



TUBING 1.000" X 0.120" MW 316 SS SPEC SHEET

SEAMLESS STICK P/N: RTT3161000X120MW-CNG

SCOPE

Tubing shall be high-integrity seamless tubing with no longitudinal or orbital welds. No welded-and-drawn tubing shall be permitted. All tubing shall be of the highest quality, MADE IN USA, under stringent industry standards, including, but not limited to PED 97/23/EC, ISO 9001 and NACE MR0175.

MANUFACTURER

Tubing manufacturer shall be ISO 9001-certified and have over 30 years of experience manufacturing tubing. Supplier shall also be compliant with other industry standards including Pressure Equipment Directive (PED) 97/23/EC.

MATERIAL

Material shall be dual-certified UNS S31600 and UNS S31603 (TP 316) per ASTM A213 (Standard Specification for Seamless Ferritic and Austenitic Alloy-Steel Boiler, Superheater, and Heat-Exchanger Tubes) and ASTM A269 (Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service). Mother Tubes: Vendors shall be RoHS and REACH compliant. All mother tubes shall be high-quality cold-finished or hot-extruded. Hot-pierced mother tubes shall not be permitted.

Chemical Composition: Per table below. All composition limits [%s] are maximum unless otherwise specified. Product analysis shall be reported in the mill test certificate.

Composition Limits, %

C	Mn	P	S	Si	Cr	Ni	Mo	Cu	N
.035	2.00	.045	.008-.017	1.00	16.0-18.0	10.0-14.0	2.0-3.0	0.50	0.04

HEAT TREATMENT

All tubing shall be delivered in the solution-annealed condition per ASTM A269. Material shall be heat treated in a vacuum furnace and rapidly cooled by Nitrogen or Argon quench to avoid sensitization. Strand heat treatment shall not be permitted.

System Accuracy Tests per AMS 2750 of the furnace temperature control system shall be performed weekly. The temperature control system must be capable of sustaining test temperature within a tolerance of $\pm 5^{\circ}\text{F}$.

Temperature Uniformity Surveys per AMS 2750 of the furnace work zone shall be performed monthly. Temperature Uniformity results shall be within $\pm 25^{\circ}\text{F}$ of pre-determined testing temperatures.

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DEFINITION

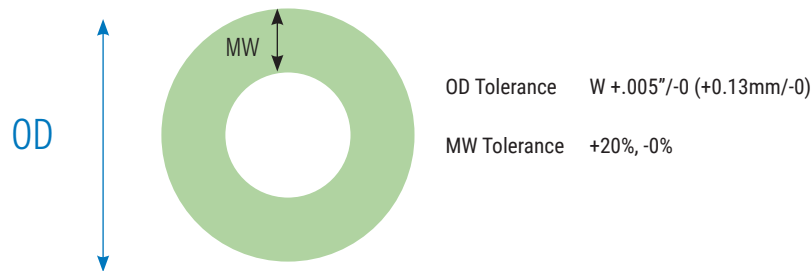
The term "lot" applies to all tubes of the same nominal diameter and wall thickness, produced from the same heat of material and annealed in the same vacuum furnace load at the same temperature for the same amount of time.

All material shall be processed to maintain lot traceability. Mixing of lots shall not be permitted.

DIMENSION AND TOLERANCES

Tubing shall be manufactured to 1.000" OD x 0.120" MW [25.40mm OD x 3.05 mm MW] with the tolerances below. All dimensions shown below are in inches. Dimensions in millimeters are displayed in parentheses.

NOTE: "MW" is defined as "minimum wall".



TESTING REQUIREMENTS AND PROCEDURES

Positive Material Identification (PMI) using Niton XL Analyzer: 100% PMI shall be performed on all material at its finished size. Manufacturer shall have clearly defined equipment procedures for alloy identification employing the principles of x-ray fluorescence to analyze metal samples. Operators of the Niton XL Analyzer shall be well-trained and certified in proper safety and measuring techniques.

Non-Destructive Testing: Manufacturer shall perform 100% hydrostatic testing of all finished material at 8,250 psi [57 MPa] per procedure outlined below.

- i. Fill tubing with deionized water.
- ii. Pressurize tubing and hold for one minute.
- iii. After one minute, vent tubing and re-pressurize.
- iv. Vent, pressurize again hold pressure for five minutes.
- v. Tubing shall show no bulges, leaks, pinholes, cracks or other defects when subjected to the calculated hydrostatic test pressure.

Hardness Testing: Tubing shall be hardness tested. All requirements of ASTM Specification E-18 (Standard Test Methods for Rockwell Hardness and Wilson Superficial Hardness of Metallic Material) are binding. This specification serves to gather, for convenience, detail from the ASTM Specification and some specific requirements.

Tensile Testing: Tensile testing shall be carried out per ASTM E8 (Standard Test Methods for Tension Testing of Metallic Materials). Specimen preparation, equipment operation and data presentation are described therein.

Micrographic Examination: The microstructure shall be examined at a minimum magnification of 100x on a suitably etched specimen, which shall show no abnormalities or any signs of sensitization.



SAMPLE RETENTION

Supplier shall retain random samples from each lot of material. Samples shall be retained as a standard practice for a period of no less than five years and made available for future testing if requested by the buyer.

MARKING

The marking shall be as follows to ensure full traceability to melt and heat treatment lot.

INSIGHTFUEL TUBING 1.00" OD x 0.120" MW TP 316 BRIGHT ANNEALED SMLS COLD DRAWN MADE IN USA ASME SA 213 ASTM A 213 / A 269 HEAT # LOT # WOID #RTT3161000 x 120MW-CNG MAWP 5300 PSI / 379 BAR AT -425 TO 300 DEG F.

MATERIAL TEST REPORTS

Tubing manufacturer shall furnish the material test certificate outlining the testing and results in accordance with ASTM A1016 (Standard Specification for General Requirements for Ferritic Alloy Steel, Austenitic Alloy Steel, and Stainless Steel Tubes). Results of mechanical testing shall fall within the ranges set forth in the table below.

Min. Tensile Strength ksi [MPa]	Min. Yield Strength (0.2% offset), ksi [MPa]	Min. Elongation in 2 in. (50 mm) [%]	Hardness, max [HRB]
75 [515]	30 [205]	35	80

LENGTHS

Stick shall be 20' (6 meters) unless otherwise specified.

NOTE

- All specifications mentioned above shall be the current revision.
- Exceptions and deviations to this document are subject to approval by manufacturer. Formal requests for exception or deviation shall be made in writing.
- This document is subject to revision without notice.