

TOLERANCES, METRIC
Corrosion and Heat Resistant Steel Tubing

1. **SCOPE:** This specification covers established manufacturing tolerances applicable to seamless and welded tubing of corrosion and heat resistant steel ordered to metric dimensions. These tolerances apply to all conditions and are based on individual measurements, unless otherwise noted. The term "excl" is used to apply only to the higher figure of a specified range.

- 1.1 These tables are based on logical metric values and preferred metric sizes.

- 1.2 Throughout this specification the term "metric" is intended to refer to the SI system.

- 1.3 **Mechanical Tubing:** The term "mechanical tubing" as used in AMS means a heavy-walled cylindrical tubing intended primarily for the machining of circular rings, flanges, shafts, etc, having a wall thickness which is a substantial proportion of the outer diameter; such tubing is not normally used as pipe for the transmission of fluids, and parts made from it are usually machined all over. This product is sometimes known as "hollow bar".

2. **DIAMETER:** Mean diameter is the average of two measurements taken at right angles to each other at the same section. Ovality is the difference between the maximum and minimum diameters of any one section of a tube. When specified by purchaser, OD tolerances in Tables I and II shall apply to the ID instead, but not to both OD and ID of the same lot of tubing.

- 2.1 **Seamless, Cold Finished:**

- 2.1.1 **Pressure Tubing:** Tubes having a specified wall thickness which is 3% or less of the specified OD while having an average diameter within the tolerances shown, will require an additional ovality tolerance equal to $\pm 0.5\%$ of the specified outside diameter.

TABLE I

Specified OD Millimetres	OD Tolerance, Millimetres (Including Out-of-Roundness)	
	Plus	Minus
Up to 25, incl	0.10	0.10
Over 25 to 38, incl	0.15	0.15
Over 38 to 50, excl	0.20	0.20
50 to 65, excl	0.25	0.25
65 to 75, excl	0.30	0.30
75 to 100, incl	0.40	0.40
Over 100 to 190, incl	0.40	0.65
Over 190 to 220, incl	0.40	1.15

2.1.2 Non-Pressure Tubing (Excluding Mechanical Tubing):

TABLE II

Specified OD Millimetres	Specified Wall Thickness Millimetres	OD Tolerance, Millimetres Cold Drawn, Annealed, or Solution Heat Treated	
		Mean OD Plus and Minus	Ovality
Up to 12, incl	Up to 0.40, excl	0.13	0.25
Up to 12, incl	0.40 and over	0.13	--
12 to 38, excl	0.60 to 1.6, excl	0.13	0.25
12 to 38, excl	1.6 and over	0.13	--
38 to 90, excl	0.60 to 2.5, excl	0.25	0.50
38 to 90, excl	2.5 and over	0.25	--
90 to 140, excl	2.5 to 4.0, excl	0.40	0.75
90 to 140, excl	4.0 and over	0.40	--
140 to 200, excl	4.0 to 6.0, excl	0.75	1.50
140 to 200, excl	6.0 and over	0.75	--
200 to 220, incl	5.0 to 8.0, excl	1.15	2.30
200 to 220, incl	8.0 and over	1.15	--

2.2 Mechanical Tubing:

2.2.1 Cold Finished:

TABLE III

Specified Diameter Millimetres	OD Tolerance, Millimetre Plus and Minus
30 to 75, incl	0.13
Over 75 to 90, incl	0.25
Over 90	0.40

2.2.2 Hot Finished:

2.2.2.1 Outside Diameter:

TABLE IV

Specified Diameter Millimetres	OD Tolerance, Millimetres Plus Only
Up to 75, incl	1.20
Over 75	1.55

2.2.2.2 Inside Diameter:

TABLE V

Specified Diameter Millimetres	ID Tolerance, Millimetres Minus Only
Up to 75, incl	1.55
Over 75	5.10

2.3 Welded:

2.3.1 Pressure Tubing: Tubes having a specified wall thickness which is 3% or less of the specified OD, while having an average diameter within the tolerances shown, will require an additional ovality tolerance equal to $\pm 0.5\%$ of the specified outside diameter.

TABLE VI

Specified OD Millimetres	OD Tolerance, Millimetres (Including Out-of-Roundness)	
	Plus	Minus
Up to 25, excl	0.10	0.10
25 to 40, incl	0.15	0.15
Over 40 to 50, excl	0.20	0.20
50 to 65, excl	0.25	0.25
65 to 75, excl	0.30	0.30
75 to 100, incl	0.40	0.40
Over 100 to 190, incl	0.40	0.65
Over 190 to 220, incl	0.40	1.15

2.3.2 Non-Pressure Tubing (Excluding Mechanical Tubing):

TABLE VII

Specified OD Millimetres	Specified Wall Thickness Millimetres	ID and OD Tolerance, Millimetres (See 2.3.2.1 and 2.3.2.2)		
		Plus and Minus		
		OD	ID	Ovality
Up to 2.5, excl	Up to 3% OD, incl	0.03	0.03	0.03
Up to 2.5, excl	Over 3% OD	0.03	0.03	--
2.5 to 5.0, excl	Up to 3% OD, incl	0.04	0.04	0.04
2.5 to 5.0, excl	Over 3% OD	0.04	0.04	--
5.0 to 14, excl	Up to 3% OD, incl	0.08	0.13	0.08
5.0 to 14, excl	Over 3% OD	0.08	0.13	--
14 to 25, excl	Up to 3% OD, incl	0.10	0.15	0.10
14 to 25, excl	Over 3% OD	0.10	0.15	--
25 to 38, excl	Up to 3% OD, incl	0.13	0.18	0.13
25 to 38, excl	Over 3% OD	0.13	0.18	--
38 to 50, excl	Up to 3% OD, incl	0.15	0.20	0.15
38 to 50, excl	Over 3% OD	0.15	0.20	--
50 to 65, excl	Up to 3% OD, incl	0.18	0.25	0.18
50 to 65, excl	Over 3% OD	0.18	0.25	--
65 to 90, excl	Up to 3% OD, incl	0.25	0.35	0.25
65 to 90, excl	Over 3% OD	0.25	0.35	--
90 to 130, excl	Up to 3% OD, incl	0.40	0.50	0.40
90 to 130, excl	Over 3% OD	0.40	0.50	--

2.3.2.1 OD and ID tolerances shall not both apply to the same lot of tubing.

2.3.2.2 For tubing with wall thickness 3% or less of specified OD, the OD tolerances apply to the mean outside diameter.

3. WALL THICKNESS:

3.1 Seamless, Cold Finished:

3.1.1 Pressure Tubing:

TABLE VIII

Specified OD Millimetres	Tolerance, % Plus Only (See 3.1.1.1)
Up to 38, incl	20
Over 38	22

3.1.1.1 For any wall thickness when the ID is under 13 mm and for wall thicknesses greater than 20% of the specified OD when the ID is under 16 mm, wall thickness tolerance shall be $\pm 10\%$ for tubing which can be produced by the rod or bar mandrel process and shall be $\pm 15\%$ for tubing which cannot be produced by this process.

3.1.2 Non-Pressure Tubing (Excluding Mechanical Tubing):

TABLE IX

Specified OD Millimetres	Tolerance, % Plus and Minus
Up to 12, excl	15
12 and over	10

3.1.3 Mechanical Tubing, Hot Finished or Cold Finished:

TABLE X

Specified Wall Thickness Millimetres	Tolerance, % Plus and Minus
3.0 to 6.0, excl	12.5
6.0 and over	10

3.2 Welded, Cold Finished:

3.2.1 Pressure Tubing: The wall thickness tolerance for all sizes of welded pressure tubing is $+18\%$, -0 .