ASTM A249 TP321H (S32109) Engineering Technical Datasheet

Prepared from ASTM A249/A249M-18a (Reapproved 2023)

1. Basic designation

Standard	Grade	UNS	Product forms	Manufacturing route
ASTM A249/A249M-18a (Reapproved 2023)	TP321H	S32109	Welded tube (WLD) / Heavily Cold Worked tube (HCW)	Automatic welding with no addition of filler metal; HCW requires not less than 35 % reduction in both wall and weld prior to final anneal.

2. Chemical composition (%)

C	Mn	P	S	Si	Cr	Ni	Mo	N	Cu
0.04–0.10	≤2.00	≤0.045	≤0.030	≤1.00	17.0–19.0	9.0–12.0	—	0.10	—

Nb/Ta	Ti	V	Al	Other
—	Ti 5(C+N) to 0.70	—	—	—

3. Mechanical properties

Condition / thickness range	Tensile strength, min	Yield strength, min	Elongation, min %	Rockwell hardness max	Vickers hardness max
Standard	75 [515]	30 [205]	35	B90	200

For tubing less than 0.354 in. [9.00 mm] inside diameter and tubing less than 0.065 in. [1.65 mm] wall thickness, Vickers hardness may be used instead of Rockwell hardness.

4. Heat treatment requirements

Solutioning temperature, min or range	Quenching / note code	Requirement
2000 °F [1100 °C]	C / B	Quenched in water or rapidly cooled by other methods; stabilization / re-solution anneal may be required when specified.

5. Dimensional scope and tolerance statement

Item	Requirement / statement
Usual dimensional range	1/8 in. [3.2 mm] inside diameter to 12 in. [304.8 mm] outside diameter; wall thickness 0.015 to 0.320 in. [0.4 to 8.1 mm].
Other dimensions	Other dimensions may be furnished provided all other requirements of ASTM A249 are met.
Mechanical-property applicability	Mechanical property requirements do not apply to tubing smaller than 1/8 in. [3.2 mm] inside diameter or 0.015 in. [0.4 mm] wall thickness.
Dimensional tolerances	ASTM A249 does not provide a separate dedicated dimension / wall tolerance table; general tube dimensional requirements are governed by ASTM A1016/A1016M as referenced in Section 4.1.

6. Standard required inspection and testing

Requirement	Details
Product analysis	One length of flat-rolled stock or one tube shall be analyzed for each heat.
Reverse-bend test requirement	A 4 in. [100 mm] minimum section shall be split longitudinally 90° on each side of the weld and bent around a mandrel of maximum thickness four times the wall thickness; no cracks or overlaps permitted.
Reverse-bend limitation	Not applicable when specified wall is 10 % or more of specified OD, or wall thickness is 0.134 in. [3.4 mm] or greater, or OD is less than 0.375 in. [9.5 mm]; in such cases, reverse flattening per A1016/A1016M applies.
Tension test frequency	One specimen for lots of not more than 50 tubes; specimens from two tubes for lots of more than 50 tubes.
Flattening test frequency	One flattening test from each end of one finished tube, not the one used for flange test, from each lot.
Flange test frequency	One flange test from each end of one finished tube, not the one used for flattening test, from each lot.
Reverse-bend frequency	One reverse-bend test from each 1500 ft [450 m] of finished tubing.
Hardness test frequency	Brinell or Rockwell hardness tests on specimens from two tubes from each lot.

Hydrostatic or NDE electric test	Each tube shall be subjected to either the hydrostatic or the nondestructive electric test; purchaser may specify which test is used.
Grain size requirement	No. 7 or coarser

7. Manufacture and filler metal note

Manufacture	Filler metal statement
WLD: automatic welding from flat-rolled steel; HCW: welded tube cold worked in weld and wall prior to final anneal. HCW weld shall be 100 % radiographically inspected before cold work.	No filler metal shall be used in the making of the weld per ASTM A249 Sections 5.1 and 5.1.2.

8. Purchase order description example

Example wording
ASTM A249/A249M TP321H Tube, UNS S32109, WLD or HCW, OD 25.4 mm × WT 1.65 mm, length 6000 mm, heat treated per Table 2, hydrostatic test or nondestructive electric test as specified, test report required, and any supplementary requirements specified by purchaser.

9. Grade-specific notes

• A solution annealing temperature above 1950 °F [1065 °C] may impair intergranular corrosion resistance after subsequent sensitizing exposure; when specified by purchaser, a lower temperature stabilization or re-solution anneal shall be used subsequent to the initial higher-temperature solution anneal.

• Grain size requirement applies: No. 7 or coarser.

• This grade includes special chemistry expressions involving Nb, Ta, Ti, or combined elements; see chemistry tables above for exact expression.