

# Stainless Steel Tube – A Guide

## Tube Specifications

ASTM Standards covered in this Section		Page
-	ASTM Tube - General Requirements	3-2
A 450/A 450M - 96	General Requirements for Carbon, Ferritic Alloy, and Austenitic Alloy Steel Tubes (Incorporated within the ASTM Tube General Requirements subsection)	3-2
A 370 - 96	Mechanical Testing of Steel Products (Incorporated within the ASTM Tube General Requirements subsection)	3-6
A 213/A 213M - 95a	Seamless Ferritic and Austenitic Alloy-Steel Boiler, Superheater and Heat Exchanger Tubes	3-10
A 249/A 249M - 96a	Welded Austenitic Steel Boiler, Superheater, Heat Exchanger and Condenser Tubes	3-16
A 268/A 268M - 96	Seamless and Welded Ferritic and Martensitic Stainless Steel Tubing for General Service	3-22
A 269 - 96	Seamless and Welded Austenitic Stainless Steel Tubing for General Service	3-26
A 270 - 95a	Seamless and Welded Austenitic Stainless Steel Sanitary Tubing	3-30
A 511 - 96	Seamless Stainless Steel Mechanical Tubing	3-33
A 554 - 94	Welded Stainless Steel Mechanical Tubing	3-38
A 632 - 90	Welded, Unannealed Austenitic Stainless Steel Tubular Products	3-43
A 778 - 90a	Welded, Unannealed Austenitic Stainless Steel Tubular Products	3-46
A 789/A 789M - 95	Seamless and Welded Ferritic/Austenitic (Duplex) Stainless Steel Tubing for General Service	3-49
A 791/A 791M - 94	Welded Unannealed Ferritic Steel Tubing	3-53
A 803/A 803M - 96	Welded Ferritic Stainless Steel Feedwater Heater Tubes	3-56

## Grades Available

Types 304L and 316L are the most readily available from stock in a large range of metric and imperial tube sizes and wall thicknesses. A wide range of other sizes and grades including duplex types and nickel alloys are manufactured to order.

## Markings on the tube

The full identification should be continuously marked down the whole length, including:

- ◆ Size – Outside Diameter (O/D) and Wall Thickness
- ◆ Specification
- ◆ Grade
- ◆ Method of Manufacture (Seamless or Welded)
- ◆ Heat Number
- ◆ Manufacturer's Name or Symbol

## Tube Size Ranges

An almost limitless size range is available with non-standards being available only in mill production quantities on long lead times. Given below is an indication of what sizes are most readily available from stock:

- ◆ Hypodermic tube from 0.4mm to 5mm O/D with wall thickness 0.05mm to 0.4mm
- ◆ Instrumentation tube in straight lengths or continuous coils of up to 1,000 metres long: O/Ds 6mm, 8mm, 10mm and 12mm with heavy wall thicknesses, typically 0.5mm, 1mm, 1.5mm or 2mm
- ◆ Metric sizes from 6mm O/D to 610mm O/D with wall thickness 1mm to 6mm
- ◆ Imperial sizes from 1/8" O/D to 6" O/D with wall thickness from 24swg to 10swg
- ◆ Hygienic/Sanitary Tube
  - Imperial sizes to ASTM A270: 3/4", 1", 1 1/2", 2", 2 1/2", 3" & 4" O/D with 16swg wall and 4" O/D with 14swg wall
  - Metric sizes to DIN 11850: 1", 1 1/2", 2", 2 1/2" & 3" O/D with 1.5 mm wall and 4" O/D with 2mm wall
- ◆ Welded Tubes for the water industry from 18mm O/D x 1.5mm wall to 910mm O/D x 5mm wall
- ◆ Welded Tube for automotive exhaust systems, mostly in grade 409 – A limited size range from 35 to 63mm O/D with wall thickness 1.2mm to 2mm
- ◆ Decorative and structural tubes (welded)
  - Round in metric and imperial O/D sizes from 1/2" O/D x 1.2mm wall to 100mm O/D x 3mm wall
  - Square in metric and imperial O/D sizes from 12.7mm O/D x 1.5mm wall to 250mm x 250 x 10mm wall
  - Rectangular in metric sizes from 20mm x 10mm x 1.2mm wall to 300mm x 200 x 10mm wall
  - Other items include Oval, Handrail and Textured - Most common oval size is 60mm x 33mm x 2.0mm wall
  - Note that most decorative tubes are supplied with a polished finish

**aalco**<sup>®</sup>

Aalco is a registered trademark of Aalco Metals Ltd

© Copyright: Aalco Metals Ltd, 25 High Street, Cobham, Surrey, KT11 3DH

All Data is indicative only and must not be seen as a substitute for the full specification from which it is drawn. In particular, the mechanical property requirements vary widely with product form and product dimensions. For more complete details please refer to the relevant specification – The BS EN Specifications for Stainless Steel are listed on a separate Datasheet.

## Standard Tolerances for welded and seamless tube to ASTM A450 / A450M

### Standard Tolerances for welded and seamless cold finished tube (ASTM A 450/A 450M)

Outside Diameter (OD)		Variations in OD <sup>1</sup>				Variation in $t_{min}$ <sup>2</sup>		Ovality <sup>3</sup> (Thin wall tube only)	
		Under		Over		Under	Over		
in	mm	in	mm	in	mm	%	%	in	m
<1	<25.4	0.004	0.1	0.004	0.1	0	20	0.020	0.5
1	25.4	0.006	0.15	0.006	0.1	0	20	0.020	0.5
>1 to 1½	>25.4 to 38.1	0.006	0.15	0.006	0.15	0	20	0.020 <sup>4</sup>	0.5 <sup>4</sup>
>1½ to <2	>38.1 to <50.8	0.008	0.2	0.008	0.2	0	22	0.020 <sup>4</sup>	0.5 <sup>4</sup>
2	50.8	0.008	0.2	0.008	0.2	0	22	2.0% of OD	
>2 to 2½	>50.8 to 63.5	0.010	0.25	0.010	0.25	0	22	2.0% of OD	
>2½ to 3	>63.5 to 76.2	0.012	0.3	0.012	0.3	0	22	2.0% of OD	
>3 to 4	>76.2 to 101.6	0.015	0.38	0.015	0.38	0	22	2.0% of OD	

#### Notes

- 1 Includes ovality tolerance except for thin wall tube
- 2  $t_{min}$  = minimum wall thickness
- 3 Ovality = Difference between maximum and minimum OD  
Thin wall tube is defined as that with a wall thickness  
 $t \leq 0.020$  in (0.5 mm) for any OD,  
 or  $t \leq 2\%$  of OD if OD  $\leq 2$  in (50.8 mm),  
 or  $t \leq 3\%$  of OD if OD  $> 2$  in (50.8 mm)
- 4 Or 2.0% of OD, if this gives a larger tolerance value.

**For more information plus a complete table of sizes and dimensions as well as full specifications, please visit the Down-Loads page of the Aalco web site and select the Tubular Products Databook.**

**<http://www.aalco.co.uk/literature/literature.html#stainless>**

*This information is based on our present knowledge and is given in good faith. However, no liability will be accepted by the Company in respect of any action taken by any third party in reliance thereon. As the products detailed may be used for a wide variety of purposes and as the Company has no control over their use; the Company specifically excludes all conditions or warranties expressed or implied by statute or otherwise as to dimensions, properties and/or fitness for any particular purpose. Any advice given by the Company to any third party is given for that party's assistance only and without liability on the part of the Company.*

*Any contract between the Company and a customer will be subject to the Company's Conditions of Sale. The extent of the Company's liabilities to any customer is clearly set out in those Conditions; a copy of which is available on request.*

**aalco**<sup>®</sup> Aalco is a registered trademark of Aalco Metals Ltd

© Copyright: Aalco Metals Ltd, 25 High Street, Cobham, Surrey, KT11 3DH

*All Data is indicative only and must not be seen as a substitute for the full specification from which it is drawn. In particular, the mechanical property requirements vary widely with product form and product dimensions. For more complete details please refer to the relevant specification – The BS EN Specifications for Stainless Steel are listed on a separate Datasheet.*