HEATCRAFT

Steam Coils

Standard or steam distributing construction is available for high and low pressure applications. Standard steam type is the basic 5/8" or 1" tube steam coil, known as the single tube design. The steam supply and condensate return headers and connections are normally at the opposite ends of the coil. Uniform steam distribution to each of the coil core tubes is accomplished by proper header assembly design. The steam supply connection should be located in the center of the header, with a perforated plate type baffle located directly behind this connection. Properly sized orifices are located in each of the core tube entrances into the header.

Steam distributing 5/8" and 1" tubes are the "freeze resistant" coils, known as the dual-tube design. It is important to note that any steam coil can freeze when exposed to freezing temperatures without the proper drainage of the condensate! This coil design utilizes a smaller inner tube, with precisely spaced, directional, orifice type perforations. This is to help direct condensate flow to the return header. The steam supply, condensate return headers, and connections may be fabricated as a same-end or opposite end orientation. When made as same end connected, the header appears as a single large header, but is actually two headers in one. Compartmentalizing the header serves multiple functions. As well as the supply and return, this compartmentalizing has the inner steam supply header warming the condensate return, and allows same end connected single and two row coil construction. This eliminates the unwanted core tube return bends on a steam coil.

STEAM COIL CONSTRUCTION

Tubing	Copper, Cupronickel, Stainless Steel or Carbon Steel
Core	Free Floating designed to expand and contract in the casing
Rows	1 or 2 (5/8" only)
Fin Surface	Sine Wave (corrugated), New Ripple (peak and valley) or Flat (5/8" only)
Casing	Galvanized Steel, Stainless Steel, Carbon Steel, Copper or Aluminum
Connections	Carbon Steel, Stainless Steel, Red Brass, or Copper Sweat (MPT, FPT, Victaulic, Grooved or Welded)
Vents & Drains	Standard on all coils

HEATCRAFT STEAM COIL SPECIFICATION

1.0 GENERAL
Non-distributing steam coils can be used in applications where freeze protection is not a concern. These should be used when entering air temperatures are a minimum of 40°F taking into consideration any outside air dampers being in the incorrect position. Non-distributing type coils should be used only with on-off steam control valves. Steam distributing coils should be used with modulating control valves or if the possibility of near freezing entering air conditions may be seen by the coil.

1.1 CERTIFICATION
Acceptable coils are to have ARI Standard 410 certification and bear the ARI symbol. Coils exceeding the scope of the manufacturer's certification and/or the range of ARI's standard rating conditions will be considered provided the manufacturer is a current member of the ARI Air-Cooling and Air-Heating Coils certification program and the coils have been rated in accordance to ARI Standard 410. Manufacturer must be ISO 9002 certified.

1.2 STEAM COIL DESIGN PRESSURES AND TEMPERATURES
Coils shall be designed to withstand 150 psi maximum operating pressures and a maximum steam temperature of 366°F for standard duty copper tube coils. Optional high pressure construction will include cupronickel tubes and headers to increase maximum operating pressure to 350 psi and maximum operating temperature to 450 degrees.

1.3 FACTORY TESTING REQUIREMENTS
Coils shall be submerged in water and tested with a minimum of 315 psi air pressure for standard copper tube coils. A 500 psig hydrostatic and shock test is required for high pressure cupronickel construction. Coils must display a tag with the inspector's identification as proof of testing.

1.4 FINS
Coils shall be of plate fin type construction providing uniform support for all coil tubes. Stainless steel fins shall be constructed of 304 & 316 stainless. Carbon steel fins shall be constructed of ASTM A109-83. Coils are to be manufactured with die-formed aluminum, copper, stainless steel or carbon steel fins with self-spacing collars, which completely cover the entire tube surface. The fin thickness shall be 0.0075 +/- 5% unless otherwise specified. Manufacturer must be capable of providing self-spacing die-formed fins 4 through 14 fins/inch with a tolerance of +/- 4%.

1.5 TUBING
Tubing and return bends shall be constructed from UNS 12200 seamless copper conforming to ASTM B75 and ASTM B251 for standard pressure applications. High pressure construction shall use seamless 90/10 Cupronickel Alloy C70600 per ASTM B111. Stainless steel tubes shall be ASTM A249. Carbon steel tubes shall be W&D - ASTM A214 & seamless - ASTM A179. Copper tube temper shall be light annealed with a maximum grain size of 0.040 mm and a maximum hardness of Rockwell 65 on the 15T scale. Tubes are to be mechanically expanded to form an interference fit with the fin collars. Tubes shall have a nominal thickness of 0.020 inch unless otherwise specified.

1.6 FREE FLOATING CORE
Coils to utilize free floating core assembly to allow for thermal expansion and contraction of tubes during coil operation.

1.7 CLEANING
Prior to brazing, residual manufacturing oils and solid contaminants shall be removed internally and externally by completely submersing the coil in a degreaser which is chemically compatible with the coil material.

1.8 HEADERS
Headers shall be constructed from UNS 12200 seamless copper conforming to ASTM B75 and ASTM B251 for standard pressure applications. High-pressure construction is to incorporate seamless 90/10 Cupronickel Alloy C70600 per ASTM B111. Stainless steel will be constructed of 304L & 316L (ASTMA312) Sch-5 or Sch-10. Carbon steel headers shall be constructed from Sch-10 (ASTM-A135A) or Sch-40 (ASTM A53A) pipe.

Steam coil return headers are to be equipped with factory-installed 1/2" fpt air vent connection placed at the highest point available on face of the header. Tube-to-header holes are to be intruded inward such that the landed surface area is three times the core tube thickness to provide enhanced header to tube joint integrity. All core tubes shall evenly extend within the inside diameter of the header no more than 0.12 inch. End caps shall be die-formed and installed on the inside diameter of the header such that the landed surface area is three times the header wall thickness.

1.9 CONNECTIONS
Standard construction fluid connections are male pipe thread (MPT) and constructed from red brass conforming to ASTM B43 or Schedule 40 steel pipe as a minimum. Stainless steel will be 304L or 316L (ASTM-A240) Sch-40 or Sch-80. Carbon steel will be A53A Sch-40, A106A Sch-40 or Sch-80 or A53B Sch-80 pipe.

1.10 BRAZING
High temperature filler metals shall be used for all brazed joints. Filler metal containing at least 5% silver will be used when joining the header to the core tubes. If flux has been used during the brazing process the coil must be steam-cleaned to remove residual fluxes from all internal and external surfaces.

1.10.1 WELDING
Gas shielded arc welding is used for welded vessels constructed of stainless steel. Gas welding is used for welded vessels constructed of carbon steel.

1.11 CASING
Coil casing and endplate shall be fabricated from Galvanized steel, as a standard construction, meeting ASTM and UL G90U requirements, Aluminum, 0.080" thick, optional, Copper, 0.063 " thick, optional,16- or 14-gauge carbon steel or stainless steel, optional. double-flange casing shall be provided when coils are specified as vertical stacking.

Standard coil intermediate tube sheets (center tube supports) shall be fabricated from the same gauge sheet stock and material as the end plates, and to the following schedule:

Finned Length (inches)	Number of Tube Sheets
6.00 – 48.00	0
48.01 – 96.00	1
96.01 – 144.00	2
144.01 and greater	4

Coils up to 120" finned length should be pitched by manufacturer in case toward condensate connection, a minimum of 1/8" per foot of finned length. Coils over 120" in finned length should be pitched in field to assure proper condensate removal.

1.12 DELIVERY
Standard lead-time for custom made retrofit steam coils of standard construction with OEM circuiting shall be 11-15 working days, with reduced lead-time emergency shipment options of 10 working days and 5 working days from order placement date and based upon production approval.

Standard lead-time for custom made steam coils of manufacturer's own standard design and circuiting shall be 10 working days, with reduced lead-time emergency shipment options for 5 working days, 48-hours and 24-hours from order placement date.

All coils shall be quoted and offered as FOB Factory, Full Freight Allowed to any and all destinations within the Continental United States.

1.13 INSTALLATION
Coils to be installed in accordance with manufacturer's instructions and any applicable piping codes.

CERTIFIED DRAWING

STANDARD STEAM - SAME END CONNECTIONS CP 1071-C

Customer _____ Customer P.O. Number _____

Job _____

Written by _____ Date _____

Approved by _____ Date _____

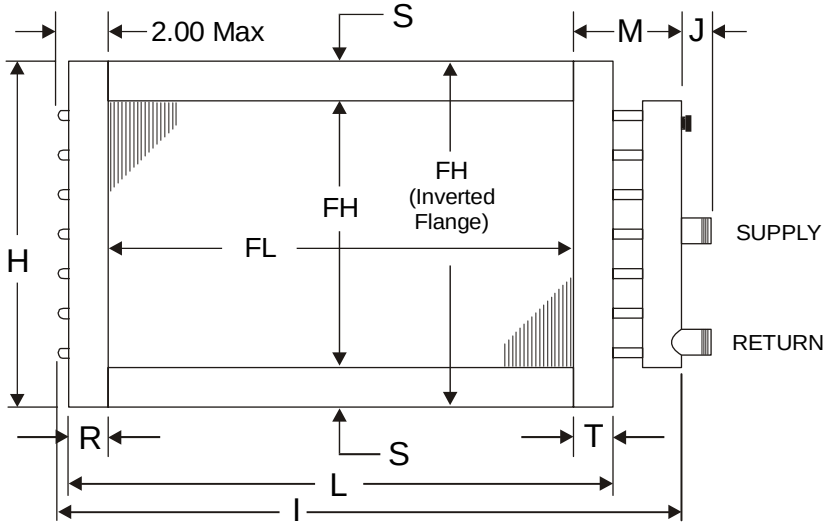
#	TAG	QTY	MODEL NUMBER						HAND
			TYPE	FPI	ROWS DEEP	FIN	FH	FL	Left, Right
1									
2									
3									
4									

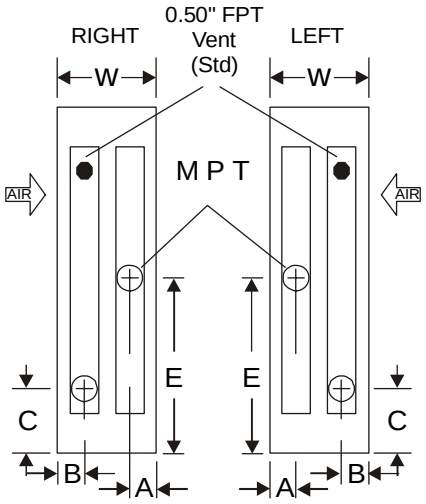
#	DIMENSIONAL DATA													
	CONNECTION										FLANGES			
	SIZE	A	B	C	E	H	I	J	L	M	R	S	T	W
1														
2														
3														
4														

MATERIALS OF CONSTRUCTION	
FINS	AL CU CS St Stl
TUBES	CU CuNi CS St Stl
HEADERS	CU CuNi Carbon Stl St Stl
CONN	Carbon Stl Red Brass St Stl
CASING	AL Galvanized Steel CU Stainless Steel

	GENERAL OPTIONS
☐	Inverted Flanges
☐	End Plates Only
☐	Label Kit
☐	Mounting Holes
☐	Phenolic Coating
☐	FPT Connections

REMARKS:





GENERAL NOTES

1. Mounting holes are optional. 0.375" diameter holes on 6" centers from the centerline of the fin height and finned length are typical for all flanges. Not available with Inverted Flanges
2. All dimensions are in inches.
3. The supply line should be connected to the middle connection on the leaving air side for counterflow operation.
4. Intermediate tube supports are fabricated from heavy gauge stock and supplied per the chart at the right.

Finned Length (FL)	Tube Supports
≤ 48	0
> 48 ≤ 96	1
>96 ≤ 144	2
> 144	4

CERTIFIED DRAWING
STEAM CP 1065-C

Customer _____ Customer P.O. Number _____

Job _____

Written by _____ Date _____

Approved by _____ Date _____

#	TAG	QTY	MODEL NUMBER						FIG#	DIST. TUBE
			TYPE	FPI	ROWS DEEP	FIN	FH	FL		
1										☐
2										☐
3										☐
4										☐

	DIMENSIONAL DATA												
	CONNECTION									FLANGES			
#	SIZE	C	D	E	H	I	J	L	M	R	S	T	W
1													
2													
3													
4													

MATERIALS OF CONSTRUCTION	
FINS	AL CU CS St Stl
TUBES	CU CuNi CS St Stl
HEADERS	Cu CuNi Carbon Stl St Stl
CONN	Carbon Stl Red Brass St Stl
CASING	AL Galvanized Steel CU Stainless Steel

	GENERAL OPTIONS
☐	Unpitched
☐	Inverted Flanges
☐	End Plates Only
☐	Slip & Drive
☐	Mounting Holes

	GENERAL OPTIONS
☐	Label Kit
☐	Phenolic Coating
☐	FPT Connections

REMARKS:

GENERAL NOTES

1. Tubes are pitched toward return connection when installed for horizontal air flow for FL ≤ 120". Installer must provide pitch on vertical air flow.
2. Mounting holes are optional. 0.375" diameter holes on 6" centers from the centerline of the fin height and finned length are typical for all flanges. Not available with when S < 1.50" or Inverted Flanges.
3. Intermediate tube supports are fabricated from heavy gauge stock and supplied per the chart below.
4. All dimensions are in inches.
5. Connection Location:
   C= 2.50" ± 0.50"
   D= 0.125" to 0.5625" above coil center line
   E= 0.125" to 0.5625" below coil center line
   C based on 1.50" flange.

FIGURE 1

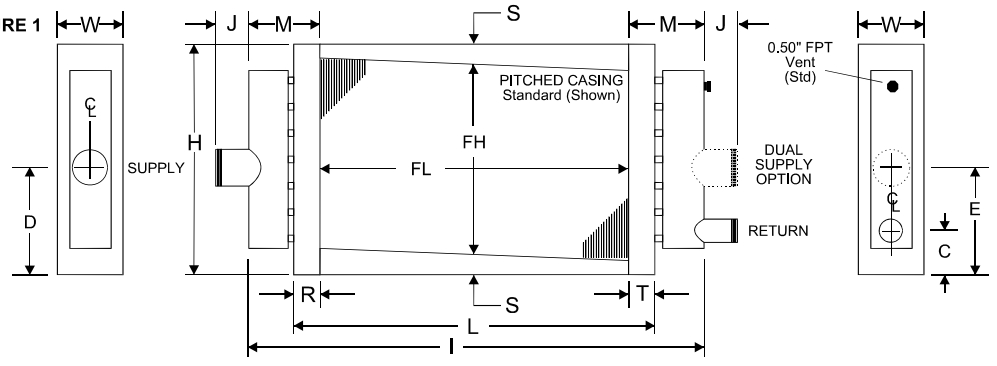
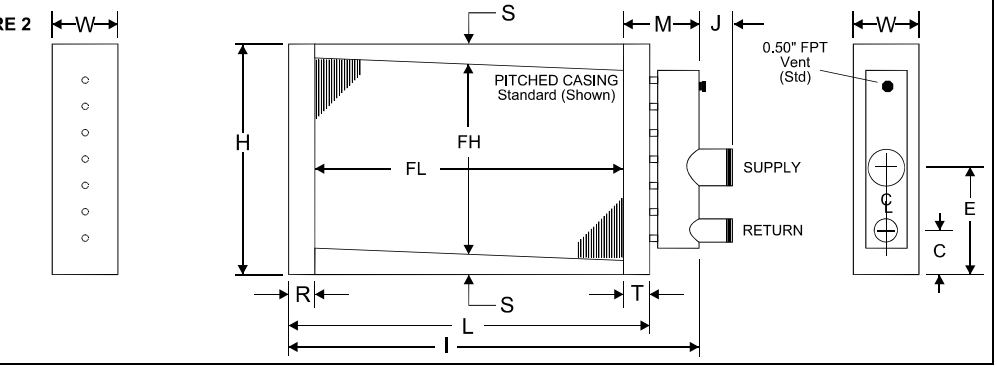


FIGURE 2



Finned Length (FL)	Tube Supports
≤ 48	0
> 48 ≤ 96	1
>96 ≤ 144	2
> 144	4

HEATCRAFT™

LUVATA

STEAM COILS

TABLE OF CONTENTS

NOMENCLATURE

5 SA 12 01 C 24.00 x 110.00

Tube OD

5 = 5/8" or 8 = 1"

Coil Type

5JA, 8JA: Distributing tube, same end conn
5GA, 8HA: Distributing tube, same end conn (high pressure)
5DA, 8DA: Distributing tube, dual supply, opp end conn
5LA, 8LA: Distributing tube, dual supply, opp end conn (high pressure)
5RA, 8RA: Distributing tube, opp end conn
5TA, 8TA: Distributing tube, opp end conn (high pressure)
5SA, 8SA: Single tube, opp end conn
5HA, 8HA: Single tube, opp end conn (high pressure)
5SB: Single tube, opp end conn, 3" center-to-center
5HB: Single tube, opp end conn, 3" center-to-center (high pressure)
5SS: Single tube, same end conn
5SH: Single tube, same end conn (high pressure)

Finned Length

Fin Height

Fin Design

A - flat (AL, CU)
B - corrugated (AL,CU)
C - sine wave (AL, CU)
F - flat (SS, CS)
G - corrugated (SS, CS)
H - sinewave (SS, CS)

Rows Deep

Fins Per Inch

DISTRIBUTING COIL TYPES

Steam distributing, jet tube, coils are excellent for any general purpose heating applications. With the superior freeze resistance provided by the tube-within-a-tube construction, they are ideal for low temperatures, preheating, and process applications. Although the steam distributing design is more resistant to freezing - it is not freeze proof. No manufacturer can accurately claim to have a freeze proof coil. Figures 1, 3 and 5 feature directional orificed inner tubes, figures 1 and 3 feature a unique elliptical supply header located inside the heavy-duty return header, and a circuiting arrangement which provides for supply and return connections at the same end or opposite end of the coil. The directional orifices properly meter steam along the entire tube length to assure a consistent temperature rise across the full coil face and accelerate condensate removal, providing a more uniform air temperature rise than the non-distributing design.

JA, GA

Model Type - JA and GA (Figure 1), offer same end supply and return connections. When made as same end connected, the header appears as a single large header, but is actually two headers in one. Steam is fed from one direction while the condensate travels in the opposite direction. The JA coil is built with copper tubing for low pressure applications. The GA coils utilize cupro-nickle, admiralty brass, carbon steel or stainless steel tubing for high pressure construction. Both the JA and GA come standard pitched in the casing, for horizontal or vertical airflow.

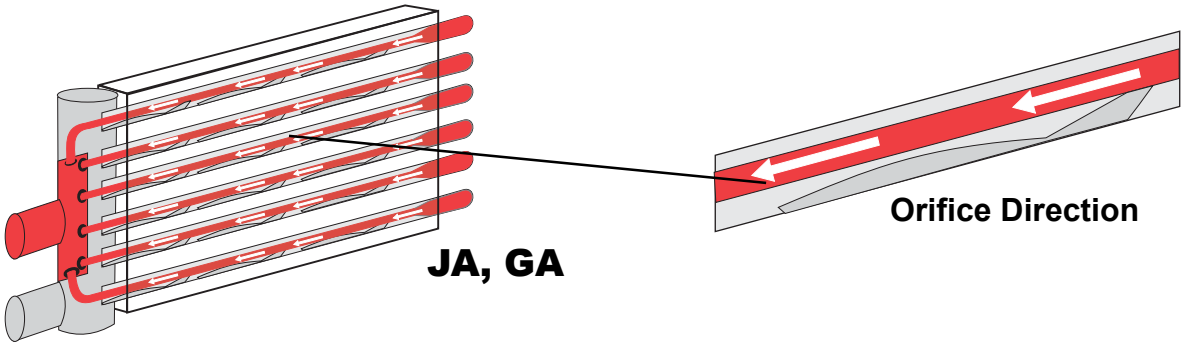


Figure 1 JA, GA Steam Distribution

Figure 2 indicates what dimensional data is needed to quote and build the coil.

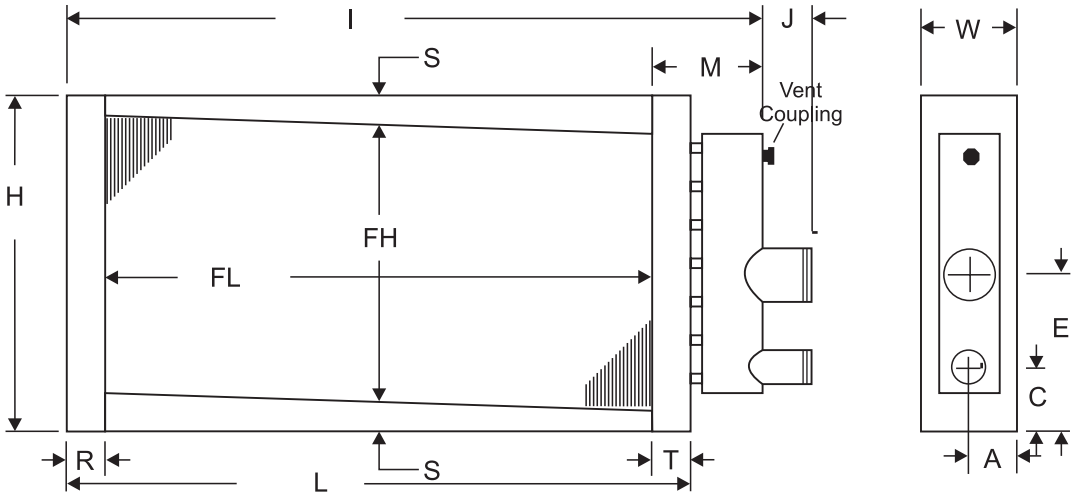


Figure 2 JA, GA Dimension Info

DISTRIBUTING COIL TYPES

DA and LA

Model Type - DA and LA (Figure 3) offer the same end return and supply connection with an additional supply connection at the opposite end. The steam is fed through both ends and the condensate is removed from one end. The DA coil is built with copper tubing for low pressure applications. The LA coils utilize cupro-nickle, admiralty brass, carbon steel or stainless steel tubing for high pressure construction. Both the DA and LA come standard pitched in the casing, for horizontal or vertical airflow.

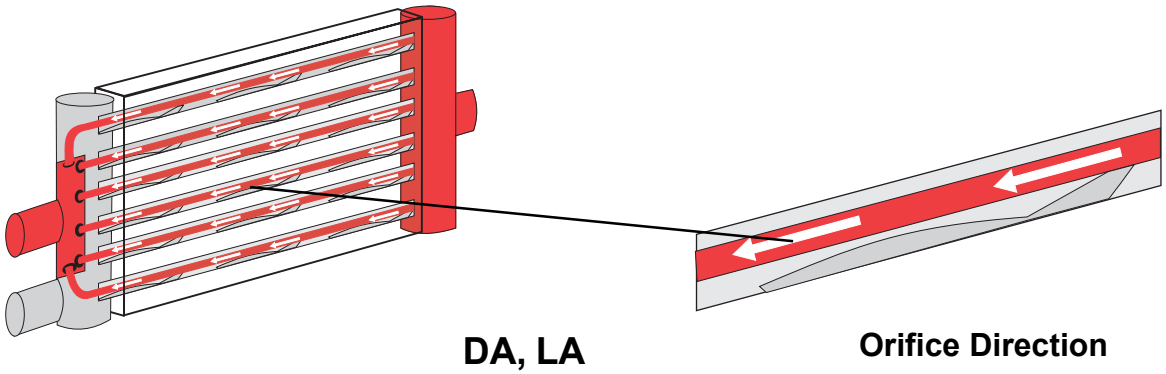


Figure 3 DA, LA Steam Distribution

Figure 4 indicates what dimensional data is needed to quote and build the coil.

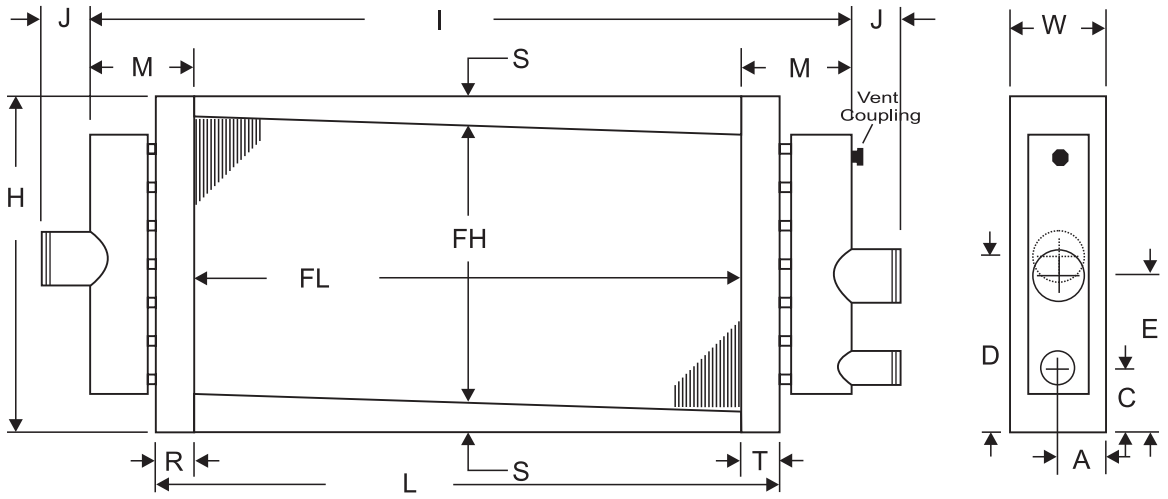


Figure 4 DA, LA Dimension Info

RA and TA

Model Type - RA and TA (Figure 5) offer opposite end connections. Steam is fed from one end while condensate is removed from the opposite end. The RA coil is built with copper tubing for low pressure applications. The TA coils utilize cupro-nickle, admiralty brass, carbon steel or stainless steel tubing for high pressure construction. Both the RA and TA come standard pitched in the casing, for horizontal or vertical airflow.

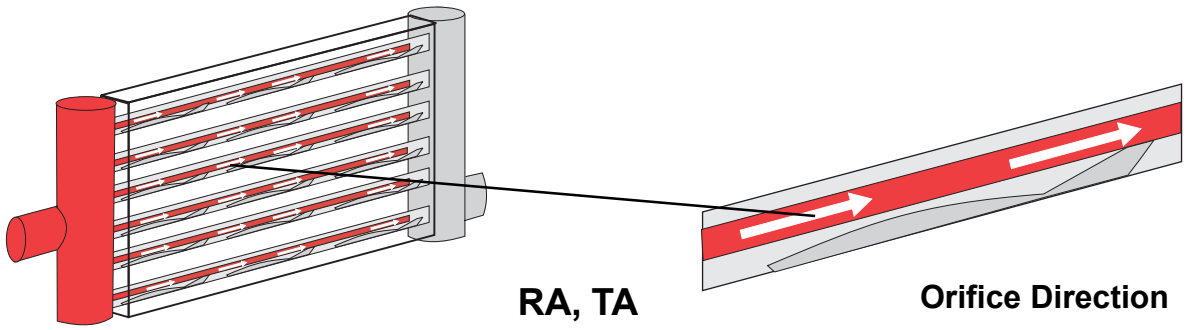


Figure 5 RA, TA Steam Distribution

Figure 6 indicates what dimensional data is needed to quote and build the coil.

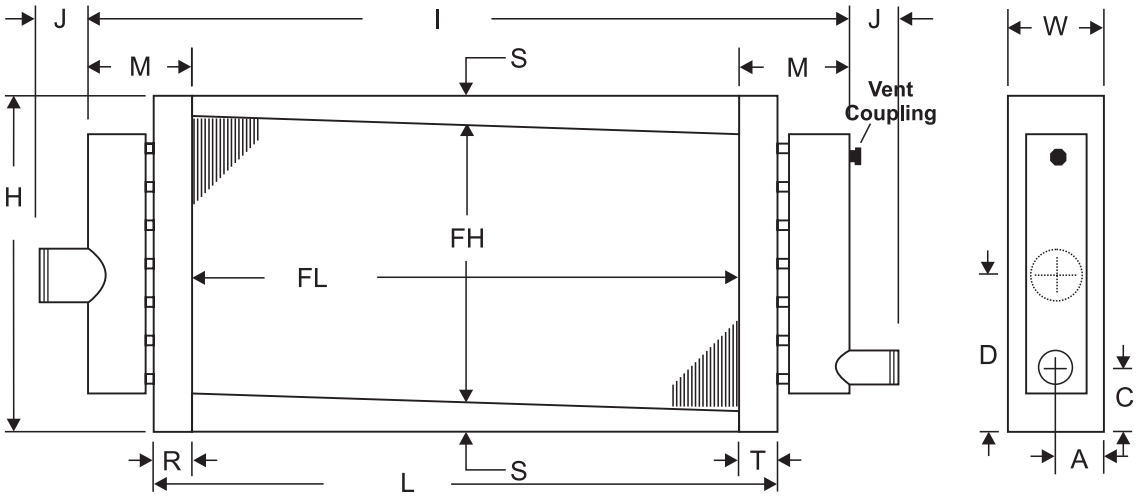


Figure 6 RA, TA Dimension Info

NON-DISTRIBUTING COIL TYPES

Non-distributing steam coils are specifically designed for economical general purpose heating. Featuring high quality and high capacity, they are an ideal choice for all regular steam applications—heating, reheating, booster, and process use. The sectional diagrams illustrate the steam circuiting of this single tube design. A perforated plate type steam baffle directly behind the supply connection assures even steam pressure across the entire header length. Inlet tube orifices meter a uniform flow of steam into each tube. This coil type is not recommended for entering air temperatures below freezing.

SA, HA, SB, and HB

Model Type SA, HA, SB, and HB (Figure 7) are designed for general purpose heating. The construction features a single tube design with opposite end supply and return connections. A perforated baffle located directly behind the supply connection insures proper steam distribution. Models SA and SB (SB built on 3" centers) are constructed of copper tubing for low pressure construction. Model HA and HB (HB built on 3" centers) utilize cupro-nickle, admiralty brass, carbon steel or stainless steel tubing for high pressure construction.

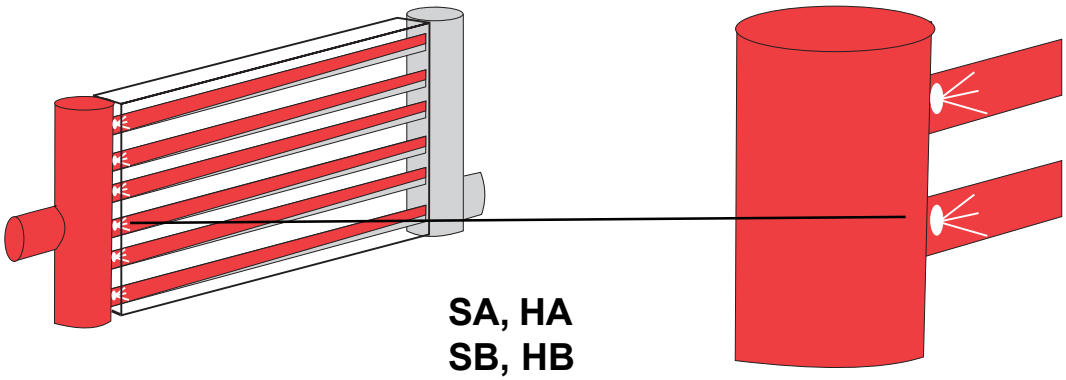


Figure 7 SA, HA, SB, HB Steam Distribution

Figure 8 indicates what dimensional data is needed to quote and build the coil.

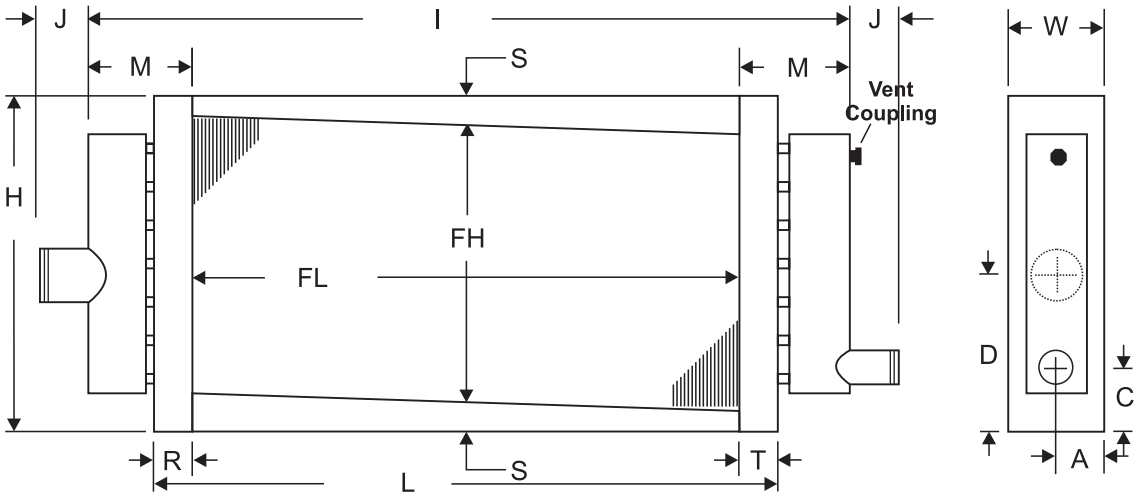
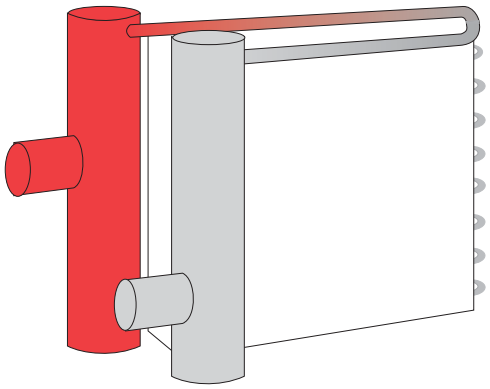


Figure 8 SA, HA, SB, HB Dimension Info

SS and SH

Model Type SS and SH (Figure 9) utilizes return bend construction and are not pitched in the casing. These coils must be installed level. Model Type SS and SH features return bend construction and same end connections. Model SS is constructed of copper tubing for low pressure construction. Model Type SH utilizes cupro-nickle, admiralty brass, carbon steel, and stainless steel tubing for high pressure construction.



SS, SH

Figure 9 SS, SH Steam Distribution

Figure 10 indicates what dimensional data is needed to quote and build the coil.

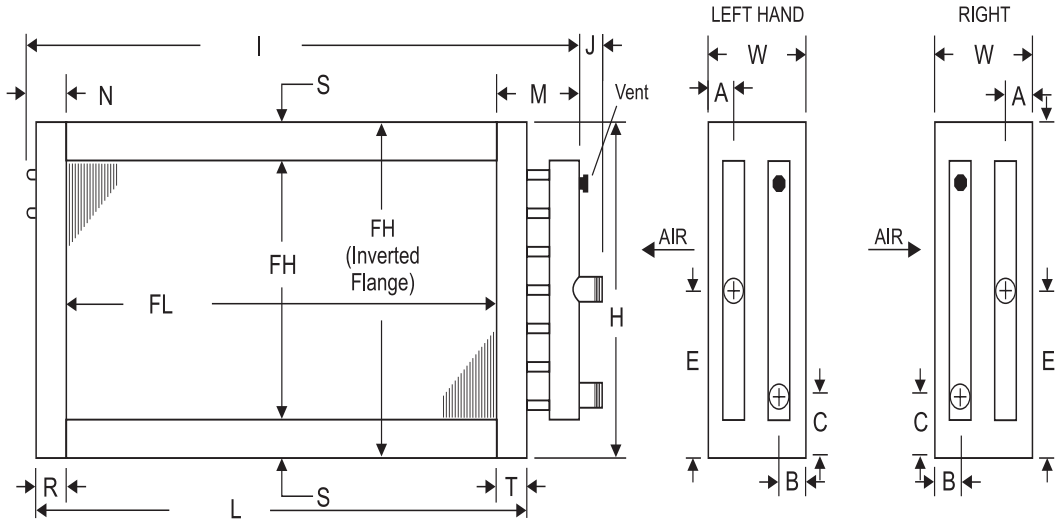


Figure 10 SS, SH Dimension Info

Note: This design is not recommended for new installatins, direct replacement only.

STEAM CONSTRUCTION

CONNECTIONS

Connection are constructed of carbon steel, red brass or stainless steel material (see Table 1). All connections will be male pipe thread (MPT), unless specified differently. It is common practice, but not a necessary construction feature, for return connection sizes to be smaller than supply connection sizes. In order to aid in condensate removal and help avoid flooding the coil the return connection should be the same size as the supply connection. In general, if the return connection is reduced it should not be reduced more than one pipe size below the supply connection. Coil connections are centered on the coil depth for even steam distributing and opposite end standard steam coils. Same end standard steam coils have connections an equal distance from the entering and leaving air edge of the coil. Dimensions are based on connection sizes and casing style. Standard steam and steam distributing coils supply connections can be moved vertically for ease of installation. Return connections for both coil types must be located low enough to assure proper drainage and are thus limited in location.

Material
Red Brass ASTM B43 Sch 40
Stainless Steel 304L or 316L ASTM A312 Sch 40 or Sch 80
Carbon Steel A53A Sch 40

Table 1 - Material Options

Tube OD (in.)	Model	Rows	≥ FH (in.)	< FH (in.)	Conn. Size (in.)
.625	DA, GA, JA, LA	1, 2	6.0	10.5	1.50
	HA, HB, RA, SA, SB, TA	2			
	HA, HB, RA, SA, SB, SS, SH, TA	1		18.0	
	SS, SH	2			
	DA, GA, JA, LA	1	12.0	60.1	2.00
	DA, GA, HA, HB, JA, LA, RA, SA, SB, TA	2			2.50
	HA, HB, RA, SA, SS, SH, TA	1	18.0	60.1	2.00
	SS, SH	2			2.50
	All Models	1, 2	61.5		2.50
1.00	DA, GA, HA, JA, LA, RA, TA, SA	1	6.0	12.0	1.50
			12.0	60.1	2.50

Table 2 - Connection Sizes

OFFSET RETURN CONNECTIONS

This option is used when the steam coil is to be installed with vertical air flow. The return connection is lowered on the horizontally installed header to help coil drainage and avoid a trough of condensate remaining in the header. Orientation of the supply and return connection is required to offset return in the correct direction.

CONNECTIONS (cont'd)

OFFSET TUBES

This is another method to help condensate removal in vertical air flow installations. The tubes are offset in the casing, providing the needed slope to drain condensate. The orientation of supply and return connections is required to offset tubes in the correct direction.

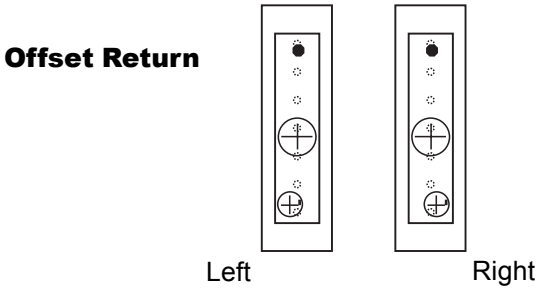


Figure 11

HEADERS

Headers shall be constructed from UNS 12200 seamless copper conforming to ASTM B75 and ASTM B251 for standard pressure applications. High pressure construction incorporates seamless 90/10 Cupro-nickel Alloy C70600 per ASTM B111. Stainless steel will be constructed of 304L & 316L (ASTM-A312) Sch-5 or Sch-10. Carbon steel shall be constructed of Sch-10 (ASTM-A135A) or Sch-40 (ASTM A53A). Steam coils will be equipped with factory-installed 0.50 inch fpt coupling to facilitate air vent connection placed at the highest point available on face of the return header. Tube-to-header holes are to be intruded inward such that the landed surface area is three times the core tube thickness to provide enhanced header to tube joint integrity. All core tubes shall evenly extend within the inside diameter of the header no more than 0.12 inch. End caps shall be die-formed and installed on the inside diameter of the header such that the landed surface area is three times the header wall thickness.

BRAZED COPPER TUBES-TO-COPPER HEADER JOINT

Seamless copper tubes are brazed into heavy gauge seamless drawn copper headers. This combination of similar metals eliminates unequal thermal expansion and greatly reduces stress in the tube-header joint. Intruded tube holes in the header allow an extra large mating surface for increased strength and durability. (See Figure 12)

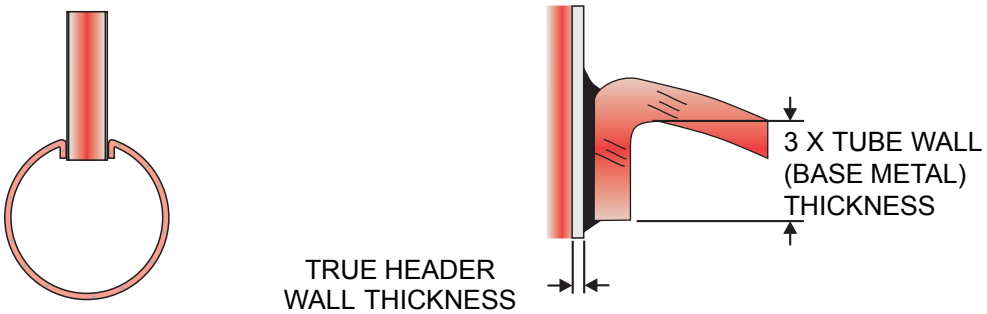


Figure 12

STEAM BAFFLES

Supply header baffle dispurses entering steam. Prevents blow-through or short circuiting and ensures equal steam distribution to all coil tubes.

STEAM CONSTRUCTION

COIL CASE

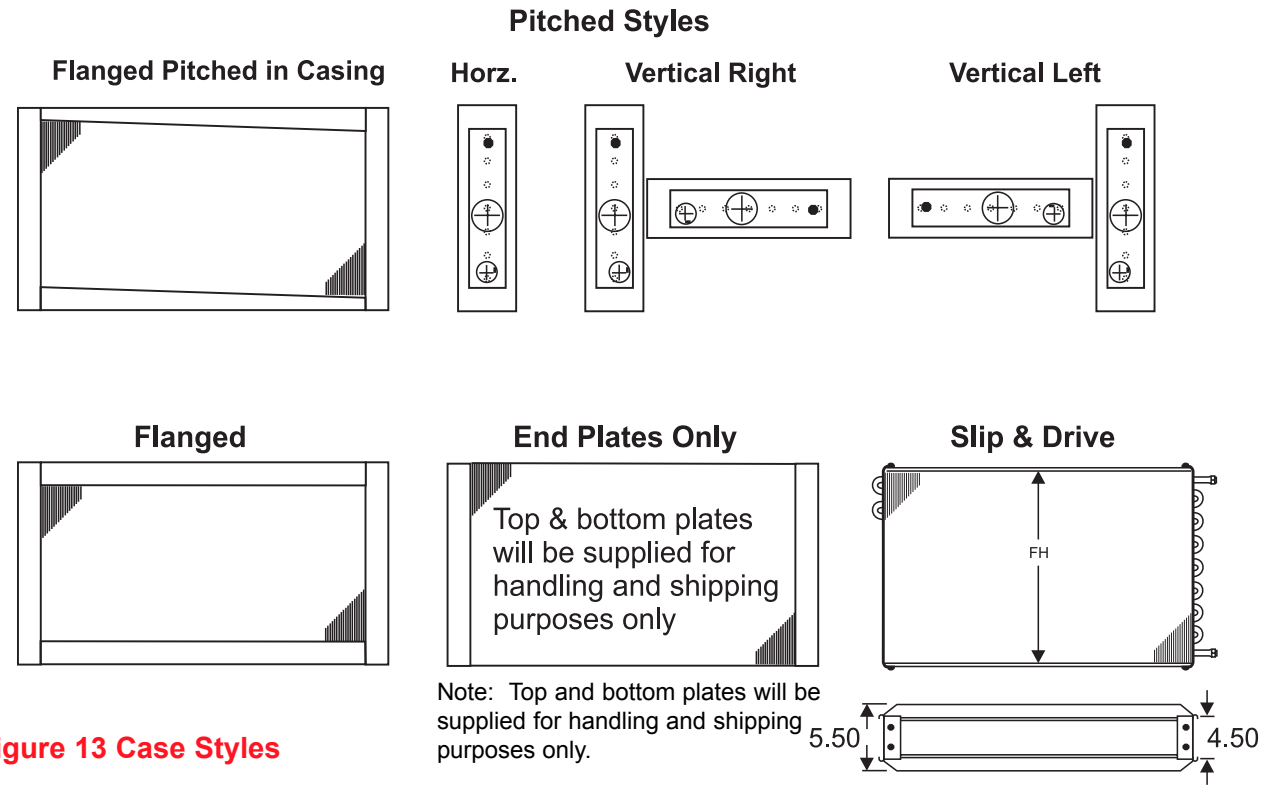
Casings and endplates shall be made from 16 gauge galvanized steel unless otherwise noted. Double-flanged casings on top and bottom of finned height are to be provided, when possible, to allow stacking of the coils. All sheet metal brakes shall be bent to 90 degrees +/- 2 degrees unless specified otherwise. Coils shall be constructed with intermediate tube support sheets fabricated from a heavy gauge sheet stock of the same material as the case, when possible. All steam coils are built with tube ferrules at every intermediate tube support and on both header plates. Coils up to 120 inches finned length should be pitched by manufacturer in case toward condensate connection, a minimum of 0.125 inches per foot of finned length. Coils over 120 inches in finned length should be pitched in the field to assure proper condensate removal or can be supplied by the factory with certain restrictions. Steam coils in excess of 100 inches in finned length are recommended to have dual supply. Consult factory for more information.

FREE FLOATING CORE

Steam casings are designed to let the core float free to provide for thermal expansion without creating stress and wear on the tubes. Since the core is not supported by the tubes there is no resultant tube wear.

PITCHED CASINGS

Pitched casings are specially designed to provide the proper pitch for positive condensate removal. Factory supplied pitched casings can save the extra installation time and expense required to provide for proper condensate removal on the job. Supply and return connections are properly sized for each coil to assure adequate steam distribution and proper condensate removal. See Figure 13 for optional case styles.



Note: Top and bottom plates will be supplied for handling and shipping purposes only.

Figure 13 Case Styles

COIL CASE (cont'd)

Material	Gauge (in.)		
	16	14	12
Galvanized Steel, ASTM A-924 and A-653	X	X	X
Copper ASTM B-152	X	X	X
Aluminum Alloy-3003, Embossed Finish Alloy-5052, Mill Finish (.125 only)	X	X	X
Stainless Steel 304L (or) 316L, 2B-Finish, ASTM A-240	X	X	*X
Stainless Steel 201L	X	X	

Table 3 Case Material

* Not available on Header Box style casing

TUBE SUPPORTS

Tube supports will be constructed of the same material as the case, when possible and provided according to the following chart.

Finned Length (FL)	< 48	> 48 < 96	> 96 < 144	> 144
Tube Support	0	1	2	4

Table 4 Tube Supports

TUBING

Tubing and return bends shall be constructed from seamless copper for standard pressure applications. High pressure construction consists of cupro-nickel, admiralty brass, stainless steel or carbon steel tubing. Copper tube temper shall be light annealed with a maximum grain size of 0.040 mm and a maximum hardness of Rockwell 65 on the 15T scale. Tubes will be mechanically expanded to form an interference fit with the fin collars. Tubes shall have a nominal thickness of 0.020 inch unless otherwise specified. See Table 5 for size and material availability. See Tables 5 and 6 for more information.

Material	Tube Thickness (in.)				
	.020	.025	.035	.049	.065
Copper UNS # C12200, ASTM B-75, B-68, B-251	X	X	X	X	X
Cupro-nickel UNS # C70600, 90/10, ASTM B-111	X		X	X	
Admiralty Brass UNS # C44400, ASTM B-111, Type-B				X	
Stainless Steel 304L (or) 316L,ASTM A-249			X	X	X
Carbon Steel W&D ASTM 214			X	X	X

Table 5 Material

STEAM CONSTRUCTION

Pressure Type	Model	Tube OD (in.)	Row	Tube Matl.	Tube Thick. (in.)	Inner Tube (in.)	Header Matl.	Header End Cap	Max. Std. Operating Limits	
									psig	°F
Low*	JA, DA RA	.625	1, 2	CU	.020	.485 x .016	CU	CU	150	366
					.025, .035 .049	.375 x .013				
	SA, SB, SS	.625	1,2		.020, 025 .035 .049	None	CuNi	Monel	200	400
	JA, DA RA	1.00	1		.023, .035 .049	.615 x .017				
High	GA, LA TA	.625	1, 2	CN	.020	.485 x .016	CN	Monel	350	436
					.035, .049	.375 x .017				
				AB	.049	.375 x .013	AB			
				SS	.035, .049	.375 x .028	SS	SS		
				CS	.049		CS	CS		
	HA, HB SH			CN	.020, .035 .049	None	CN	Monel		
				AB	.049		AB	Monel		
				SS	.035, .049		SS	SS		
				CS			CS	CS		
	GA, LA TA	1.00	1	CN	.035, .049	.615 x .017	CN	Monel		
				SS			SS	SS		
				CS	.049	.625 x .035	CS	CS		

Table 6 Connection Information

* Pressure between 50-200 will receive CuNi Header and silver braze.

FINS

Coils shall be built of plate fin type construction providing uniform support for all coil tubes. Coils are manufactured with die-formed aluminum, copper, cupro-nickel, stainless steel or carbon steel fins (see Table 7) with

Material	Fin Thickness (in.)			
	.0060	.0075	.0095	.0160
Aluminum Alloy-1100	X	X	X	X
Copper Alloy-110	X	X	X	X
Cupro-nickel 90/10 Alloy-706		X		
Stainless Steel 302-2B		X	X	
Carbon Steel ASTM A109-83		X	X	

Table 7 Fin Material

FINS (cont)

self-spacing collars which completely cover the entire tube surface, providing metal-to-metal contact. The fin thickness will be 0.0075 +/- 5% unless otherwise specified. Fins are fabricated to accommodate 0.625 inch tubes 1.50 inch equilaterally spaced, for one row coils and 1.50 x 1.299, for two row coils. 1.0 inch diameter tube coils have tube holes with 3.0 inch tube face spacing. Fins are self-space die-formed fins 4 through 14 fins/inch with a tolerance of +/- 4%.

Tube OD (in.)	Fin Pattern (in.)	Fin Material	FPI (in.)	Fin Style	Fin Thickness (in.)			
					.0060	.0075	.0095	.0160
.625	1.50 x 1.299	AL, CU	4-7	A, B			X	X
				C			X	
			8-14	A, B	X	X	X	X
				C	X	X	X	
	1.50 x .150	SS, CS	4-5	F, G, H			X	
			6-14			X	X	
1.00	3.00 x 2.125	AL, CU	4-14	B			X	
		SS, CS	4-5				X	
			6-14			X	X	

Table 8 Fin Size

ENGINEERING

CORE TUBE CONSIDERATIONS

Steam (psig)	Tube Thick. (in.) & Matl
> 2 & < 20	.020 Copper
≥ 20 & < 50	.025 Copper
≥ 50 & < 75	.035 Copper
≥ 75 & < 100	.049 Copper
≥ 100 & < 150*	.020 Cupronickel
≥ 150 & < 200*	.035 Cupronickel
≥ 200 & < **	.049 Cupronickel

Table 9 Tube Considerations

* .049 Admiralty brass is an option for the pressures noted
** Consult factory for applications over 200 psig

Table 9 is to be used as a guideline only. If within 10 psi of next wall thickness, consider the next heavier tube wall to extend coil life. Above recommendations are based on our experience. If steam quality and system are ideal, .020 inch wall tubes are recommended to 150 psi working pressure.

CORE TUBE CONSIDERATIONS (cont)

MAXIMUM OPERATING TEMPERATURE FOR TUBE MATERIAL
Based on average temperature across coil (entering air + leaving air ÷ 2).

Tube Material	Max Temp. (°F)
CU (Copper)	350
CUNI (Cupronickel	450
Admiralty Brass	450

Table 10 Tube Temperature

Note: All considerations are based on typical systems and conditions of service. A specialty steam consultant or distributor should be contacted for specific recommendations on a particular application.

GENERAL FORMULAS

BTUH
BTUH = 1.08 x SCFM x Temp. Rise
Where 1.08 = (Specific heat of air) x Min./Hr.) x Density Std. Air
Specific heat = .24 at 70°F
Min./hr. = 60
Density std. air = .075 Lbs./cu. ft.

TEMPERATURE RISE (TR)
TR = BTUH ÷ (1.08 x SCFM)

LEAVING AIR TEMPERATURE
Lvg Air Temp. = Ent. Air Temp. + Temp. Rise

FACE AREA
FA = (Fin Height x Finned Length) ÷ 144

FACE VELOCITY (FPM)
FPM = SCFM ÷ Face Area (sq. ft.)

POUNDS CONDENSATE
Lbs Cond./HR. = BTUH ÷ Latent Heat of Steam

PROPERTIES OF SATURATED STEAM

Pressure (psig)	Temp (°F)	Latent Heat (btu/lb)
2	218.64	966.20
5	227.33	960.40
10	239.59	952.50
15	249.83	945.60
20	258.91	939.40
25	266.92	933.90
30	274.11	928.80
40	286.84	919.60
50	297.73	911.70

Pressure (psig)	Temp (°F)	Latent Heat (btu/lb)
60	307.48	904.40
70	316.01	897.90
80	324.08	891.60
90	331.29	886.00
100	337.95	880.50
125	352.89	868.20
150	365.92	856.90
175	377.43	846.80
200	387.93	837.20

Table 11 Steam Properties

THERMOSTATIC AIR VENT AND VACUUM BREAKER

Picture 1

THERMOSTATIC AIR VENT

The thermostatic air vent allows the system to purge itself of non-condensables. As non-condensables gather at the high point in the system, the vent's thermostatic mechanism becomes "insulated" by the non-condensables and begins to cool and relaxes to its open position. The vent opens allowing the gasses to escape and be replaced by the higher temperature steam. The vent closes as steam replaces the escaped gasses and begins the process of heating or expanding the mechanism back to it's closed position. The vent remains closed until the lower temperature non-condensables again replace the higher temperature steam.

Thermostatic air vents are available for coils for steam pressure up to 125 psig. For coils with operating pressure above 125 psig and < 300 psig the factory should be consulted for lead-time.

VACUUM BREAKER

The vacuum breaker allows the coil to purge itself of an internal vacuum, typically caused by a modulating control valve. When the control valve throttles back the steam pressure due to reduced load demand it inherently creates a vacuum in the coil as the existing steam inside the coil begins to condense. If left to it's own design, condensing steam, which is allowed to pull a vacuum, can cause catastrophic damage to any coil or pressurized vessel. The presence of vacuum conditions activates the vacuum breaker and allows air to enter the coil thus breaking the vacuum, and allowing condensate to flow freely from the coil.

Picture 2

Both assemblies supplied with piping components shown

ASSEMBLY

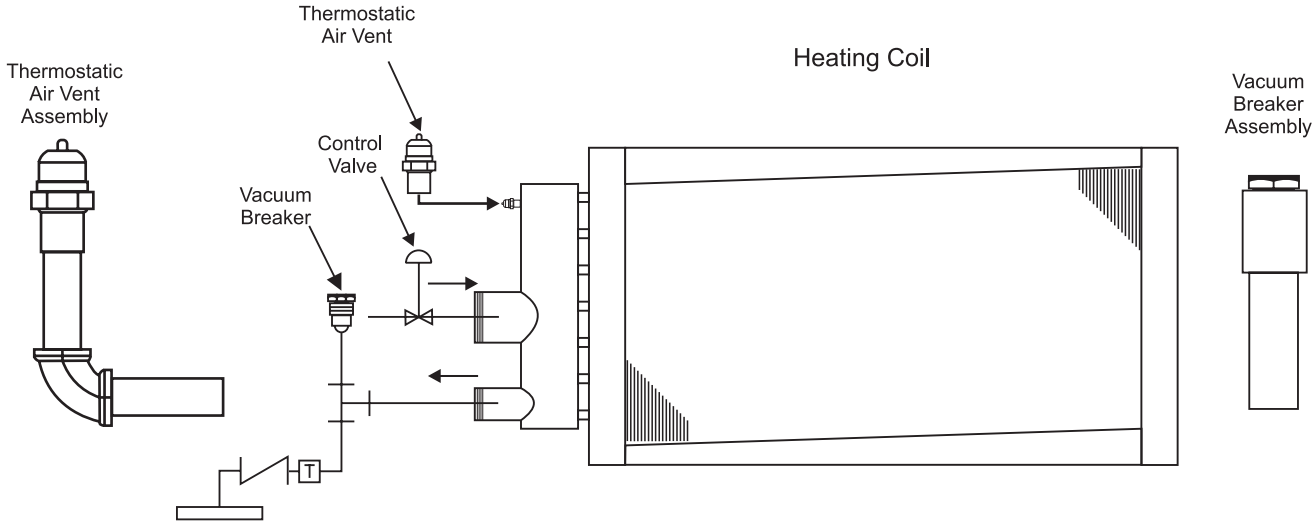


Figure 14 TAV and Vacuum Breaker Assembly

HEATCRAFT™

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LUVATA

HEATCRAFT

Steam Coil Installation Operation and Maintenance

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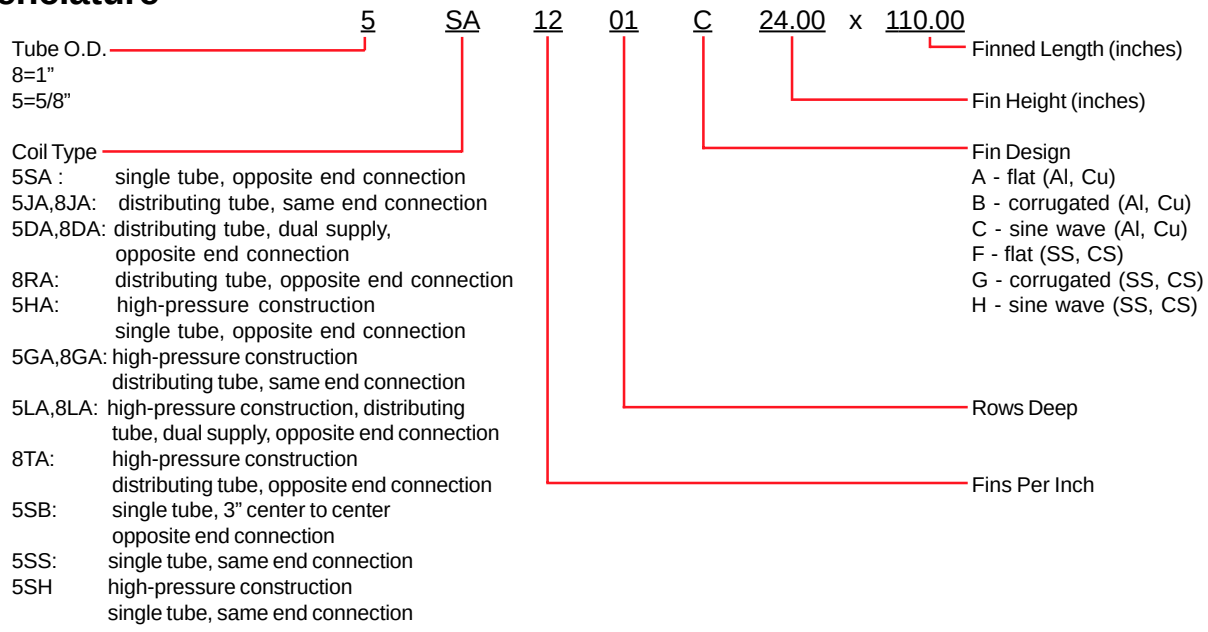
Guidelines for the installation, operation and maintenance of Heatcraft steam heating coils have been provided to help insure the proper performance of the coils and their longevity. These are general guidelines, which may have to be tailored to meet the specific requirements of any one job. As always, a qualified party or individual should perform the installation and maintenance of any coil. Protective equipment such as safety glasses, steel toe boots and gloves are recommended during the installation and routine maintenance of the coil. ***Caution! Steam, even at low pressure, can cause serious bodily injury that may result in death. Be sure the system is off or the components are isolated before beginning work.***

Receiving Instructions

1. All Heatcraft coils are factory tested, inspected and carefully packaged.
2. Damage to the coils can occur after they have left the factory. Therefore, the coils should be inspected for shipping damage upon receipt. The freight bill should also be checked against items received for complete delivery.
3. Damaged and/or missing items should be noted on the carrier's freight bill and signed by the driver.
4. For additional assistance, contact your local Heatcraft coil representative.

Nomenclature



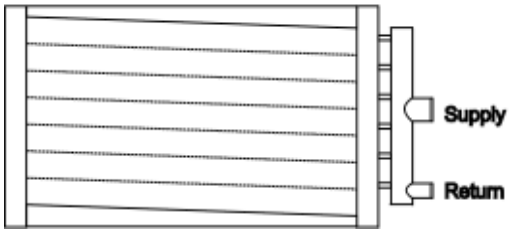


Figure1a - Case Pitched

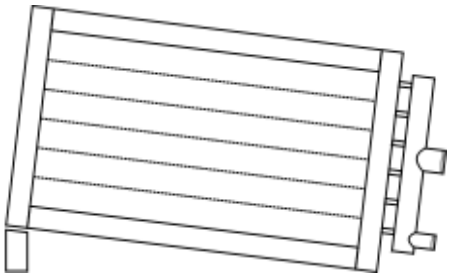


Figure1b - Case Unpitched

Mounting

Steam coils must be properly mounted for condensate removal. This will aid in preventing destructive water-hammer, keeping coils from freezing and preventing corrosive elements from collecting in the tubes. Case-pitched coils should be installed level as shown in Figure 1a. Heatcraft models SA, SB, HA, JA, GA, DA, LA, RA and TA come standard pitched in the casing. Heatcraft models SS and SH utilize return bend construction and are not pitched in the casing, but need to be installed level as in Figure 1a - Case Pitched. Coils that are unpitched, must be installed with the tubes pitched towards the return connection as shown in Figure 1b (with the exception of Heatcraft models SS and SH). A minimum pitch of 1/8" per foot of coil length is required (pitch has been exaggerated in Figure 1b - Case Unpitched).

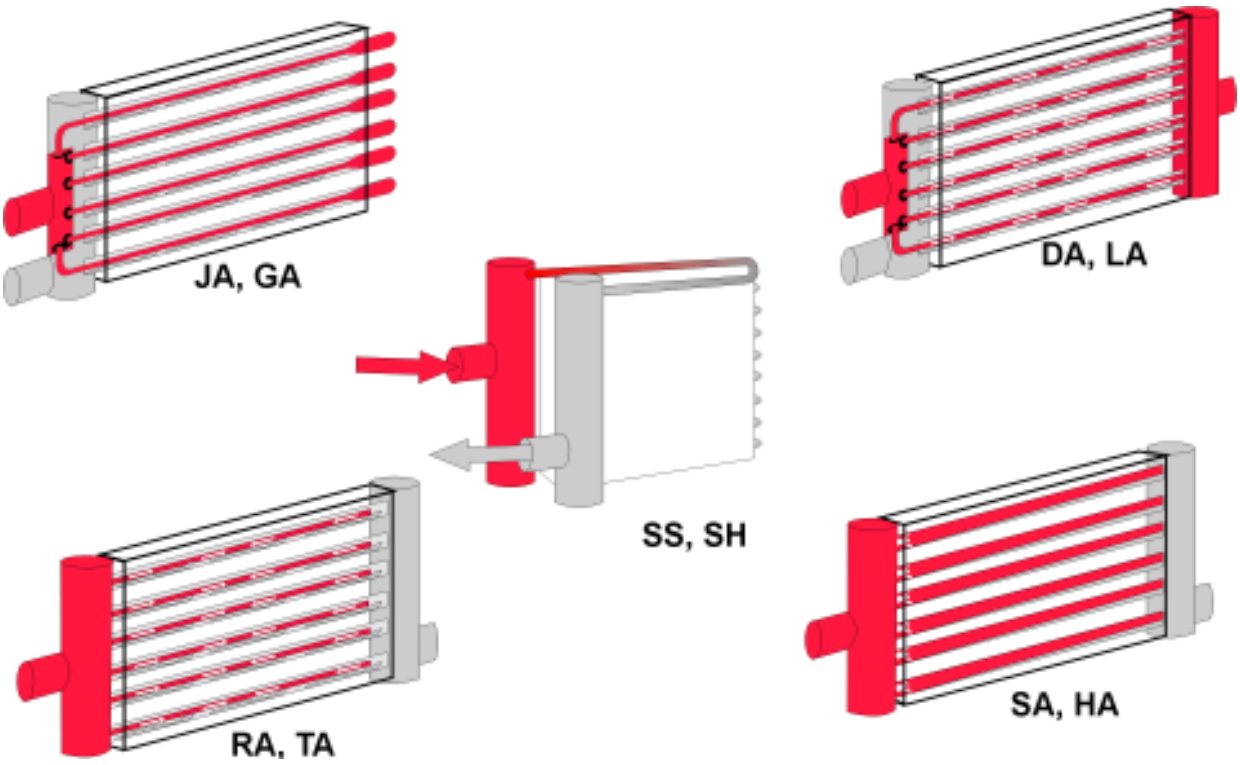


Figure 2 - Coil Types

Coil Types

Distributing

Heatcraft models JA, RA and DA jet-tube steam distributing coils are excellent for any general purpose heating application. With the superior freeze resistance provided by the tube-within-a-tube construction, it is ideal for low temperature preheating and special process applications. The construction features inner tubes with directional orifices to aid in steam distribution and condensate removal. Model JA offers same-end supply and return connections. Model RA offers opposite-end supply and return connections. Model DA offers dual-supply opposite-end connections for long coils that see sub-freezing air temperatures. Models GA, TA and LA utilize cupro-nickle, carbon steel and stainless steel tubing for high-pressure construction.

Single Tube

Heatcraft model SA steam coil is designed for general purpose heating. The construction features a single tube design with opposite-end supply and return connections. A perforated baffle located directly behind the supply connection insures proper steam distribution. Model HA utilizes cupro-nickle, carbon steel and stainless steel tubing for high-pressure construction.

Standard Steam

Heatcraft model SS steam coil features return-bend construction and same-end connections. Model SH utilizes cupro-nickle, carbon steel and stainless steel tubing for high-pressure construction.

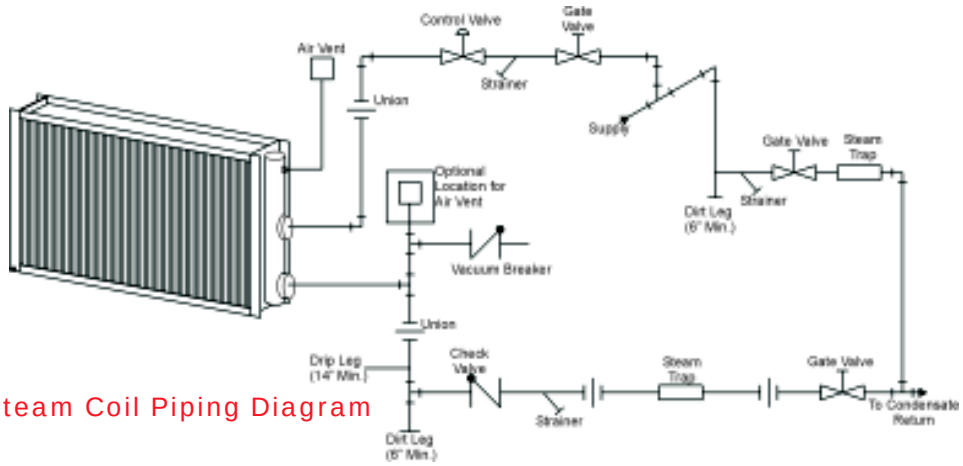


Figure 3 - Steam Coil Piping Diagram

Note 1: Vacuum breakers and air vents should be piped to a drain or other suitable location where discharged steam cannot lead to personal injury.

Installation

1. Carefully remove the coil from the shipping package to avoid damage to the finned surface area. Damaged fins can be straightened using an appropriate fin comb.
2. Heatcraft recommends cleaning the coil with a commercially available coil cleaner prior to installation. Refer to **Maintenance** on Page 5 for cleaning recommendations.

3. Mount coil properly to insure positive condensate drainage. Refer to ***Mounting*** instructions Page 2.
4. Proper clearance should be maintained between the coil and other structures such as the fan, filter racks, transition areas, etc.
5. Utilize vacuum breakers on each coil. Steam traps require a positive pressure differential to force the condensate through the valve seat. If the coil's pressure drops below atmospheric, the pressure differential across the valve will be negative and the condensate will not drain. This condition can lead to serious damage or failure of the coil due to freezing, water hammer and corrosion. Refer to piping diagram for recommended placement. See Note 1 in Figure 3 - Steam Coil Piping Diagram on Page 3.
6. Trap each coil separately. Differences in pressure from coil to coil can result in the backing-up of condensate which will result in poor coil performance and possible damage.
7. Provide an air vent for each coil at its highest location. Heatcraft provides a ½" threaded vent connection on the return manifold as a standard on all steam coils. Non-condensable gasses present in the steam will collect in a coil and reduce its capacity. Therefore, it is necessary to provide a means for the removal of these gasses. Also, these gasses can diffuse into the condensate forming byproducts, which can lead to severe corrosion. See Note 1 in Figure 3 - Steam Coil Piping Diagram on Page 3.
8. Steam supply lines need to be drained of condensate. This can be accomplished by the use of drip legs. This ensures that high quality steam enters the coil.
9. Condensate return piping should be the same size as the coil's return connection from the coil outlet to the steam trap.
10. Once installed, the coil should be pressurized to 100 psig with dry nitrogen or other suitable gas. The coil should be left pressurized for a minimum of 10 minutes. If the coil holds the pressure, the hook-up can be considered leak free. If the pressure drops by 5 psig or less, re-pressurize the coil and wait another 10 minutes. If the pressure drops again, there are more than likely one or more small leaks, which should be located and repaired. Pressure losses greater than 5 psig would indicate a larger leak, which should be isolated and repaired. Be sure to check valves and fittings as potential sites for leakage or bleed. If the coil itself is found to be leaking, contact your local Heatcraft representative. Unauthorized repair to the coil may void the coil's warranty (see Heatcraft's warranty policy on back cover).
11. All field brazing and welding should be performed using high quality materials and an inert gas purge (such as nitrogen) to reduce oxidation of the internal surface of the coil.
12. All field piping must be self supporting. System piping should be flexible enough to allow for thermal expansion and contraction of the coil. The use of flexible connections and/or swing joints is recommended.

13. The coil along with the control valve and trap should be isolated by manual valves to allow for servicing.
14. Refer to Figure 3 - Steam Coil Piping Diagram on Page 3 for general piping.
15. If you are unsure about any portion of the installation, contact your local steam specialist for assistance. Failure to properly install the coil can result in irreparable damage to the coil as well as other components in the system.

Operation

1. Proper air distribution is vital to coil performance. Air-flow anywhere on the coil face should not vary by more than 20%.
2. Air velocities should be maintained between 200 and 1500 feet per minute.
3. Operating pressures must be at or below the maximum operating pressure for that coil at the steam temperature. Pressure and temperature limitations can be determined through Heatcraft's *Pressure and Temperature* program. Contact your local Heatcraft coil representative for assistance.

Maintenance

1. Scheduled plant maintenance should include the draining and flushing of the condensate drip legs and sediment traps as well as inspection of condensate traps, vacuum breakers, air vents and valves. Boiler water analysis should also be performed on a regular basis.
2. To continually deliver full heating capacity, both the external and internal heat transfer surfaces must be maintained as clean and corrosion free as possible. The finned surface can be maintained by the use and constant inspection of pre-filters. The filters should be replaced as needed.
3. Should the finned surface become fouled, the coil can be cleaned utilizing commercially available coil cleaning fluids. Caution should be exercised in selecting the cleaning solution as well as the cleaning equipment. Improper selection can result in damage to the coil and/or health hazards. Be sure to carefully read and follow the manufacturer's recommendations before using any cleaning fluid. Clean the coil from the leaving air-side so that foreign material will be washed out of the coil rather than pushed further in.
4. Internal coil maintenance consists primarily of preventing scale and corrosion. This is accomplished through aggressive boiler water treatment, removal of dissolved oxygen and the removal of non-condensable gasses such as carbon dioxide.

Note: Boiler water treatment is beyond the scope of this manual. Contact your local water treatment specialist for assistance in establishing a proper boiler-water treatment program.

LUVATA

HEATCRAFT

COMMERCIAL PRODUCTS WARRANTY

Luvata Grenada LLC, hereinafter referred to as the “Company”, warrants that it will provide free suitable repair or replacement of coils in the event any coil of its manufacture used in the United States proves defective in material or workmanship within twelve (12) months from the date shipped by the Company.

THIS WARRANTY CONSTITUTES THE BUYER’S SOLE REMEDY. IT IS GIVEN IN LIEU OF ALL OTHER WARRANTIES. THERE IS NO IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT AND UNDER NO CIRCUMSTANCE SHALL THE COMPANY BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES, WHETHER THE THEORY BE BREACH OF THIS OR ANY OTHER WARRANTY, NEGLIGENCE, OR STRICT TORT.

This warranty extends only to the original purchaser. Of course, abuse, misuse, or alteration of the product in any manner voids the Company’s warranty obligation.

This warranty does not obligate the Company to pay any labor or service costs for removing or replacing parts, or any shipping charges.

No person (including any agent or salesman) has authority to expand the Company’s obligation beyond the terms of this express warranty, or to state that the performance of the coil is other than that published by Luvata Grenada LLC.

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