





CARDINAL
UHP

TECH CM SPECIFICATION

for
304 AND 316 STAINLESS STEEL TUBING FOR USE IN BULK GAS,
VACUUM AND INSTRUMENTATION TUBING SYSTEMS FOR
THERMOCOUPLE CLEAN APPLICATIONS
Current Issue: 29-August-2018

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| Mike Pellegrini Division VP – Site Manager | Jim Bundschuh Engineering and QA Manager |

| Issue Date | Revision Description |
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| 28-August-2003 | Revised format and updated reference documents. |
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The following documents must be reviewed when this specification is revised:

Control Plan

TECH CM SPECIFICATION

304 AND 316 STAINLESS STEEL TUBING FOR USE IN BULK GAS, VACUUM AND INSTRUMENTATION TUBING SYSTEMS FOR THERMOCOUPLE CLEAN APPLICATIONS



1 SCOPE

- 1.1 This specification will establish criterion for passivated seamless and welded tubing for use and installation in bulk gas, vacuum, and instrumentation piping systems requiring Thermocouple Clean tubing.
- 1.2 This specification is applicable to tubing with outside diameter sizes of 1/4" through 6" inclusive.

2 REFERENCE DOCUMENTS

- ASTM A213-EAW† Standard Specification for Seamless Ferritic and Austenitic Alloy-Steel Boiler, Superheater, and Heat-Exchanger Tubes
† Exception for Average Wall – Nominal wall thickness is used, not minimum wall thickness.
- ASTM A249 Standard Specification for Welded Austenitic Steel Boiler, Superheater, Heat-Exchanger, and Condenser Tubes
- ASTM A269 Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service
- ASTM A632-S3 Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing (Small-Diameter) for General Service
- ASTM A 1016/A 1016M General Requirements for Carbon, Ferritic Alloy, and Austenitic Alloy Steel Tubes
- ISO 9001-2015 Quality Management System.

3 MATERIAL REQUIREMENTS

- 3.1 All tubing shall be produced from TP 316L or TP 304L stainless steel, depending on customer requirements. The chemical composition will follow Table 1 of ASTM A269. Seamless tubing shall be manufactured and tested to ASTM 213 or ASTM 249 with dimensional tolerances conforming to ASTM A269.
- 3.2 Tubing shall be manufactured and tested to ASTM A269.

- 3.3 Seamless or welded tubing shall be used for 1/4" through 2" OD, depending on the customer purchase requirements. Tubing greater than 2" OD shall be produced from welded raw material.

4 TRACEABILITY AND MARKING REQUIREMENTS

- 4.1 All raw material and finished products shall be mill and heat traceable back to the original mill test report.
- 4.2 Tubing shall be marked with the size and wall thickness, the alloy, and the heat number.

5 FITTINGS

- 5.1 Use Tech 10 fittings with Tech CM tubing.

6 CLEANING, AND PACKAGING PROCEDURES

- 6.1 Mercury or ozone depleting chemicals are not used in the processing of Tech CM products.
- 6.2 All tubing shall be thermocouple cleaned and capped in accordance with ASTM A632 - S3.
- 6.3 All Tubing shall be passivated. Tubing shall be rinsed in deionized water following passivation. Final drying agent will be UHP grade bulk nitrogen, filtered at point of use.
- 6.4 The OD of tubing shall be provided with a mill finish and mill finished ends.
- 6.5 Tubing is capped, bulk bagged in 4 – 6 mill polyethylene bags and heat-sealed for sizes less than 1" diameter.

7 TESTING AND INSPECTION STANDARDS AND PROCEDURES

- 7.1 Tubing shall be measured with calipers, micrometers, or other acceptable methods, to certify that the finished products conform to the following dimensional requirements:

| PARAMETER | COMPONENT | VARIATION FROM NOMINAL |
|------------------|-----------------------|------------------------|
| Length | | +1/2", -18" |
| Wall Thickness | 1/4" - 3/8" inclusive | +/- 15% |
| | 1/2" - 6" inclusive | +/- 10% |
| Outside Diameter | 1/4" - 1" inclusive | +/- 0.005" |
| | 1-1/2" - 3" inclusive | +/- 0.010" |
| | 4" | +/- 0.015" |
| | 6" | +/- 0.030" |
| Ovality | | Per ASTM A269 |

- 7.2 The following documentation shall be supplied with all CM orders—
 - 7.2.1 Mill Test Reports
 - 7.2.2 Certificate of Conformance: for the following measurements
 - Dimensional Tolerances