

ASTM A554 MT-316L Technical Datasheet

Prepared from ASTM A554-16

1. Basic designation

Standard	Grade	UNS / Designation	Product	Form / shape	Supply conditions
ASTM A554-16	MT-316L	—	Welded stainless steel mechanical tubing	Round / square / rectangular / special	As-welded; welded and annealed; cold reduced; cold reduced and annealed

Family: Austenitic. Tubing is made from flat-rolled steel by an automatic welding process without addition of filler metal. Inside diameter bead may be furnished as not removed, controlled to 0.005 in. [0.13 mm] or 15% of wall, or removed.

2. Chemical composition (%)

C	Mn	P	S	Si	Ni	Cr	Mo	Ti	Cb/Nb	N	Cu	Other
≤0.035	≤2.00	≤0.045	≤0.030	≤1.00	10.0–15.0	16.0–18.0	2.0–3.0	—	—	—	—	For small diameter/thin walls with many drawing passes, C max 0.040%

Table 1 footnotes applicable where relevant: MT-304L and MT-316L may require C max 0.040% for very small diameter / thin walls. MT-309S-Cb and MT-347 use columbium not less than 10 × carbon and not more than 1.00%. MT-321 uses titanium not less than 5 × carbon and not more than 0.60%.

3. Round tubing dimensional tolerances (all conditions except tubing with bead removed) — Table 2

OD size	Wall thickness range	OD tolerance	Notes
Under 1/2 (12.7 mm)	0.020 to 0.049 in. (0.51 to 1.24 mm)	±0.004 in. (0.10 mm)	Wall tolerance ±10%
1/2 to 1 (12.7 to 25.4 mm)	0.020 to 0.065 in. (0.51 to 1.65 mm)	±0.005 in. (0.13 mm)	Wall tolerance ±10%
1/2 to 1 (12.7 to 25.4 mm)	Over 0.065 to 0.134 in. (1.65 to 3.40 mm)	±0.010 in. (0.25 mm)	Wall tolerance ±10%
Over 1 to 1 1/2 incl.	0.025 to 0.065 in.	±0.008 in. (0.20 mm)	Wall tolerance ±10%
Over 1 to 1 1/2 incl.	Over 0.065 to 0.134 in.	±0.010 in. (0.25 mm)	Wall tolerance ±10%
Over 1 1/2 to 2 incl.	0.025 to 0.049 in.	±0.010 in. (0.25 mm)	Wall tolerance ±10%
Over 1 1/2 to 2 incl.	Over 0.049 to 0.083 in.	±0.011 in. (0.28 mm)	Wall tolerance ±10%
Over 1 1/2 to 2 incl.	Over 0.083 to 0.149 in.	±0.012 in. (0.30 mm)	Wall tolerance ±10%
Over 2 to 2 1/2 incl.	0.032 to 0.065 in.	±0.012 in. (0.30 mm)	Wall tolerance ±10%
Over 2 to 2 1/2 incl.	Over 0.065 to 0.109 in.	±0.013 in. (0.33 mm)	Wall tolerance ±10%
Over 2 to 2 1/2 incl.	Over 0.109 to 0.165 in.	±0.014 in. (0.36 mm)	Wall tolerance ±10%
Over 2 1/2 to 3 1/2 incl.	0.032 to 0.165 in.	±0.014 in. (0.36 mm)	Wall tolerance ±10%
Over 2 1/2 to 3 1/2 incl.	Over 0.165 in.	±0.020 in. (0.51 mm)	Wall tolerance ±10%
Over 3 1/2 to 5 incl.	0.035 to 0.165 in.	±0.020 in. (0.51 mm)	Wall tolerance ±10%
Over 3 1/2 to 5 incl.	Over 0.165 in.	±0.025 in. (0.64 mm)	Wall tolerance ±10%
Over 5 to 7 1/2 incl.	0.049 to 0.250 in.	±0.025 in. (0.64 mm)	Wall tolerance ±10%
Over 5 to 7 1/2 incl.	Over 0.250 in.	±0.030 in. (0.76 mm)	Wall tolerance ±10%
Over 7 1/2 to 16 incl.	All	0.00125 in./in. or mm/mm of circumference	Wall tolerance ±10%

Table 2 notes: wall tolerance is ±10% of specified wall thickness. For OD up to and including 5 in., when wall thickness is 3% or less of OD, ovality tolerance is twice the tabular OD tolerance spread. For OD over 5 in. to 16 in. with wall thickness 3% or less of OD, ovality shall not exceed 1.5% of specified OD.

4. Round tubing dimensional tolerances (tubing with bead removed) — Table 3

OD size	OD tolerance	ID tolerance	Notes
Up to 3/32 (2.4 mm), excl	OD ±0.001 in. (0.03 mm)	ID ±0.001 in. (0.03 mm)	Wall tolerance ±10%
3/32 to 3/16 excl	OD ±0.0015 in. (0.038 mm)	ID ±0.0015 in. (0.038 mm)	Wall tolerance ±10%

3/16 to 1/2 excl	OD ±0.003 in. (0.08 mm)	ID ±0.005 in. (0.13 mm)	Wall tolerance ±10%
1/2 to 1 excl	OD ±0.004 in. (0.10 mm)	ID ±0.006 in. (0.15 mm)	Wall tolerance ±10%
1 to 1 1/2 excl	OD ±0.005 in. (0.13 mm)	ID ±0.007 in. (0.18 mm)	Wall tolerance ±10%
1 1/2 to 2 excl	OD ±0.006 in. (0.15 mm)	ID ±0.008 in. (0.20 mm)	Wall tolerance ±10%
2 to 2 1/2 excl	OD ±0.007 in. (0.18 mm)	ID ±0.010 in. (0.25 mm)	Wall tolerance ±10%
2 1/2 to 3 1/2 excl	OD ±0.010 in. (0.25 mm)	ID ±0.014 in. (0.36 mm)	Wall tolerance ±10%
3 1/2 to 5 incl	OD ±0.015 in. (0.38 mm)	ID ±0.020 in. (0.51 mm)	Wall tolerance ±10%
Over 5 to 16 incl	OD ±0.00125 in./in. or mm/mm of circumference	ID ±0.0013 in./in. or mm/mm of circumference	Wall tolerance ±10%

Table 3 notes: tubing may be specified to only two of the three dimensions—outside diameter, inside diameter, or wall. Ovality provisions apply when wall thickness is 3% or less of OD. Wall tolerance is ±10% of specified wall thickness.

5. Length variations and straightness — Table 4 / Section 9.4

Length	Outside diameter	Over tolerance	Under tolerance
4 ft and under	Up to 2 in. OD incl	+1/16 in. (1.6 mm)	0
4 ft and under	Over 2 to 4 in. OD incl	+3/32 in. (2.4 mm)	0
4 ft and under	Over 4 in. OD	+1/8 in. (3.2 mm)	0
Over 4 to 10 ft incl	Up to 2 in. OD incl	+3/32 in. (2.4 mm)	0
Over 4 to 10 ft incl	Over 2 in. OD	+1/8 in. (3.2 mm)	0
Over 10 to 24 ft incl	All sizes	+3/16 in. (4.8 mm)	0

For all diameters in lengths over 24 ft (7.3 m), an additional over tolerance of 1/8 in. (3.2 mm) for each 10 ft (3.0 m) or fraction thereof is permissible, up to 1/2 in. (12.7 mm) maximum. Straightness tolerance for round tubing is 0.030 in. (0.76 mm) max in any 3 ft (0.9 m) length.

6. Square and rectangular tubing tolerances — Table 5

Largest specified outside dimension across flats	Wall thickness	Across-flats tolerance
To 1 1/4 in. (31.8 mm) incl	All	±0.015 in. (0.38 mm)
Over 1 1/4 to 2 1/2 in. incl	All	±0.020 in. (0.51 mm)
Over 2 1/2 to 5 1/2 in. incl	All	±0.030 in. (0.76 mm)
Over 5 1/2 to 8 in. incl	All	±0.060 in. (1.52 mm)
Wall thickness	Maximum corner radius	
Over 0.020 to 0.049 in. incl	3/32 in. (2.4 mm)	
Over 0.049 to 0.065 in. incl	1/8 in. (3.2 mm)	
Over 0.065 to 0.083 in. incl	9/64 in. (3.6 mm)	
Over 0.083 to 0.095 in. incl	3/16 in. (4.8 mm)	
Over 0.095 to 0.109 in. incl	13/64 in. (5.2 mm)	
Over 0.109 to 0.134 in. incl	7/32 in. (5.6 mm)	
Over 0.134 to 0.156 in. incl	1/4 in. (6.4 mm)	
Over 0.156 to 0.200 in. incl	3/8 in. (9.5 mm)	
Over 0.200 to 0.250 in. incl	1/2 in. (12.7 mm)	
Over 0.250 to 0.375 in. incl	3/4 in. (19.1 mm)	
Largest size	Twist in 3 ft, max	
Under 1/2 in. (12.7 mm)	0.050 in. (1.4 mm/m)	
1/2 to 1 1/2 in. incl	0.075 in. (2.1 mm/m)	
Over 1 1/2 to 2 1/2 in. incl	0.095 in. (2.6 mm/m)	
Over 2 1/2 to 4 in. incl	0.125 in. (3.5 mm/m)	
Over 4 to 6 in. incl	0.250 in. (6.9 mm/m)	
Over 6 in.	0.375 in. (10.4 mm/m)	

Square and rectangular tubing wall tolerance is ±10% of nominal wall thickness. Squareness of sides: $\pm B = C \times 0.006$, where C is the length of the longest side. Straightness tolerance is 0.075 in. in 3 ft or 2.1 mm in 1 m using a 3-ft (1-m) straightedge and feeler gauge.

7. Condition, workmanship, finish, marking, and packaging

Requirement	Details
-------------	---------

Supply condition	As welded, welded and annealed, cold reduced, or cold reduced and annealed. Square and rectangular welded tubing is supplied as cold worked unless otherwise specified.
ID bead condition	Bead not removed; bead controlled to 0.005 in. [0.13 mm] or 15% of specified wall, whichever is greater; or bead removed.
Surface finish	Tubes shall be free of scale. Special surface conditioning must be stated in the order.
Workmanship	Ends smooth and free of burrs. Injurious defects not permitted. Surface imperfections may be removed within 10% of specified wall or 0.002 in. [0.05 mm], whichever is greater.
Coating	Normally shipped without protective coating unless special protection is specified.
Marking	Manufacturer name/brand, specified size, purchaser order number, ASTM A554, and grade.
Civil packaging	0.065 in. wall and lighter may be boxed, crated, cartoned, or bundled. Heavier tubing is normally shipped loose, bundled, or in secured lifts.
Government packaging	When specified, MIL-STD-129 / Fed. Std. No. 123 marking and MIL-STD-163 Level A packaging may apply.

8. Optional supplementary requirements

Supplementary requirement	Details
S1 Hardness test	Round annealed condition hardness shall meet Table S1.1. This grade: All austenitic unless shown below: 192 HB max / 90 HRB max / HRC not specified
S2 Tension test	When specified, tubes shall meet Table S2.1 tensile properties. This grade: MT304L & MT316L: TS 70 ksi [483 MPa] min / YS 25 ksi [172 MPa] min / El 35% min
S3 Nondestructive test	Type of NDT and inspection limits must be specified in the order.
S4 Test reports	Mill test reports furnished when specified; melting type included if ordered.
S5 Government certification	Producer/supplier certification and reports when specified for government orders.
S6 Government rejection provisions	Inspection, rejection, and disposition rules for government orders.
S7 Annealed welds	Purchaser may specify duplex mechanical tubing with PWHT in accordance with ASTM A790/A790M. Applicable especially to duplex grades.

9. Purchase order description example

Example wording
ASTM A554 welded stainless steel mechanical tubing, Grade MT-316L, UNS —, round (or square / rectangular) tubing, specified OD and wall thickness, length, condition, ID bead condition, surface finish, chemical analysis report if required, supplementary requirements if required, end use, ASTM A554-16.

10. Grade-specific notes

- No additional grade-specific note beyond the chemistry and supplementary tables was identified.