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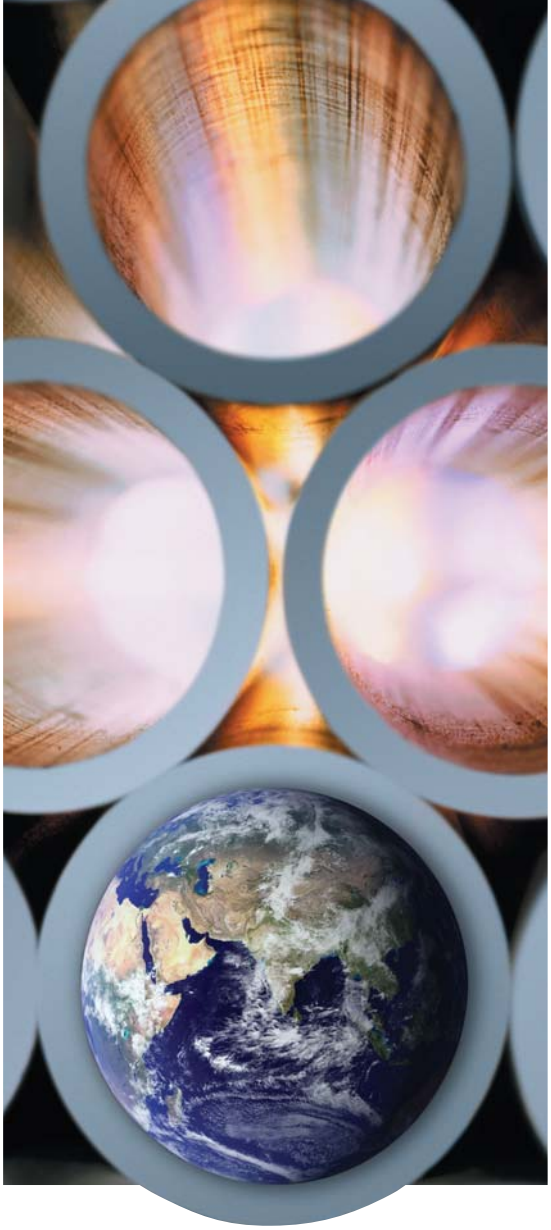

WORLDWIDE SUPPLIER OF HEAT EXCHANGER TUBES

TUBE SUPPLY INTERNATIONAL

TSI

INTRODUCTION

Our experience in the process industry has been built up over more than 25 years of supplying heat exchanger tube, boiler tube, pipe and extended surface tubing to the exacting requirements of clients throughout the world.

Tube Supply International has the proven capability to ensure that orders are delivered to consistent high quality standards, on time, wherever the destination. Delivery can be scheduled to meet either emergency or planned maintenance requirements.

We have the capability to supply a vast range of seamless and welded carbon steel, stainless steel, copper alloy, nickel alloy and titanium tube in accordance with most international specifications.

Utilising our large inventory we can deliver to suit the most exacting of requirements.

Our technically experienced staff offer an unrivalled service to clients throughout the world. Whatever exchanger product required we can be of assistance.

Our logistical experience ensures a smooth and on time delivery to the ultimate destination.

Our management system and procedures are accredited to ISO 9001:2000 by BSI.

QUALITY SYSTEMS

Our management system procedures are accredited to ISO 9001:2000 by BSI. The comprehensive quality assurance accreditations of our production mills ensure that the products supplied are fully in accordance with the highest industry standards.

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STOCK TUBES

Stock tubes are available for emergency or rapid delivery requirements, cut to length, de-burred, U bent (if required), packed and delivered to the specified destination.

With in excess of 1400 tonnes of heat exchanger and boiler tube in lengths of up to 19.6 metres we can supply almost any emergency requirement.

Delivery can be arranged to meet the needs of the client with transport by land, sea or air.

Seamless cold drawn carbon steel tubes
ASTM A179 / BS3059 / DIN 17175 ST35.8
Euronorm Equivalent EN10216

Seamless cold drawn alloy steel tubes
ASTM A213 in T5, T9 and T11
Euronorm Equivalents X11CrMo5+NT1, X11CrMo9-1+1 and 10CrMo5-5

Seamless cold drawn stainless steel tubes
ASTM A213 TP304 / TP304L / TP316 / TP316L and TP321

Welded carbon steel tubes ASTM A214

Welded stainless steel tubes
ASTM A249 / A269 / in TP304L and 316L

Seamless copper alloy tubes
ASTM B111 in C443, C687, C706 and C715:
BS2871 Pt 3 CZ110, CZ111, CN102 and CN107

Welded titanium tubes ASTM B338 GR 2

Tube OD	Wall tks	ASTM A179	BS3059 Part 1 320	ASTM A213 T5/T9/T11	ASTM A214	ASTM A213			ASTM A249		A789 UNS 31803	ASTM B111 / BS2871 Part 3				ASTM B338 Grade 2	Tube OD mm	Wall tks mm
						304/L	316/L	321	304/L	316/L		C687 CZ110	C443 CZ111	C706 CN102	C715 CN107			
5/8"	18SWG					○	○	○									15.88	1.22
5/8"	16BWG	○	○			○	○	○									15.88	1.65
3/4"	20BWG					○	○	○								○	19.05	0.90
3/4"	18BWG					○	○	○	○	○				○			19.05	1.24
3/4"	16BWG	○	○			○	○	○	○	○	○	○	○	○	○		19.05	1.65
3/4"	14BWG	○	○	○	○	○	○	○				○	○				19.05	2.11
3/4"	12BWG	○	○			○	○	○									19.05	2.77
3/4"	10BWG	○	○			○	○	○									19.05	3.41
1"	20SWG															○	25.4	0.91
1"	16BWG					○	○	○	○	○							25.4	1.65
1"	14BWG	○	○		○	○	○	○	○	○							25.4	2.11
1"	12BWG	○	○	○	○	○	○	○									25.4	2.77
1"	10BWG	○	○			○	○	○									25.4	3.41
1 1/4"	12BWG	○	○														31.75	2.77
1 1/2"	10BWG	○	○														38.1	3.41
20mm	2mm	○				○	○	○									20	2.00
25mm	2mm	○				○	○	○									25	2.00

○ Denotes stock item

SEAMLESS COLD DRAWN TUBES

Cold finished seamless carbon, carbon alloy, copper alloy, stainless steel, nickel alloy and titanium.

Drawing from a large inventory of raw materials we can deliver to suit the most exacting of customer requirements.

On site bending and ultrasonic testing facilities add to our flexibility.

Tubes can be supplied in sizes ranging from 12.7mm through 63.5mm OD in either straight or U bent form.

Specifications and material grades supplied are:
ASTM/ASME: A179 / A192 / A210 / A213 / A268 / A269 / A312 / A789 / B111 / B163 / B165 / B407 / B423 and B667.

BS, DIN, ANFOR, UNI & JIS equivalents are available.

Grade availability

Carbon alloy grades: T1 / T5 / T9 / T11 / T12 and T22
Euronorm Equivalents X11CrMo5+NT1, X11CrMo9-1+1, 10CrMo5-5, 13CrMo4-5, 10CrMo9-10

Austenitic steel grades: TP304 / TP304L / TP316 / TP316L / TP317 / TP321 / TP347 / UNS31803 and UNS8904(904L)

Ferritic steel grades: TP405 / TP410 / TP410S and TP430

Copper alloy grades: C443 / C687 / C706 and C715

Nickel alloy grades: 2200 / 2201 / 4400 / 6600 / 6625 / 8800 / 8825 and 8020

Titanium grades: GR 2 and GR 7

WELDED TUBES

Welded stainless steel, nickel alloy and titanium tubes.

We are able to supply a large range of high quality, rigorously tested welded tubing. Tubes can be supplied as either direct welded or welded and cold worked.

Tubes can be supplied in sizes ranging from 12.7mm through 101.6mm OD in either straight or U bent form.

Welded tube specifications and material grades supplied are:
ASTM/ASME: A249 / A269 / A789 / B515 / B516 / B626 / B674 / B704 / B730 and B338

BS, DIN, ANFOR, UNI and JIS equivalents are available.

Grade availability

Austenitic stainless grades: TP304 / TP304L / TP316 / TP316L / TP317 / TP321 / TP347 / UNS 8904 / S31803 / S32750

Nickel and nickel alloy grades: UNS 8800 / UNS 4400 / UNS 6625 / C10276 / C6022 / UNS 2200 / UNS 2201

Titanium grades: GR2 / GR3 / GR7 and GR12

U TUBES

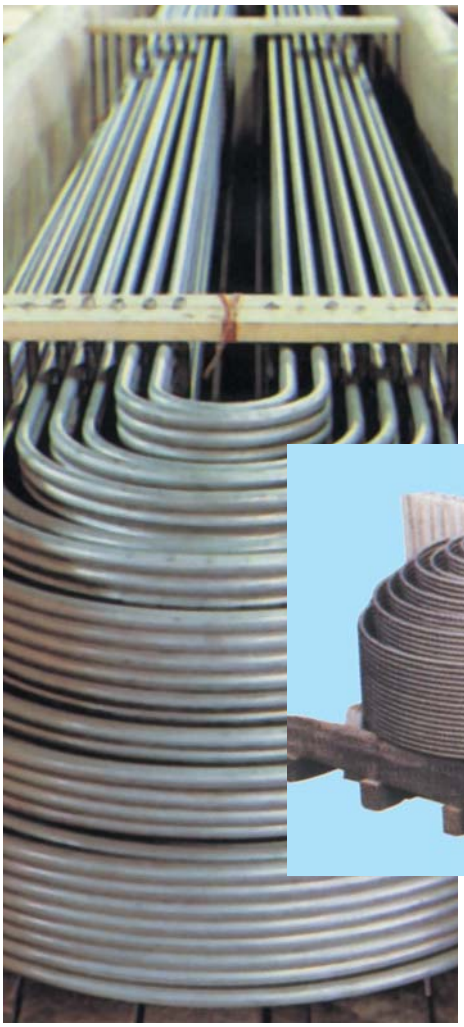
U tubes can be supplied to most outside diameters, thickness, material specifications and radii.

Bend areas plus necessary straight leg sections can be heat treated in accordance with specified requirements.

U tubes can also be hydrostatically tested if required.

Final packing can be either in cases or strapped to pallets.

For a rapid quotation please specify:
Material specification / Outside diameter of tube / Wall thickness / Straight leg length / Number of tubes at each radius and length / Whether heat treatment of the bend area is required / Whether hydrostatic testing is required / Packing method required



ALLOY STEEL FURNACE TUBES

Used in high temperature applications in furnaces and fired heaters.

Tube diameters are usually in the 2" to 9" range (nominal bore sizes can also be supplied) with single lengths of up to 21,400 mm (70 ft).

Tubes can be supplied with ends weld prepped or plain to suit client's requirements.

Specifications: ASTM/ASME: A161 / A200 / A209 / A213 / A335

Material Grades: T5 (5%Cr) / T9 (9% Cr) / T11 ($1^{1}/_{4}$% Cr) / T22 ($2^{1}/_{4}$% Cr) / T1 ($^{1}/_{2}$% Mo) & T91

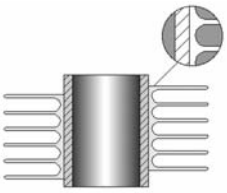
HELICAL HIGH FINNED TUBES

Helical high finned tubes have been used in the manufacture and repair of air cooled heat exchangers for over 60 years.

A good quality supply source is imperative for emergency repair and equipment maintenance.

For your rapid quotation please specify:
Number of pieces. Tube: Diameter, thickness, length and material specification. Fin: Type, material, spacing, thickness, height and unfinned end lengths. Delivery period required.

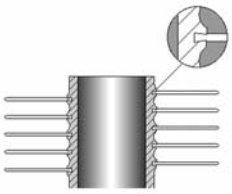
Extruded Fins



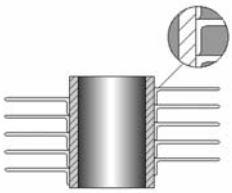
The fin gives complete protection to the base tube and is much stronger than the applied type due to work hardening of the fin material during the extrusion process.
Upper temperature limit: 350 deg C

Applied Fins

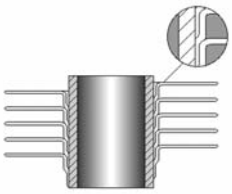
Are manufactured by wrapping a fin around the base tube to give the required characteristics for the process application. See types below.



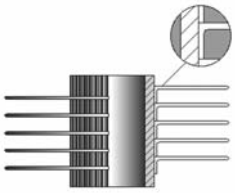
a) G Fin Tube (or embedded fin)
Fin is embedded into the outer wall of the tube but gives no surface protection. In general use for continuous process applications; i.e. refineries, petrochemical, fertilizer and gas plants.
Upper temperature limit: 450 deg C



b) L Fin (or wrapped fin)
The fin is wrapped around the tube and secured at each end. Gives some surface protection to the tube. Used for moderate temperature cooling applications.
Upper temperature limit: 120 deg C



c) LL Fin (or overlapped fin)
The fin is wrapped around the tube with an overlapping foot and secured at each end. Gives good surface protection to the tube. Used for moderate temperature cooling applications.
Upper temperature limit: 180 deg C



d) KL fin (or knurled L fin)
The fin is wrapped around the tube and the foot is rolled into the outer surface of the pre knurled tube and secured at each end. Gives good surface protection to the tube and improved heat transfer compared to L or LL type fin. Used for moderate temperature cooling applications.
Upper temperature limit: 250 deg C

HIGH FREQUENCY WELDED HELICAL FINNED TUBES

Used in boilers, furnaces and fired heaters.

A continuous helical fin is attached to the base tube by high frequency electric resistance welding in order to give an efficient and thermally reliable bond. Fins can be either solid or serrated (segmented).

Tube and pipe sizes available:
Tube OD: 25.4 / 31.8 / 38.1 / 50.8 / 63.5 and 76.0 mm
Pipe OD: 88.9 / 101.6 / 114.3 / 141.3 / 168.3 and 219.1 mm

Tube/pipe thickness:
Minimum 2.13mm for solid fin
Minimum 1.90mm for serrated fin
Minimum thickness is also dependant on the fin thickness and tube/pipe OD

Fin height range:
Solid fin: 6.3 mm - 31.8 mm.
Serrated fin: 12.7 mm - 38.1 mm

Fin height is dependant on the fin type (solid or serrated) tube OD, fin thickness and material.

Fin thickness is dependant on the fin material, height of fin and tube OD. Usually between 1.0 mm and 3.4 mm.

Fin density is dependant upon fin type (solid or serrated) tube OD, fin height, fin thickness and fin material. Density is generally between 1 fin/inch and 7 fins/inch.

Materials for both tube/pipe and fin can be a combination of carbon steel, low alloy steel and stainless steel.

For a rapid quotation please specify:
Number of pieces.

Pipe/tube: diameter, thickness, length and material specification.

Fins: material specification, type (solid or serrated) height, thickness, spacing, finned length and unfinned sections.

Weld prep details if required.

Delivery period required.

INTEGRALLY FINNED TUBES

Developed as a method of increasing heat transfer performance of fluids whilst minimising the physical size and cost of the heat exchanger.

The fin is produced by being rolled from the wall of the tube and is therefore integral with the tube itself. Due to fin rolling the wall thickness beneath the finned section is reduced compared with the plain ends. The bore of the finned section is slightly reduced. Most tubular materials can be finned, however hardness of the material usually determines the finning code or fin profile.

Harder materials such as stainless steel, nickel alloys and titanium are usually supplied with a greater fin density (28, 30 or 36 fins/inch). This shallower fin profile reduces work hardening of the material and helps eliminate the possibility of fin root cracking.

Softer materials such as carbon steel, copper and copper alloys are usually supplied with a deeper profile giving a lower fin density (16 or 19 fins/inch).

Plain ends and any skipped sections must be specified.

Finished tubes can be U bent if required. The U bend area can be either finned or plain, to meet the required specification.

Manufacturing limitations

Materials:

1. Carbon and low alloy steel
2. Stainless steel: TP304 / TP304L / TP316 / TP316L / TP321 and duplex.
3. Copper alloys: Alloy 443 / 687 / 706 / 715 etc.
4. Titanium and high nickel alloys

Tube sizes – Outside diameter: 12.7 / 15.8 / 19.05 and 25.4mm

Plain end wall thickness: >= 1.25 mm

Length: up to 24,000 mm

Surface area improvement

Typical surface area improvements by using integral low fin tubes are:

1. 19.05 mm OD with 19 fins/inch: 270%
2. 25.4 mm OD with 26 fins/inch: 330%

Dependant on the fluids within the heat exchanger, the thermal improvement can range from between 20% to in excess of 100%.

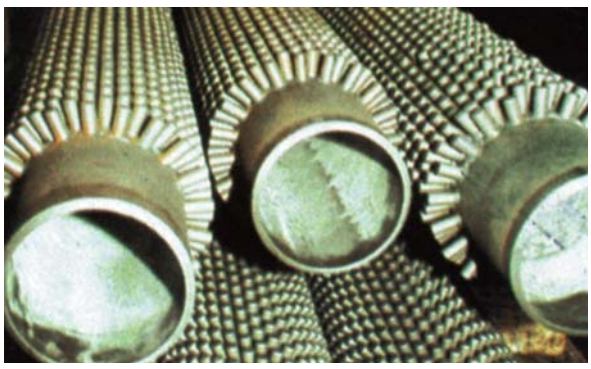
STUDDED TUBE AND PIPE

Because of their relative ease of cleaning, studded tubes/pipes are used in furnaces and fired heaters as an alternative to high frequency welded fintubes wherever the process application is such that heavy fouling of the surface may occur.

The studs are attached to the pipe in diametrically opposing pairs around the circumference by electrical resistance welding to ensure a high integrity bond for strength and heat flow.

Stud diameter, height and pitch can be specified on an individual basis.

Welding tests are carried out as a matter of course to ensure the effectiveness of the stud to pipe bond. Heat treatment of the completed studded tube is carried out where necessary. Should fouling eventually reduce the process performance of the equipment the studded surface can be cleaned efficiently by shot blasting without damage to the materials.



LONGITUDINAL FINNED TUBES

Applications include double pipe and multi-tube heat exchangers, fired heaters, gas coolers and tank heaters.

The fins are formed from a U channel of material with the base of the channel being pressure rolled and spot welded to the tube or pipe.

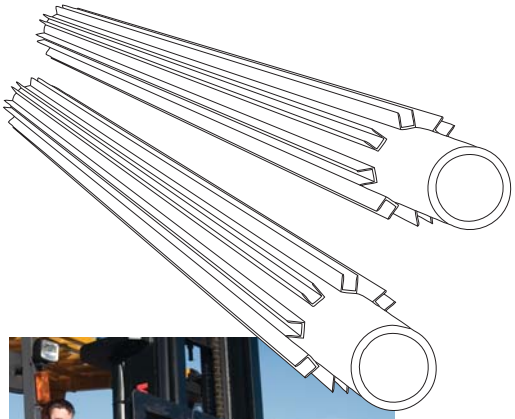
Can be manufactured from most weldable or brazable materials and supplied in either straight lengths or in U bend form.

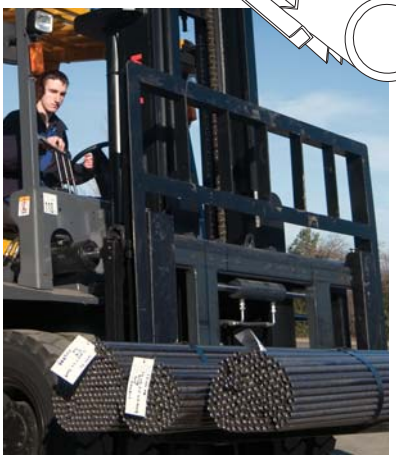
The fin channels are welded to the tube in opposite pairs. Fin height, number of fins and thickness can be uniquely specified.

Fins can be applied to either OD tube or NB pipe.

Fins can be either solid or perforated to suit the application.

For your rapid quotation please specify:
Number of pieces
Pipe/tube: diameter, thickness, length and material specification
Fins: height, thickness, number, length, material specification and unfinned ends
Delivery period required





ASSOCIATED PRODUCTS

Forged header plugs

Used in air cooled heat exchangers, forged header plugs can be supplied in a large range of materials from carbon steel (ASTM A105) through A182 stainless steel grades to nickel alloys and titanium.

Quantities, thread size and threaded length can be specified to order.

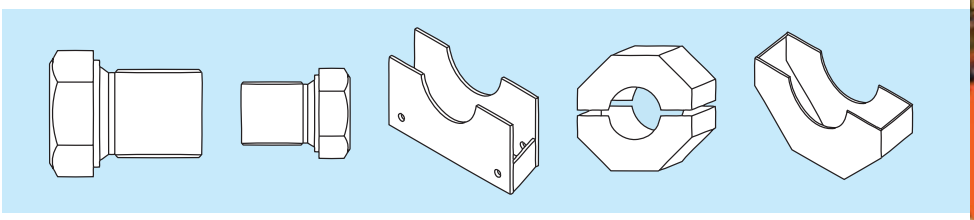
Unusual sizes can be catered for when drawings are made available.

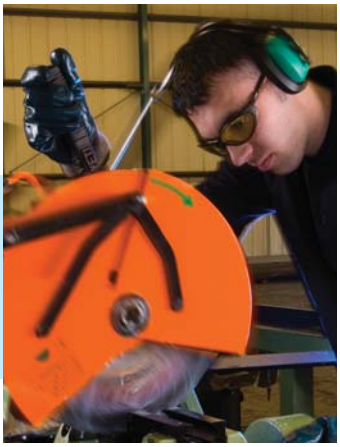
Pressed support boxes

Used in air cooled heat exchangers for supporting the finned tubes in accordance with API 661.

Are manufactured in aluminium, brass, copper or galvanised steel.

Are supplied as half boxes in rectangular or hexagonal support format to suit the finned tube pitch.





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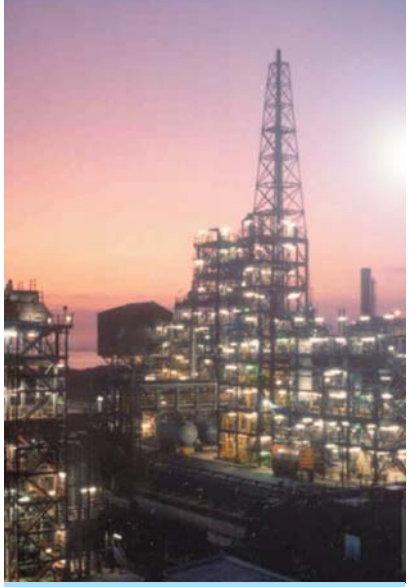

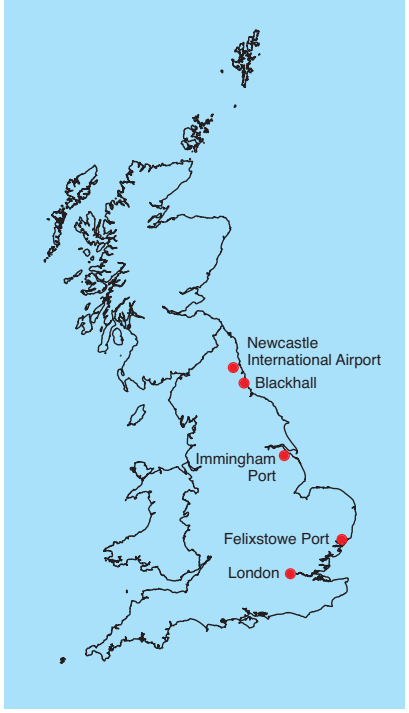

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