# ASTM A269/A269M TP316L (S31603) Engineering Datasheet

*Full grade version with complete tables*

## 1. Basic designation

| Standard | Grade | UNS | Product form | Service scope |
|---|---|---|---|---|
| ASTM A269/A269M-15 | TP316L | S31603 | Seamless and welded austenitic stainless steel tubing | General service; corrosion-resisting and low-/high-temperature service |

## 2. Chemical composition (%)

| C | Mn | P | S | Si | Ni | Cr | Mo | N | Ti | Cb/Ta | Cu | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.035 max | 2.00 max | 0.045 max | 0.030 max | 1.00 max | 10.0–15.0 | 16.0–18.0 | 2.00–3.00 | — | — | — | — | For small OD/thin wall, C max 0.040 applies |

## 3. Heat treatment and hardness requirements

| Austenitizing temperature, min/range °F [°C] | Hardness, max | Heat treatment condition | Marking note |
|---|---|---|---|
| 1900 [1040] | 192 HBW / 200 HV / 90 HRB | Solution heat-treated condition | If final heat treatment is below 1900 °F [1040 °C] and specified on order, mark with suffix HT plus actual temperature |

## 4. Mechanical / test requirements required by ASTM A269

| Requirement | Details |
|---|---|
| Flaring test (seamless) | One test on one tube from each lot of finished tubes. |
| Flange test (welded) | One test on one tube from each lot of finished tubes. |
| Lot definition for flaring/flanging | Same nominal size and wall thickness from same heat; when final heat treatment is batch type, same furnace charge; when continuous or direct quench after hot forming, lot size per Table 3. |
| Hardness test | Brinell or Rockwell on specimens from two tubes from each lot. |
| Reverse flattening (welded tubes) | One reverse flattening test from each 1500 ft [460 m] of finished tubing; coiled tubing over 1500 ft sampled at both ends. |
| Hydrostatic or NDE electric test | Each tube shall be subjected to NDE electric test or hydrostatic test; type at manufacturer option unless specified in the purchase order. |
| Small size limitation | Mechanical property requirements do not apply to tubing smaller than 1/8 in. [3.2 mm] ID or 0.015 in. [0.38 mm] thickness. |

Note: ASTM A269 does not provide a per-grade tensile/yield property table like ASTM A312. For A269, the grade-specific mandatory table is heat treatment and hardness (Table 2), while the mechanical test program is defined in Sections 9 to 11.

## 5. Lot size table for continuous process or direct quench after hot forming

| Size of tube | Size of lot |
|---|---|
| 2 in. [50 mm] and over OD and 0.200 in. [5.08 mm] and over wall | not more than 50 tubes |
| Less than 2 in. [50 mm] but over 1 in. [25 mm] OD, or over 1 in. [25 mm] OD and under 0.200 in. [5.08 mm] wall | not more than 75 tubes |
| 1 in. [25 mm] or less OD | not more than 125 tubes |

## 6. Permissible variations in dimensions

| Group | Size, OD, in. [mm] | Permissible variation in | Permissible variation in | Cut length over, in. [mm] | Cut length under | Thin-walled tubes |
|---|---|---|---|---|---|---|

| | | OD, in. [mm] | wall thickness, % | | | |
|---|---|---|---|---|---|---|
| 1 | Up to 1/2 [13] | ±0.005 [0.13] | ±15% | 1/8 [3.2] | 0 | — |
| 2 | 1/2 to 1-1/2 [13 to 38), excl | ±0.005 [0.13] | ±10% | 1/8 [3.2] | 0 | less than 0.065 in. [1.65 mm] nominal |
| 3 | 1-1/2 to 3-1/2 [38 to 89), excl | ±0.010 [0.25] | ±10% | 3/16 [4.8] | 0 | less than 0.095 in. [2.41 mm] nominal |
| 4 | 3-1/2 to 5-1/2 [89 to 140), excl | ±0.015 [0.38] | ±10% | 3/16 [4.8] | 0 | less than 0.150 in. [3.81 mm] nominal |
| 5 | 5-1/2 to 8 [140 to 203), excl | ±0.030 [0.76] | ±10% | 3/16 [4.8] | 0 | less than 0.150 in. [3.81 mm] nominal |
| 6 | 8 to 12 [203 to 305), excl | ±0.040 [1.01] | ±10% | 3/16 [4.8] | 0 | less than 0.200 in. [5.08 mm] nominal |
| 7 | 12 to 14 [305 to 356), excl | ±0.050 [1.26] | ±10% | 3/16 [4.8] | 0 | less than 0.220 in. [5.59 mm] nominal |

Table 4 notes: For tubes ordered with wall 3/4 in. [19.0 mm] or over, or ID 60% or less of OD, wall thickness tolerance is ±12.5%. For tubes less than 1/2 in. [12.7 mm] ID that cannot be successfully drawn over a mandrel, wall thickness may vary ±15%. Ovality provisions apply for thin-walled tubes. For cut lengths over 24 ft [7.3 m], the over tolerance increases by 1/8 in. [3 mm] for each 10 ft [3 m] or fraction thereof over 24 ft, or 1/2 in. [13 mm], whichever is less.

## 7. Optional supplementary requirements

| Supplementary requirement | Requirement summary |
|---|---|
| S1 Stress-relieved annealed | For TP304L, TP316L, TP321, TP347, TP348; 1550–1650 °F [845–900 °C] after roll straightening; no mechanical straightening after stress relief. |
| S2 Pneumatic test | Air-under-water or pneumatic leak test in accordance with A1016/A1016M. |
| S3 Stabilizing heat treatment | After solution anneal, TP321, TP347, TP348 receive stabilizing treatment at a lower temperature as agreed between purchaser and vendor. |
| S4 Intergranular corrosion test | Per ASTM A262 Practice E when specified. S3 may be necessary for grades containing titanium or columbium. |

## 8. Welding filler / weld repair note

| Item | Statement |
|---|---|
| Filler metal table in ASTM A269 | ASTM A269 does not contain a grade-by-grade filler metal table. If filler selection is needed for fabrication or repair, it should be specified separately by project documents, welding procedure, or applicable welding standards. |

## 9. Purchase order description example

| Example wording |
|---|
| ASTM A269/A269M TP316L Tubing, UNS S31603, seamless (or welded), OD 25.4 mm × WT 2.11 mm, random length, solution heat treated, hydrostatic test or NDE electric test, test report required, supplementary requirements as specified. |