	#12;1-1/16-12	21.44	.88	3.38	14.00	2.62	30
BM - 321	19.50	24.80	2.75	9.75	17.00	9.75	14.62	10.72	.75	#12;1-1/16-12	21.44	.88	3.38	22.88	–	30
BM - 322	18.69	24.80	2.75	9.75	17.00	9.75	14.62	10.72	.75	#12;1-1/16-12	21.44	.88	3.38	14.00	2.62	30



(SINGLE PASS) (TWO PASS)

PIPING HOOK-UP

Note:

To obtain the best performance place the opening of the unit against the fan air intake of the motor. Use a gasket or calking compound around the joint to prevent air from leaking out from around the edges.

note: AIHTI reserves the right to make reasonable design changes without notice.

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Receiving / Installation

a) Inspect unit for any shipping damage before uncrating. Indicate all damages to the trucking firms' delivery person and mark it on the receiving bill before accepting the freight. Make sure that the core and fan are not damaged. Rotate the fan blade to make sure that it moves freely. *Since the warranty is based upon the unit date code located on the model identification tag, removal or manipulation of the identification tag will void the manufacturers warranty.*

c) Standard Enamel Coating: American Industrial provides its standard products with a normal base coat of oil base air cure enamel paint. The enamel paint is applied as a temporary protective and esthetic coating prior to shipment. While the standard enamel coating is durable, American Industrial does not warranty it as a long-term finish coating. It is strongly suggested that a more durable final coating be applied after installation or prior to long-term storage in a corrosive environment to cover any accidental scratches, enhance esthetics, and further prevent corrosion. It is the responsibility of the customer to provide regular maintenance against chips, scratches, etc... and regular touch up maintenance must be provided for long-term benefits and corrosion prevention.

d) Special Coatings: American Industrial offers as customer options, Air-Dry Epoxy, and Heresite (Air-Dry Phenolic) coatings at additional cost. American Industrial offers special coatings upon request, however American Industrial does not warrantee coatings to be a permanent solution for any equipment against corrosion. It is the responsibility of the customer to provide regular maintenance against chips, scratches, etc... and regular touch up maintenance must be provided for long-term benefits and corrosion prevention.

e) American Industrial recommends that the equipment supplied should be installed by qualified personnel who have solid understanding of system design, pressure and temperature ratings, and piping assembly. Verify the service conditions of the system prior to applying any air cooled heat exchanger series cooler. If the system pressure or temperature does not fall within the parameters on model rating tag located on the heat exchanger, contact our factory prior to installation or operation.

g) Heat exchanger should be securely fastened using the mounting foot brackets (included). All mounting holes should be used to secure unit into place.

h) Connections should be made in "one pass" or "Two Pass" configurations exactly as indicated in the "piping hook up" illustration. The process flow entering the "Fluid IN" port and exiting the "Fluid OUT" port eliminates air pockets and assures that the unit will stay completely flooded. Flexible hose can be applied to reduce the risk of core failure due to thermal expansion or system vibration. Piping alignment and support is required for hoses longer than four feet in length and for piping exerting more than 10 lbs of dynamic force. It is recommended that filtration be located ahead of the heat exchanger to prevent excessive backpressure and clogging.

i) With respect to the heat exchangers nozzle size, flow line sizes should be sized to handle the appropriate flow rate and system pressure drop requirements, normally flow line rates of about 8-12 feet per second and inlet pressure less than 100psig are experienced. If the flow line size is larger than the heat exchanger nozzle size, additional pressure loss beyond the published pressure loss data may occur.

j) Electric motors should be connected only to supply source of the same characteristics as indicated on the electric motor information plate. Prior to starting, verify that the motor and fan spin freely without obstruction. Check carefully that the fan turns in the correct rotation direction (normally counter clockwise) from the motor side (fan direction arrow). Failure to operate the fan in the proper direction could reduce performance or cause serious damage to the heat exchanger or other components.

k) Solely at the request of customers, American Industrial provides direct acting internal inlet port to outlet port bypass relief valves as an additional safe guard against excessive flow and over pressurization of the heat exchanger. American Industrial purchases and applies high quality hydraulic system cartridge valves and components made available for hydraulic system use. However, American Industrial does not specify, recommend, suggest, guarantee, or warrantee the internal relief valve or its performance to safe guard the heat exchanger from damage or prevent failure due to excessive flow or over pressurization. It is the ultimately the sole responsibility of the customer/user to verify with the original equipment manufacture all conditions associated with applying an additional system relief valve prior to application.

Maintenance

Regular maintenance intervals based upon the surrounding and operational conditions should be maintained to verify equipment performance and to prevent premature component failure. Since some of the components such as, motors, fans, etc... are not manufactured by American Industrial, maintenance requirements provided by the manufacture must be followed.

a) Inspect the entire heat exchanger and motor/fan assembly for loosened bolts, loose connections, broken components, rust spots, corrosion, fin/coil clogging, or external leakage. Make immediate repairs to all affected areas prior to restarting and operating the heat exchanger or its components.

b) Heat exchangers operating in oily or dusty environments will often need to have the coil cooling fins cleaned. Oily or clogged fins should be cleaned by carefully brushing the fins and tubes with water or a non-aggressive degreasing agent mixture *(Note: Cleaning agents that are not compatible with copper, brass, aluminum, steel or stainless steel should not be used)*. A compressed air or a water stream can be used to dislodge dirt and clean the coil further. Any external dirt or oil on the electric motor and fan assembly should be removed. *Caution: Be sure to disconnect the electric motor from its power source prior to doing any maintenance.*

c) In most cases it is not necessary to internally flush the coil. In circumstances where the coil has become plugged or has a substantial buildup of material, flushing the coil with water or a solvent may be done. Flushing solvents should be non-aggressive suitable for the materials of construction. Serviceable Core® models can be disassembled and inspected or cleaned if required.

e) Fan blades should be cleaned and inspected for tightness during the regular maintenance schedule when handling a fan blade care must be given to avoid bending or striking any of the blades. Fan blades are factory balanced and will not operate properly if damaged or unbalanced. Damaged fan blades can cause excessive vibration and severe damage to the heat exchanger or drive motor. Replace any damaged fan with an American industrial suggested replacement.

f) Air cooled exchanger cabinets are constructed using 7ga. through 18ga. steel that may be bent back into position if damaged. Parts that are not repairable can be purchased through American Industrial.

g) Coil fins that become flattened can be combed back into position. This process may require removal of the coil from the cabinet.

h) It is not advisable to attempt repairs to brazed joints of a brazed construction coil unless it will be done by an expert in silver solder brazing. Brazed coils are heated uniformly during the original manufacturing process to prevent weak zones from occurring. Uncontrolled reheating of the coil may result in weakening of the tube joints surrounding the repair area. In many instances brazed units that are repaired will not hold up as well to the rigors of the system as will a new coil. American Industrial will not warranty or be responsible for any repairs done by unauthorized sources. Manipulation in any way other than normal application will void the manufactures warranty.

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"Y" STRAINER (for Shell & Tube Heat Exchangers And Air/Oil Coolers)

APPLICATIONS & SPECS. ("Y" Strainers)

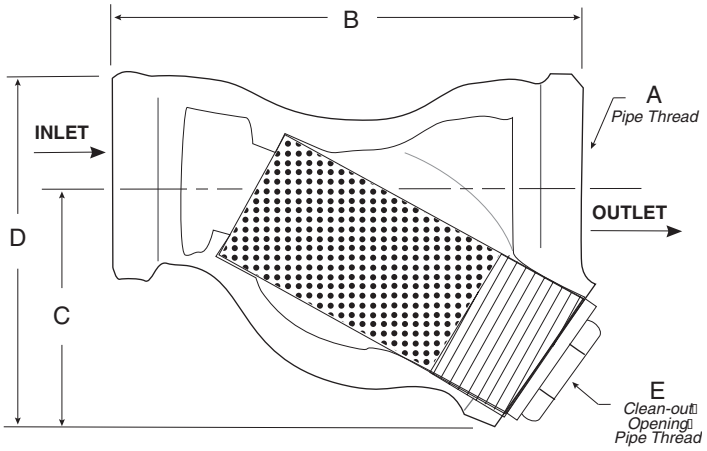
These strainers are engineered for water or steam, and are adaptable for many other uses. Cleaning is accomplished by simply removing a pipe plug without disconnecting any piping. Or, if it is desirable to clean without interrupting service, a blow-off valve can be connected to the clean-out opening. ***Note:*** Pumps, control valves, traps, or other equipment controlling the flow of liquids or gases require proper protection with strainers for trouble free operation.

18 - Y BRASS STRAINERS

The 18 - Y strainer body is a sturdy red brass casting. Standard units have 50 mesh brass wire screens. Brazing connections are available on special order instead of pipe threads.

20 - Y STRAINERS

The 20 - Y strainer has a heavy cast iron body with accurately machined pipe thread inlet and outlet (National Pipe Thread N.P.T.). It contains a strainer screen of 0.02" thick brass with 100, 1/16" perforations per inch.



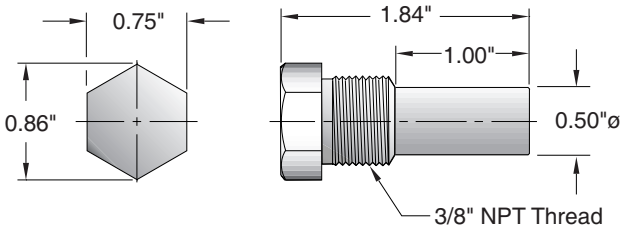
MODEL	SIZE A (NPT)	DIMENSIONS (Inches) B	C	D	E (NPT)	WT. (lbs.)
18 - Y RED BRASS	0.38"	2.50"	2.63"	2.00"	0.25"	0.75
	0.50"	2.50"	2.63"	2.00"	0.25"	0.75
	0.75"	3.50"	3.75"	2.75"	0.50"	1.75
	1.00"	3.50"	3.75"	2.75"	0.50"	1.75
20 - Y CAST IRON	0.50"	4.00"	3.25"	2.50"	0.38"	1.75
	0.75"	4.00"	3.25"	2.50"	0.38"	1.75
	1.00"	4.75"	4.38"	3.38"	0.75"	4.00
	1.25"	6.00"	5.13"	3.88"	0.75"	4.75
	1.50"	6.00"	5.13"	3.88"	0.75"	4.75
	2.00"	8.13"	6.38"	4.63"	0.75"	13.00
PRESSURE RATINGS, ALL MODELS: 125lbs. per Sq.In.						

Part Number	Description	
	Size NPT	Material
310-3002	1/2"	Cast Iron
310-3004	3/4"	
310-3006	1"	
310-3008	1-1/4"	
310-3009	1-1/2"	
310-3010	2"	
310-3011	2-1/2"	
310-3012	3"	

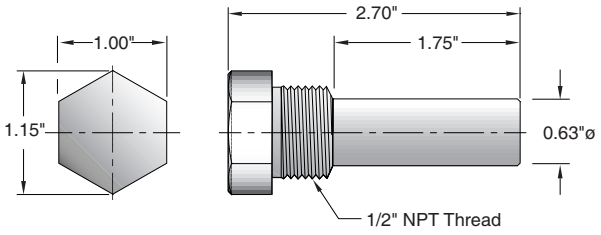
Part Number	Description	
	Size NPT	Material
310-3001	3/8"	Red Brass
310-3003	1/2"	
310-3005	3/4"	
310-3007	1"	
310-3013	1-1/4"	
310-3014	1-1/2"	
310-3015	2	
310-3016	2-1/2"	
310-3017	3"	

ZINC ANODE

For 2" to 5" diameter heat exchanger
Part Number 301-0004



For 6" and up diameter heat exchanger
Part Number 301-0003



note: AIHTI reserves the right to make reasonable design changes without notice.

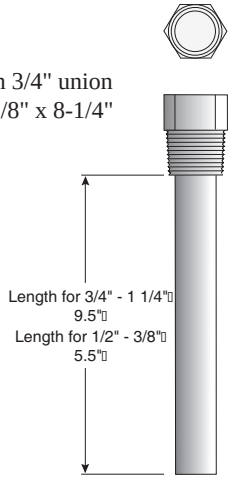
355 American Industrial Drive LaCrosse, VA 23950 tel: 434-757-1800 fax: 434-757-1810 email: sales@aihti.com

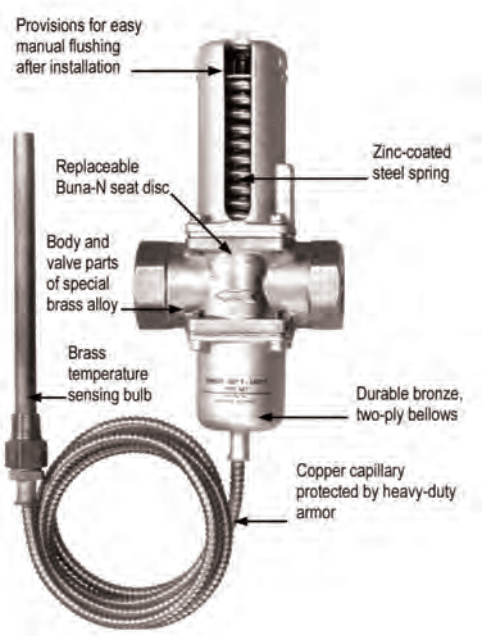
56T THERMOSTATIC MODULATING WATER VALVE WITH BULB WELL ASSEMBLY

(for Shell & Tube Heat Exchangers And Air/Oil Coolers)

SPECIFICATIONS

Sizes	0.375", 0.50", 0.75", 1.00", 1.25" FPT
Fluid Pressure	125psi (max.)
Standard Temperature	40° - 100° F., 60° - 140° F., 100° - 175° F., 125° - 200° F., 140° - 240° F., 200° - 275°F.
Body	Brass alloy casting
Valve Parts	Brass alloy
Standard Capillary Length	6' & 20' foot
Standard Bulbs	For 3/8" & 1/2" valve sizes: 5/8" x 6 with 3/4" union connections. For 3/4" & 1" valve sizes: 5/8" x 8-1/4" with 3/4" union connections. Stainless steel construction available.
Standard Bulb Mounting	3/4" NPT
Seat Disk	Buna-N-replaceable
Seat Bead	Stainless Steel - replaceable





APPLICATION INFORMATION

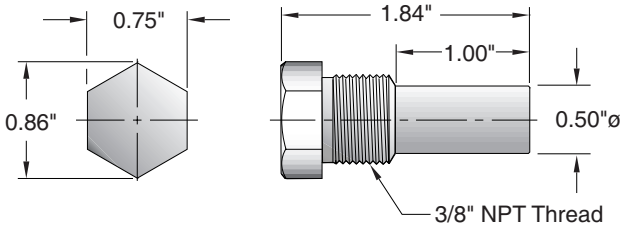
- Built for rugged machine tool and hydraulic applications.
- Adjustable temperature range to meet your requirements.
- Quick response to temperature changes.
- Extra heavy-duty direct acting bellows for longer service.

Note: Please consult factory if a non-cataloged temperature is required.

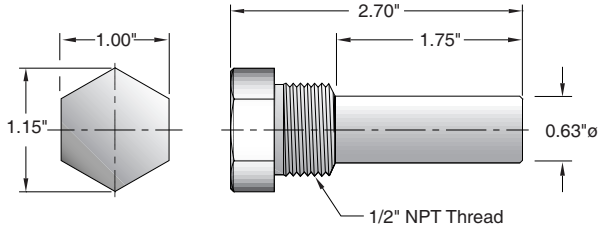
The type 56-T valve gives smooth regulation of water and other fluids. It's designed for the most rugged application. For example: hydraulic power packaging equipment, hydraulic presses, plastic molding equipment, and anywhere reliability in temperature control is demanded. The type 56-t valve is a better designed product that won't leak or chatter. To insure dependability, every valve is factory tested three times in different temperature baths. Extra performance can be expected of the bellows also. They are direct acting with sturdy walls, and the inner spring is zinc coated. The seat beads are stainless steel to resist the erosive effects of *wire drawing* and provide longer life for your needs. Additional features include mounting in any position, Buna-N seat disc, and manual flushing.

Part Number	Thermostatic Modulating Water Valve		Optional Bulb Well	
	Size NPT	Temp. Range	Brass	Stainless Steel
310-1001	3/8"	60 °F - 140 °F	310-2001	310-2003
310-1004	1/2"	60 °F - 140 °F	310-2001	310-2003
310-1008	3/4"	60 °F - 140 °F	310-2002	310-2004
310-1014	1"	60 °F - 140 °F	310-2002	310-2004
310-1020	1-1/4"	60 °F - 140 °F	310-2002	310-2004
310-1046	1-1/2"	60 °F - 140 °F	Bulb Well Not Available	
310-1047	2"	60 °F - 140 °F	Bulb Well Not Available	
310-1025	3/8"	100 °F - 175 °F	310-2001	310-2003
310-1005	1/2"	100 °F - 175 °F	310-2001	310-2003
310-1010	3/4"	100 °F - 175 °F	310-2002	310-2004
310-1015	1"	100 °F - 175 °F	310-2002	310-2004
310-1026	1-1/4"	100 °F - 175 °F	310-2002	310-2004

For 2" to 5" diameter heat exchanger
Part Number 301-0004



For 6" and up diameter heat exchanger
Part Number 301-0003



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ELECTRICAL TEMPERATURE CONTROLLER WITH BULB WELL ASSEMBLY (for Air/Oil Coolers)

SPECIFICATIONS:
A) Material: Stainless Steel
B) Power Limits:
1)For three phase motor operation, use only with a magnetic starter, 125 VA max. (VA =volts x amps)
2)For pilot duty, 125 VA max.
120v AC/8.0 amps max 230v AC/5.1 amps max
277v AC/4.2 amps max 460v AC/2.0 amps max
3)Temperature operating range: -40°F to 212°F.

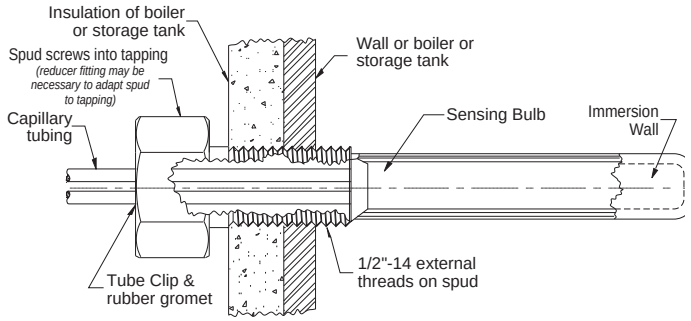
Part Number	Description
310-4011 (old part number 310-4001)	TC-511 with 6-Foot Capallary Tube & Bulb Well
310-4002	TC-511 with 20-Foot Capallary Tube & Bulb Well
310-2025 (old part number 310-2005)	Replacement Bulb Well TC-511

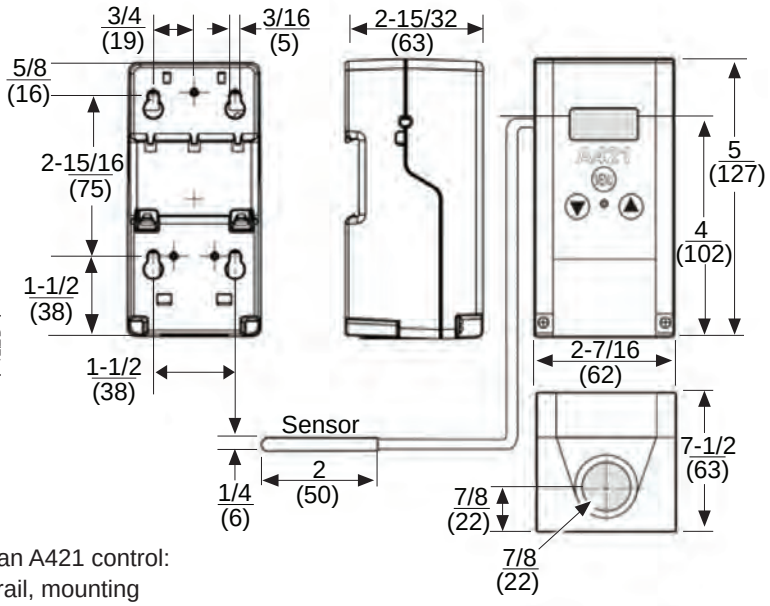
APPLICATIONS (Temperature Controller)

The A421 Series Electronic Temperature Controls are single-stage, electronic temperature controls with a single-pole, double-throw (SPDT) output relay. A421 controls feature a backlit LCD with adjustable brightness and three-button touchpad interface that can be set up to restrict user adjustments. An LED indicates the output relay's On/Off status. A421 controls have simple On and Off temperature settings for heating or cooling, an adjustable anti-short cycle delay, temperature setback, and sensor offset capability.

INSTALLATION
When installing this product:
1. Read instructions carefully. Failure to follow the instructions could damage the product or cause a hazardous condition.
2. Check the ratings given in the instructions and on the product to make sure the product is suitable for your application.
3. Installer must be a trained, experienced service technician.
4. After installation is complete, check out product operation as provided in the instructions.

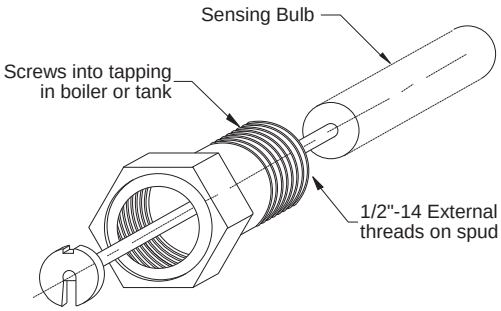
ELECTRICAL RATINGS:
See Installation Instruction Manual





LOCATION AND MOUNTING.

Observe the following guidelines when locating and mounting an A421 control:
- Ensure that the mounting surface can support the control, DIN rail, mounting hardware, and any (user-supplied) panel or enclosure.
- Mount the control in a vertical, upright orientation wherever possible. DIN rail mounting is strongly recommended for Type 1 controls.
- In direct-mount applications, mount the control on a fat and even surface. Mount the control in a location free of corrosive vapors and observe the ambient operating conditions listed in Technical Specifications for both the A421 control and the A99 sensor.
- Allow sufficient space for connecting and routing wires, viewing the LCD, and using the touchpad.
- Do not mount the control on surfaces that are prone to vibration or in a location where high-voltage relays, motor starters, other sources of electromagnetic emissions, or strong radio frequency may cause interference.
- Do not install the control in an airtight enclosure.
- Do not install heat generating devices with the control in an enclosure that may cause the ambient temperature to exceed 150°F (66°C).



OPERATION
See Installation Instruction Manual

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“3-Way” Thermostatic Valve

Thermostatic valves utilize the principle of expanding wax, which in the semi-liquid state undergoes large expansion rates within a relatively narrow temperature range. The self contained power element activates a stainless steel sliding valve which provides positive three-way actions. All thermostatic valves are factory set at predetermined temperatures; no further adjustments are necessary. A wide range of temperatures are available for water and oil temperature control applications.

On starting, the total fluid flow is in a by-pass mode. As fluid temperature rises to the control range some fluid is diverted to the cooling system. As fluid temperature continues to increase, more flow is diverted, and when in a fully stroke condition all fluid flow is positively directed to the cooling system. Thermostatic valves may be used for either mixing or diverting applications. In normal operation fluid temperatures are controlled to within a few degrees.

Standard thermostatic valve housings are made from high quality grey iron castings.

Part Number	Description		Part Number	Description	
	Temp. Setting	Size NPT		Temp. Setting	Size NPT
310-7029	100 °F	1/2”	310-7014	100 °F	1-1/2”
310-7023	110 °F		310-7034	110 °F	
310-7030	120 °F		310-7035	120 °F	
310-7043	140 °F		310-7012	140 °F	
310-7006	160 °F		310-7001	160 °F	
310-7031	100 °F	3/4”	310-7002	100 °F	2”
310-7032	110 °F		310-7024	110 °F	
310-7022	120 °F		310-7036	120 °F	
310-7042	140 °F		310-7020	140 °F	
310-7007	160 °F		310-7010	160 °F	
310-7033	100 °F	1”	310-7037	100 °F	3”
310-7026	110 °F		310-7038	110 °F	
310-7028	120 °F		310-7039	120 °F	
310-7021	140 °F		310-7041	140 °F	
310-7008	160 °F		310-7040	160 °F	

Adjustable Electrical Temperature Switch (see page 274)

Part Number	Description
310-4011	TC-511 with 6-Foot Capallary Tube & Bulb Well
310-4002	TC-511 with 20-Foot Capallary Tube & Bulb Well
310-2025	Replacement Bulb Well TC-511

Standard Terms and Conditions of Sale *(1 of 3)*

STANDARD TERMS AND CONDITIONS OF SALE

January 1, 2003 Supersedes all prior "Standard Terms And Conditions Of Sale"

All sales by American Industrial Heat Transfer Inc. ("Seller") to the party to whom a Seller's Acknowledgment is addressed ("Purchaser") are subject to the following terms and conditions in addition to the terms and conditions contained in any acknowledgement or sales order confirming your order ("Seller's Acknowledgement"). Where terms of any such Seller's Acknowledgement conflict with the following terms and conditions, the terms and conditions of Seller's Acknowledgement shall control. These Terms and Conditions shall apply to all transactions between Seller and Purchaser unless superseded by new Terms and Conditions delivered by Seller or by the express terms and conditions contained in Seller's Acknowledgment.

Acceptance. All purchase orders are accepted by Seller at its General Offices in LaCrosse, Virginia. Seller's acceptance of any purchase order it receives is expressly limited to the exact terms contained here and in this Seller's Acknowledgment. Additional or different terms contained in Purchaser's offer or any attempt by Purchaser to vary any of the terms here and in Seller's Acknowledgment shall be rejected but such proposal shall not operate as a rejection of Purchaser's offer unless such variances are in the terms of the description, quantity, price or delivery schedule of the goods or services to be provided hereunder, in which case such additional or different terms shall be deemed material and such offer shall be deemed accepted without said additional or different terms or attempted variations. Acceptance by Seller of any purchase order containing terms additional to or different from the terms contained in this Seller's Acknowledgment or containing modifications of the terms contained here and in Seller's Acknowledgment shall not be deemed as assent to those additional, different or modified terms. Purchaser's receipt of Seller's Acknowledgment without prompt written objection thereto, or Purchaser's acceptance of all or any part of the goods or services ordered from Seller, shall constitute assent by Purchaser to the terms contained here and in Seller's Acknowledgment. If this Seller's Acknowledgment shall be deemed an offer by Seller to sell goods or services to Purchaser, such offer is expressly limited to the exact terms contained herein. The dispatch of a purchase order by Purchaser shall then constitute Purchaser's acceptance of these Standard Terms and Conditions of Sale and Seller's Acknowledgment. If this Seller's Acknowledgment is deemed an offer as aforesaid, any proposal by Purchaser for additional or different terms or any attempt by Purchaser to vary any of the terms of this Seller's Acknowledgment in Purchaser's purchase order is hereby objected to and rejected; provided, however, that any such proposal by Purchaser shall not operate as a rejection of Seller's offer unless it contains variances in the terms of the description, quantity, price or delivery of the goods or services to be provided hereunder, in which case any such proposal shall be deemed material, and this Seller's Acknowledgment shall be deemed accepted without said additional or different terms or attempted variations.

Payment Terms. The full amount billed or contracted for is due and payable thirty (30) days from delivery of the goods or performance of services. A finance charge computed at the periodic rate of one and one-half percent (1.5%) per month (which is an annual rate of eighteen percent (18%)) on the unpaid balance will be made on accounts not paid when due, and Purchaser agrees to pay such charges and pay attorneys' fees if action is brought to collect from Purchaser. Seller has the option to ask for and receive payment in full or in partial prior to order acceptance, final construction, or delivery of any product. Unless otherwise specified, 100% of the price quoted for any tooling is to be paid with the placement of the order to Seller. Samples submitted shall be deemed approved and accepted if written notice of rejection is not received within thirty (30) days after date of submittal. Purchaser agrees that Seller shall have a possessory lien on all tools and other property of Purchaser which is in Seller's possession for the total amount owing by Purchaser to Seller for all tooling and other work and for all parts, materials and services of all kinds supplied or rendered by Seller to Purchaser, which lien shall be enforceable in the manner provided in the Uniform Commercial Code.

Taxes. Any tax which the Seller may be required to pay or collect through assessment or otherwise, under any existing or future law upon or with respect to the sale, purchase, delivery, transportation, storage, processing, use or consumption of any goods or services described herein, including, without limitation, taxes upon or measured by receipt from sales or services (but excluding taxes based upon the income of Seller), shall be for the account of Purchaser and be added to the price of such goods or services. Purchaser shall promptly pay the amount thereof to Seller upon demand but may in lieu of such payment, furnish to Seller evidence of the issuance of tax exemption certificates acceptable to the appropriate taxing authorities.

Prices. Except as otherwise provided, all price quotations are valid for thirty (30) days. Prices are based on costs prevailing on the date of quotation and, therefore, are subject to change at any time to reflect increased costs. Prices are quoted on samples, blueprints, or drawings on hand, and any modification thereof subjects this quotation to adjustment. Quotations are is based on the continuous production of the quantity specified, smaller runs subject to increase in price. If higher quantity level is desired by Purchaser, Seller will render a quotation based upon the revised requirements set forth by Purchaser.

Credit. All orders are subject to the approval of Seller's Credit Department, and Seller may at any time refuse to make shipment or delivery if Purchaser fails to fulfill the terms and conditions of payment or fails to provide security satisfactory to Seller's Credit Department. Seller reserves right to refuse or cancel credit and require full payment prior to shipment. If in Seller's opinion the financial condition of Purchaser at any time does not justify continuation of production or shipment on the terms of payment specified, Seller may require full or partial payment in advance or such further assurance as Seller shall require to justify such continued production or shipment.

Default in Payment and Bankruptcy of Purchaser. If Purchaser fails to make payments on any agreement between Purchaser and Seller in accordance with Seller's terms, Seller, in addition to any other remedies available to it, may, at its option, (a) defer further shipments until such payments are made and satisfactory credit arrangements are reestablished, (b) cancel the unshipped balance of any order or (c) take any other action available under applicable law. In the event of any proceedings, voluntary or involuntary, in bankruptcy or insolvency by or against Purchaser, the inability of Purchaser to pay its debts as they become due, or in the event of the appointment, with or without Purchaser's consent, of an assignee for the benefit of creditors or of a receiver, then Seller shall be entitled, in its sole discretion, to cancel the unshipped balance of any order without any liability.

Transportation Charges. All prices, quotations, shipments and deliveries by Seller are F.O.B. Seller's plant and risk of loss passes to Purchaser once goods are tendered for such delivery. All transportation and other charges including handling fees are for the account of Purchaser, including any increase or decrease in such charges prior to shipment.

Method of Shipment. Method and route of shipment is at Seller's discretion, unless Purchaser supplies explicit instructions, which are subsequently accepted by Seller in writing. Seller does not assume responsibility for any damage directly or indirectly resulting from delays in delivery. When parts are broken or damaged in transit from Seller to Purchaser, it is considered the responsibility of Purchaser to file a claim with the carrier for said breakage or damage. If the method of shipment specified by Purchaser is deemed by Seller to be unavailable or otherwise unsatisfactory, Seller reserves right to use an alternate method or route or both whether or not at a higher cost to Purchaser. Seller shall promptly notify Purchaser of any such change. The risk of loss or damage to the goods shipped shall pass to the Purchaser when the goods are delivered to the carrier for shipment and Purchaser shall be responsible for insuring such goods thereafter.

Producing or Shipping Point. Seller reserves right to produce and ship all or any part of the goods specified in any order from any of its plants or facilities.

Force Majeure. Seller shall not be liable for any delay in the performance of orders, or in the delivery or shipment of goods, or for any damages suffered by Purchaser as a result of such delay when such delay is occasioned by causes beyond Seller's control. Such causes shall include but are not limited to an act of God or the public enemy, fire, explosion, flood, unusually severe weather, drought, war, riots, sabotage, vandalism, accident, embargo, government priority, government action or failure of the government to act when action is required, requisition or allocation or other action of any governmental authority, interruption of or delay in transportation, inadequacy or shortage or failure of supply of materials or equipment, breakdowns, non-scheduled shutdowns for repairs, plant accidents, labor shortage, strikes, labor trouble, or by compliance with any order or request of the United States Government or any officer, department, agency, instrumentality or committee thereof. It is understood and agreed that economic conditions affecting the ability or desirability of the performance of this agreement by either party shall not be deemed to constitute "force majeure" circumstances as contemplated by this paragraph. The Seller shall have the right to cancel the entire agreement with Purchaser or any part thereof in the event of the happening of any such cause beyond the Seller's control without any resulting liability.

Good Delivery. Shipments made by Seller within a reasonable time after the specified date of delivery shall constitute a good delivery. No right of cancellation shall accrue to Purchaser based on such a delivery.

Permissible Variations. Goods shipped by Seller shall be within the limits and sizes published by Seller, subject, however, to Seller's right to ship overages or underages in accordance with Seller's standard practices and goods shipped by Seller will be subject to standard variations provided such variations are non-functional or are not material in nature.

note: AIHTI reserves the right to make reasonable design changes without notice.

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LIMITED WARRANTY. SELLER MAKES NO WARRANTIES EXPRESSED OR IMPLIED, INCLUDING BUT NOT BY WAY OF LIMITATION, ANY IMPLIED WARRANTY OF MERCHANTABILITY AND ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, ON ANY ORDER EXCEPT THAT SELLER WARRANTS TITLE TO ALL GOODS FURNISHED BY SELLER AND EXCEPT THAT SELLER WARRANTS FOR A PERIOD OF ONE YEAR FROM THE DATE MARK LOCATED ON THE SELLER'S IDENTIFICATION TAG THAT ALL GOODS DESCRIBED ON SELLER'S ACKNOWLEDGMENT OF PURCHASER'S PURCHASE ORDER WILL BE MANUFACTURED IN ACCORDANCE WITH THE SPECIFICATIONS, IF ANY, SET FORTH IN SAID PURCHASE ORDER AND EXPRESSLY ACCEPTED IN SELLER'S ACKNOWLEDGMENT SUBJECT TO SELLER'S STANDARD MANUFACTURING VARIATIONS AND PRACTICES. IN THE CASE OF COMPONENTS OR ACCESSORIES FURNISHED BY SUPPLIERS TO SELLER, PURCHASER'S WARRANTY FROM SELLER SHALL BE LIMITED TO THE WARRANTY OF THE COMPONENT OR ACCESSORY SUPPLIER. THE FOREGOING WARRANTIES ARE THE SOLE AND EXCLUSIVE WARRANTIES APPLICABLE TO THE GOODS DELIVERED, AND ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTY OF MERCHANTABILITY, ARE HEREBY EXPRESSLY DISCLAIMED AND NEGATED. WITHOUT LIMITING THE GENERALITY OF THE FOREGOING, PURCHASER ACKNOWLEDGES THAT SELLER'S PRODUCTS ARE NOT PACKAGED OR PROTECTED FOR LONG PERIODS OF STORAGE AND THUS MAY CORRODE OR RUST OVER TIME.

Damaged Goods. If any goods should arrive at Purchaser's destination in a damaged condition or should a shortage occur, Purchaser shall immediately report the damage or shortage to the delivering carrier and to Seller. Any loss or shortage occasioned by damage or otherwise occurring in transit will be for account of Purchaser. Allegedly defective goods or parts are to be returned by Purchaser to a destination specified by Seller, freight charges prepaid by Purchaser. All repairs and replacements are subject to verification and inspection by Seller. Seller shall not be responsible for costs of de-installation and re-installation of goods or parts returned.

Claims. Claims respecting the condition of goods, compliance with specifications or any other matter affecting goods shipped to Purchaser must be made promptly and, unless otherwise agreed to in writing by Seller, in no event later than twenty-one (21) days after receipt of the goods by Purchaser. Purchaser shall set aside, protect and hold such goods without further processing until Seller has an opportunity to inspect and advise of the disposition, if any, to be made of such goods. In no event shall any goods be returned, reworked or scrapped by Purchaser without the express written authorization of Seller. If field service is rendered by the Seller at Purchaser's request and the alleged defect is found not to be with the Seller's product, component or accessory, the Purchaser shall pay for the time and expenses of the field representative. Bills for service, labor or other expenses that have been incurred by the Purchaser, their customer or agent, without approval or authorization by the Seller, will not be accepted. Changes or repairs attempted or made in the field without Seller's written authorization automatically void all warranties.

LIMITATION OF PURCHASER'S REMEDIES. PURCHASER'S REMEDIES WITH RESPECT TO ANY CLAIM ARISING OUT OF ANY ORDER, ANY GOODS DELIVERED PURSUANT TO ANY ORDER AND EXPRESSLY ACCEPTED IN SELLER'S ACKNOWLEDGMENT, OR SELLER'S PERFORMANCE IN CONNECTION WITH ANY ORDER, INCLUDING, WITHOUT LIMITATION, ANY CLAIM ARISING OUT OF ANY RECALL, DEFECT OR ALLEGED DEFECT IN ANY GOODS OR SERVICES FURNISHED BY SELLER, SHALL BE LIMITED EXCLUSIVELY TO THE RIGHT OF REPAIR OR REPLACEMENT OF SUCH GOODS OR SERVICES, AT SELLER'S OPTION. WITHOUT IN ANY WAY LIMITING THE GENERALITY OF THE FOREGOING, IN NO EVENT SHALL SELLER BE LIABLE FOR ANY CONSEQUENTIAL OR INCIDENTAL DAMAGES, INCLUDING, WITHOUT LIMITATION, ANY LOSS OF ANTICIPATED PROFITS INCURRED BY PURCHASER WITH RESPECT TO ANY GOODS OR SERVICES FURNISHED BY SELLER, OR ANY DAMAGES ARISING FROM INJURIES TO PERSONS AS A RESULT OF PURCHASER'S OR A THIRD PARTY'S NEGLIGENCE. SELLER'S WARRANTY DOES NOT COVER FAILURES RESULTING FROM THE IMPROPER INSTALLATION, MOUNTING DESIGN OR APPLICATION OR FROM CORROSION. THE PROVISIONS OF THIS PARAGRAPH ARE A MATERIAL TERM OF THIS TRANSACTION.

Warranty Procedures. If Purchaser experiences a problem with Sellers goods and believes that it is covered by Seller's warranty, or Purchaser has equipment that needs to be repaired or replaced, contact Seller through Purchaser's local distributor. The basic information that Purchaser will need to begin the process is the complete nameplate data. Products will not be accepted for return unless an RGA (Return Goods Authorization) number has been assigned by Seller and the product for return or repair is shipped prepaid. Products returned for warranty evaluation must be complete (without missing components), and unaltered (not disassembled, manipulated cleaned or the like). The product(s) must have the original model tag fully intact. Products returned for warranty consideration are subject to a $100 minimum fee plus any additional handling charges in the event that the reason for the return is not covered by Seller's warranty. Additional handling fees are to cover the cost of failure analysis, testing and the like. All handling charges will be waived for products that are subject to a valid warranty claim. Products to be returned for warranty are to be shipped prepaid via Seller assigned carrier.

Return for Credit. Over the years AIHTI has made substantial investments in engineering, computers, “CNC” computer numeric controlled manufacturing technology, and computer enterprise system. As a result of this technology, any order received by American Industrial is immediately processed and in many cases ordered products or parts are manufactured the same day. Due to this unique innovative manufacturing capability, every product is manufactured specifically for each customer order. AIHTI expects the customer to verify the accuracy of the product prior to placing an order. Therefore, American Industrial will not accept any product for credit, exchange, or restock.

Repairs. Products being returned for repair, refit, test or similar matters must be drained completely prior to shipment. Purchaser must clearly label the product with information to identify the Purchaser and Seller's RGA number. Purchaser should also include a note with instructions for service, failure, nature of problem and the fluids that are used inside of the product. A base handling charge of $100 will be applied for each product regardless of condition that it is in when returned for evaluation. Products being returned for evaluation must be shipped prepaid. Quotations for repair, test, cleaning, and similar matters will be issued shortly after return to Seller. All products returned shall be considered abandoned by Purchaser and may be scrapped if the Purchaser or shipper renders no disposition instructions after 45 days from notification by written quotation. Seller does not warranty any repaired products under any circumstances. Products repaired and the repairs are the sole responsibility of the owner of the products. Products sent to Seller for evaluation will be returned, upon request and at the owner’s expense.

Quality Assurance. Seller shall have no obligation to ensure that any goods or services purchased from Seller meet any special quality assurance specifications and/or other requirements unless such specifications and/or other requirements are set forth in Purchaser's purchase order or separately provided in writing to Seller and, in either case, expressly accepted in this Seller's Acknowledgment and Purchaser represents that goods which it purchases from Seller will not be applied by Purchaser or resold by Purchaser for application to, any critical end use, including, without limitation, use in connection with or in any way related to the construction or operation of a nuclear facility unless the appropriate specification and/or other requirement for such end use is set forth in Purchaser's purchase order and is expressly accepted in a separate writing by Seller. In the event that any such goods or any services supplied by Seller in connection therewith are applied to a critical end use without the appropriate specification and/or other requirement therefor having been set forth in Purchaser's purchase order and expressly accepted in a separate writing by Seller, Purchaser shall indemnify and hold Seller harmless against any and all damages or claims for damages made by any person for any injury, fatal or nonfatal, to any person or for any damage to the property of any person incident to or arising out of such application, including, without limitation, any loss resulting from radioactive, toxic, explosive, or other hazardous properties of source material, special nuclear material, or by-product material as such terms are defined in the Atomic Energy Act of 1954 or any law amendatory thereof or regulations adopted pursuant thereto. The Seller reserves the right to improve its products through changes in design or material, as it may deem desirable without being obligated to incorporate such changes in products of prior manufacture.

Cancellation. Purchaser Orders cannot be cancelled without cause by Purchaser without the express written consent of the Seller. Should Purchaser attempt to cancel an order without cause, Purchaser shall reimburse Seller against all loss occasioned by such cancellation, including loss of anticipatory profits and liability for commitments made by Seller relating to the Purchase Order and shall purchase any existing inventory and work in process which Seller has in its possession to fulfill Seller's existing orders for Purchaser at the time of cancellation. As used herein, "cause" shall mean a material breach of Seller's duties and obligations hereunder and the failure to cure such breach after Purchaser notifies Seller of such breach and affords Seller a reasonable time to cure same.

Confidentiality and Publicity: Purchaser shall consider all information furnished by Seller to be confidential and shall not disclose any such information to any person,

 355 American Industrial Drive LaCrosse, VA 23950 tel: 434-757-1800 fax: 434-757-1810 email: sales@aihti.com

Standard Terms and Conditions of Sale *(3 of 3)*

firm or corporation, other than Purchaser's or Seller's employees, subcontractors or government inspectors, unless authorized to do so by Seller in writing. Purchaser shall not disclose in any manner to third parties, including, without limitation to, advertising, or publishing concerns, Seller's identity or the identity of any subsidiaries or affiliates of Seller. Unless otherwise agreed to in writing, no commercial, financial or technical information disclosed in any manner or at any time by Purchaser to Seller shall be deemed secret or confidential and Purchaser shall have no rights against Seller with respect thereto except such rights as may exist under patent laws.

Tooling: If and to the extent any Purchase Order relates to the purchase of tools, jigs, die fixtures, equipment, drawings and specifications (collectively, "tooling") or specifically requires tooling for completion by Seller, then Seller shall at all times be and remain the owner of such tooling and shall bear the risk of loss and be responsible for insuring same. If any Purchase Order requires the development of such tooling, then the price quoted by Seller is based on a minimum production of a specified quantity of parts from such tooling and, in the event Purchaser does not ultimately purchase such quantity of parts, an equitable adjustment in the purchase price for products shall be made to reflect such lower quantity and Seller's unamortized cost of the tooling so produced. Seller's price quotation is based upon estimated usage of tooling but no representations or warranties are made by Seller that the tooling so built will ultimately be capable of producing product in accordance with such anticipated usage. Purchaser agrees to pay for changes in tooling made necessary by changes in specifications accepted by Seller, such changes to be made at Purchaser's risk. Parts produced from Purchaser's supplied tooling cannot be guarantied by Seller. Purchaser provided tooling is not insured and Seller shall not be responsible or liable for any loss or damage thereto or for any materials or equipment owned or furnished by Purchaser. Purchaser shall be solely responsible for insuring such tooling and Purchaser waives any claim or right of subrogation it may have against Seller arising out of Seller's failure to insure such tooling. Seller reserves the right to charge Purchaser the reasonable costs and expenses of refurbishing any tooling if so required by Seller to fulfill any Purchase Order. When for a period of one (1) year no orders are received for parts to be produced from tooling, Seller may notify Purchaser in writing at Purchaser's last known address in Seller's files that tooling is no longer proprietary to Purchaser and, with respect to Purchaser supplied tooling, such tooling shall become Seller’s property or, at Seller’s option, Seller man return such tooling to Purchaser at Purchaser’s expense.

Prototypes: If this Purchase Order relates to the production of a prototype by Seller for or on behalf of Purchaser, (a) such prototypes will be manufactured in accordance with Purchaser's specifications including material selection and (b) actual product produced by Seller may vary from such prototype in a non-material and non-functional manner. Seller's sole liability in the event it is unsuccessful in producing a prototype in accordance with Purchaser's specifications shall be limited to the purchase price paid by Purchaser with respect thereto. Purchaser shall be responsible for the cost of all tooling necessary for the development of the prototype as provided in the paragraph Captioned “Tooling” above.

Technical Assistance and Advice: Seller's warranty shall not be enlarged and no obligation or liability shall arise out of Seller's rendering of technical assistance, technical advice facilities, service or recommendations made by Seller in connection with Purchaser's purchases of the goods hereunder. Said technical services, advice, assistance or recommendations made by Seller or any representative of Seller concerning any use or application of any goods furnished hereunder is believed to be reliable, but SELLER MAKES NO WARRANTY, EXPRESS OR IMPLIED, AND THE SAME ARE HEREBY EXPRESSLY DISCLAIMED as to the same and the results to be obtained. Purchaser assumes all responsibility for loss or damage resulting from the use of any such goods.

Indemnification: Purchaser agrees to indemnify, save harmless and defend Seller from and against any and all liability for loss, damage or injury to person or property in any manner arising out of or incident to the performance of any Seller's Acknowledgment or other sale by Seller or its servants, employees, agents or representatives. Without limiting the generality of the foregoing, Purchaser will indemnify and hold harmless Seller, its officers, employees, agents, successors, assigns, customers and users of its products from and against any and all losses, expenses, claims, suits and liabilities (including incidental and consequential damages and court costs and attorneys fees) arising as a result of any claim that the manufacture, use, sale or resale of goods delivered by Seller in accordance with Purchaser's specifications or designs infringes on any patent, utility model, industry design, copyright or other intellectual property rights in any country. Without limiting the generality of the paragraph captioned “Limitation of Purchaser’s Remedies” above, in the case of any claim of infringement or the sale of products is enjoined, Seller shall have no obligation to procure for Purchaser the right to continue using such products or to replace same with equivalent non-infringing products or to modify the products so they become non-infringing.

Setoffs: Purchaser shall make no deduction or setoff for any claim arising out of or from any transaction with Seller nor shall Purchaser take any discount, credit or allowance without Seller's written consent.

Assignment: Purchaser shall not assign any order or any interest therein without the written consent of Seller. Any such actual or attempted assignment without Seller's prior written consent shall entitle Seller to cancel such order upon written notice to Purchaser.

Termination: Seller may terminate any order or any part thereof for any reason at Seller's convenience upon written notice to Purchaser. Upon such termination, Purchaser agrees to waive all claims for damages including, without limitation, any loss of anticipated profits, and to accept as its sole remedy for termination the reasonable additional costs of obtaining substitute goods of the same quantity and quality, provided that in no event shall such costs exceed the price of the order or part thereof so terminated as stated on Seller's Acknowledgment. Any claim for adjustment not asserted within sixty (60) days from the date of such termination shall be deemed to have been waived by Purchaser.

Allocation of Risk: Purchaser acknowledges that these Standard Terms and Conditions of Sale and Seller's Acknowledgment allocates risks with respect to goods and/or services sold to Purchaser and this risk allocation is reflected in the prices to be paid by Purchaser for said goods and/or services purchased hereunder. Purchaser warrants that it has read this provision, understands it and is bound by its terms.

Packaging: Seller will use all reasonable means to comply with any packaging, loading or bracing requirements specified in any order. Seller will charge for compliance with Purchaser's special requirements in accordance with Seller's price list for extras in effect at time of shipment. If no packaging, loading or bracing requirements are specified by Purchaser, Seller shall comply with the minimum requirements customarily applied by Seller to the method of transportation used for such goods.

Entire Agreement: These Standard Terms and Conditions of Sale and Seller’s Acknowledgment and any other documents referred to on the face thereof constitute the entire agreement between Seller and Purchaser.

Modification: No addition or modification of the terms and conditions of these Standard Terms and Conditions of Sale and Seller’s Acknowledgment shall be binding on Seller unless specifically agreed to by Seller in writing.

Waiver : Seller's failure to insist on performance of any of these Standard Terms and Conditions of Sale and Seller's Acknowledgment or to exercise any right or privilege or Seller's waiver of any breach hereunder shall not thereafter waive any other terms, conditions, or privileges, whether of the same or similar type.

Governing Law: Seller and Purchaser's agreement shall be governed by and interpreted in accordance with the laws of the State of Illinois of the United States of America. Manufacture, shipment and delivery are subject to any prohibition, restriction, priority, allocation, regulation or condition imposed by or on behalf of the United States of America or any other governmental body with appropriate jurisdiction which may prevent or interfere with fulfillment of any order.

Re-orders: Re-orders, if accepted by Seller, are considered as placed under the same terms and conditions as Purchaser's previous order, when such orders are not placed pursuant to a formal written proposal and acceptance.

Disclosure: Seller shall have the right to disclosure of the identity of Purchaser and the nature of the work Seller is performing on Purchaser's behalf to Seller's customers and prospective customers and in any promotional materials provided such disclosure does not contain any confidential and proprietary information concerning Purchaser.

DISPUTES: SELLER AND PURCHASER AGREE TO SUBMIT ANY DISPUTES REGARDING ANY ORDER, ANY GOODS DELIVERED PURSUANT TO ANY ORDER AND EXPRESSLY ACCEPTED IN SELLER'S ACKNOWLEDGMENT, OR SELLER'S PERFORMANCE IN CONNECTION WITH ANY ORDER, INCLUDING WITHOUT LIMITATION SELLER'S LIMITED WARRANTY OBLIGATION, TO MEDIATION BY AN INDEPENDENT MEDIATOR TO BE MUTUALLY AGREED UPON BY SELLER AND PURCHASER. THE COST OF SUCH MEDIATION SHALL BE BORNE EQUALLY BY SELLER AND PURCHASER. IN THE EVENT SUCH MEDIATION DOES NOT RESOLVE THEIR DISPUTE, SELLER AND PURCHASER AGREE TO SUBMIT SUCH DISPUTE TO AN INDEPENDENT ARBITRATOR, TO BE MUTUALLY AGREED UPON BY SELLER AND PURCHASER OR, OTHERWISE, CHOSEN BY THE MEDIATOR. SELLER AND PURCHASER AGREE THAT ALL MEDIATION AND ARBITRATION SHALL BE CONDUCTED IN ZION, ILLINOIS. THE NON-PREVAILING PARTY AT THE ARBITRATION SHALL PAY THE PREVAILING PARTY'S ATTORNEYS' FEES AND COSTS INCURRED IN PARTICIPATING IN THE ARBITRATION.

note: AIHTI reserves the right to make reasonable design changes without notice.
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American Industrial Heat Transfer Inc.®

Manufacturer of Quality Heat Exchangers

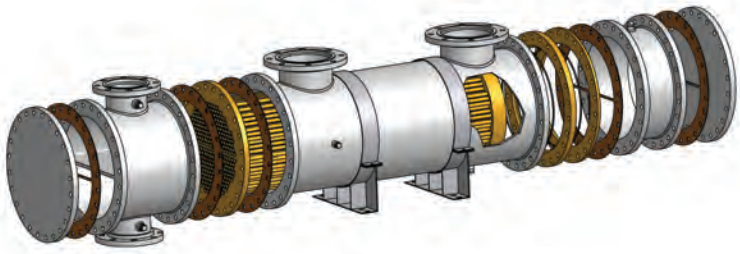
www.aihti.com

AB Series

AA Series

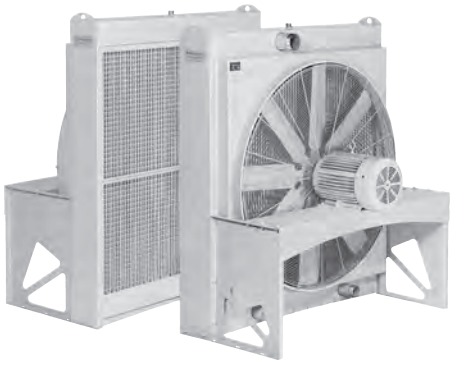
CS Series

AB 2000



SRCS Expanded

ACA Series

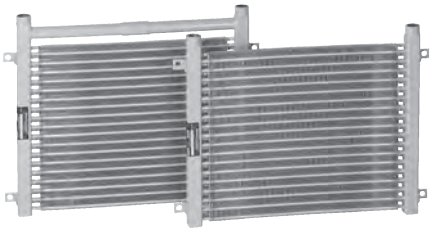


AOCS Series

ASME Air Oil

AC Series

LP Series



AOM Series