

# SCiMax Tubes and Fittings

## Specifications and Submittal Documentation





## Tubes and Fittings Specifications and Submittal Documentation

**Products:** Tubing and fittings for use in the semiconductor industry

**Material:** Stainless steel 316L

**Sizes:** ¼" O.D. up to 6" O.D

**Surface finish:** Electropolished / Mechanical Polished / Bright Annealed

### Reference Standards

#### ASTM Specifications

- ASTM A269, A270-S2: Standard specification for seamless or welded austenitic stainless-steel tubing for general uses
- ASTM A632, Standard specification for seamless or welded austenitic stainless-steel tubing (Small diameters) for general uses
- ASTM A262: E, recommended practices for detecting susceptibility to intergranular attack in austenitic stainless steel
- ASTM E112: Standard Test Methods for Determining Average Grain Size
- ASTM A967 Passivation process
- ASTM A912 EP Process (when applicable)
- ASME B46.1, ASTM A213, SA 213, ASTM 312

#### CGA G-4.1

- Cleaning Equipment

#### SEMI F17

- Specification for Ultra High Purity Electropolished and High Purity Mechanical Polished (MP) / Bright Annealed 316L Stainless steel tubing and tubular fittings

### Material characteristics

#### Manufacturing

- ¼" - 1" (include): Seamless
- 1" - 6": Welded

#### Sulfur content\*

- ¼" - 1": 0.005 - 0.010%
- 1" - 6": 0.005 - 0.017%

#### Tube Annealing Process

- Bright Annealed in dry hydrogen atmosphere

\* Coax sleeves are fillet welded and the sulfur content may be up to 0.03%



## Mechanical Properties

Yield strength offset (0.2%)	Tensile strength	Elongation (in 2" (50mm))	Reduction	Hardness
170 (N/mm <sup>2</sup> ) min	485 (N/mm <sup>2</sup> ) min	40%	N/A	Max. 95 HRB

## Surface roughness - SEMI F17 & ASME B46.1

Tube and fitting Code	Description	Roughness - Ra measurements [ $\mu$ -inch/ $\mu$ -meter]	
		Inner Diameter	Outer Diameter
EP	Electropolished	*Ra avg $\leq$ 8/0.2	Ra max $\leq$ 32/0.8
MP/BA	Mechanical Polished (MP) / Bright Annealed (BA)	**Ra avg $\leq$ 16/0.4	Ra max $\leq$ 32/0.8

\* Ra max  $\leq$  10/0.25  $\mu$ -inch/ $\mu$ -meter  
For products  $>1"$ : Ra ave. 10/0.25  $\mu$ -inch/ $\mu$ -meter

\*\* Ra max  $\leq$  20/0.50  $\mu$ -inch/ $\mu$ -meter

## Tube and Fittings Tolerances

Tubing specifications, ASTM A269 / A270 / A632

Tubing Diameter	Wall Thickness	OD Dimensional Specifications	Length*	Wall Thickness Tolerance
		ASTM Spec.	ASTM Spec.	ASTM Spec.
1/4"	.035"	+0.004"/-.000"	-0+1/8"	+/-10%
3/8"	.035"	+0.004"/-.000"	-0+1/8"	+/-10%
1/2"	.049"	+0.005"/-.005"	-0+1/8"	+/-10%
3/4"	.065"	+0.005"/-.005"	-0+1/8"	+/-10%
1"	.065"	+0.005"/-.005"	-0+1/8"	+/-10%
1 1/2"	.065"	+0.010"/-.010"	-0+1/8"	+/-10%
2"	.065"	+0.010"/-.010"	-0+1/8"	+/-10%
2 1/2"	.065"	+0.010"/-.010"	-0+1/8"	+/-10%
3"	.065"	+0.010"/-.010"	-0+1/8"	+/-10%
4"	.083"	+0.015"/-.015"	-0+1/8"	+/-10%
6"	.109"	+0.030"/-.030"	-0+1/8"	+/-10%

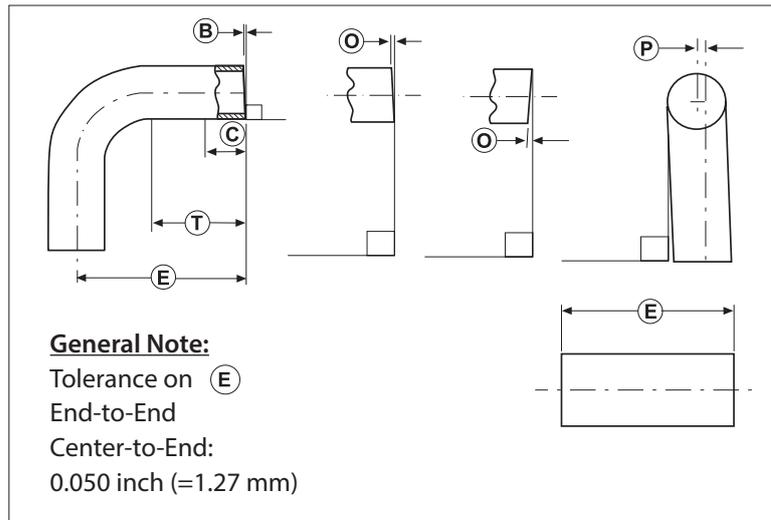
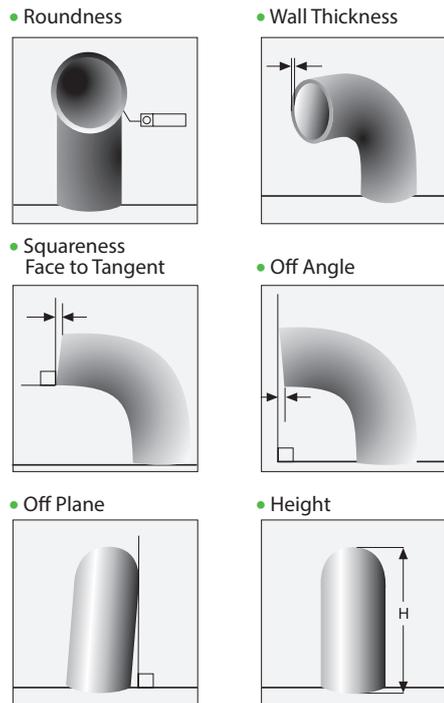
## Tube Face End-Square Tolerance

OD Size [Inch]	1/4" - 3/4"	1" - 2"	2 1/2"	3" - 4"	6"
	0.005	0.008	0.01	0.016	0.03

### Fitting Tolerances

Nominal OD Size	¼"	⅜"	½"	¾"	1"	1½"	2"	2½"	3"	4"	6"
O.D. Tolerance	±.005	±.005	±.005	±.005	±.005	±.008	±.008	±.010	±.010	±.015	±.030
Nominal Wall Thickness	.035	.035	.049	.065	.065	.065	.065	.065	.065	.083	.109
Wall Thickness Tolerance before EP	+0.003/-0.004	+0.003/-0.004	+0.005/-0.008	+0.005/-0.008	+0.005/-0.008	+0.005/-0.008	+0.005/-0.008	+0.005/-0.008	+0.005/-0.008	+0.008/-0.010	+0.015/-0.015
Wall Thickness Tolerance after EP	+0.005/-0.010	+0.005/-0.010	+0.005/-0.010	+0.005/-0.010	+0.005/-0.010	+0.005/-0.010	+0.005/-0.010	+0.005/-0.010	+0.005/-0.010	+0.008/-0.012	+0.015/-0.017
Control Length (C)	.750	.750	.750	.750	.750	.750	.750	.750	.750	.750	.750
Tangent Length (T)	1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.750	2.000	2.500
Squareness Face to Tangent (B)	.005	.005	.005	.005	.008	.008	.008	.010	.016	.016	.030
Off Angle (O)	.009	.012	.014	.018	.025	.034	.043	.054	.068	.086	.135
Off Plane (P)	±.030	±.030	±.030	±.030	±.030	±.050	±.050	±.050	±.050	±.060	±.060

\* All dimensions are in Inches  
 Tubing specifications, ASTM A269 / A270 / A632



- All other tolerances per ASTM A270 / A269.
- The measured wall Thickness of each tubing batch should be reported as part of the certificate of test results.
- Each separate package should contain tubing with the same wall thickness, produced from the same ingot (i.e., a "BATCH") and the same nominal size (i.e., same O.D.).

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## Marking

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- Marking method - permanent**
- Tubes - Engraving / Pin marking / Laser Mark
  - Fittings - Laser Mark
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- Each product will be marked with the following details**
- Brand Name: SciMax
  - Job Number
  - Size x Wall Thickness (in inch units)
  - Material Grade
  - Heat Number
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## Labeling

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- Each product is identified with a SciMax label with the following:**
- Brand Name: SciMax
  - Job Number
  - Size x Wall Thickness (in inch units)
  - Material Grade
  - Heat Number
  - QR Code - to scan and download the MTR (Material Test Reports) from the web
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## Packing

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- EP Products**
- EP products are cleaned with UPW 18MΩ, packed in a Class10 (ISO4) clean room and UHP N2 is used to purge.
  - EP products are capped with mylar and red PE caps.
  - EP products are packed with two layers nylon sleeves.
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- MP/BA Products**
- MP/BA products are cleaned with DI-WATER, packed in a Class1,000 (ISO6) clean room and HP N2 is used to purge.
  - MP/BA products are capped with mylar and yellow PE caps.
  - MP/BA products are packed with one layer nylon sleeve.
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- Tubes Length: 6.1 meters (20Ft) long
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- Conventional Cargo - wooden crates
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## Documentation / Certification

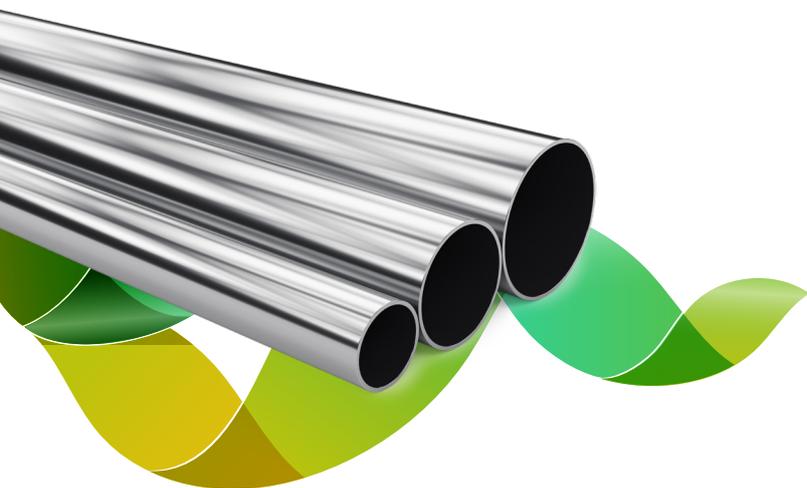
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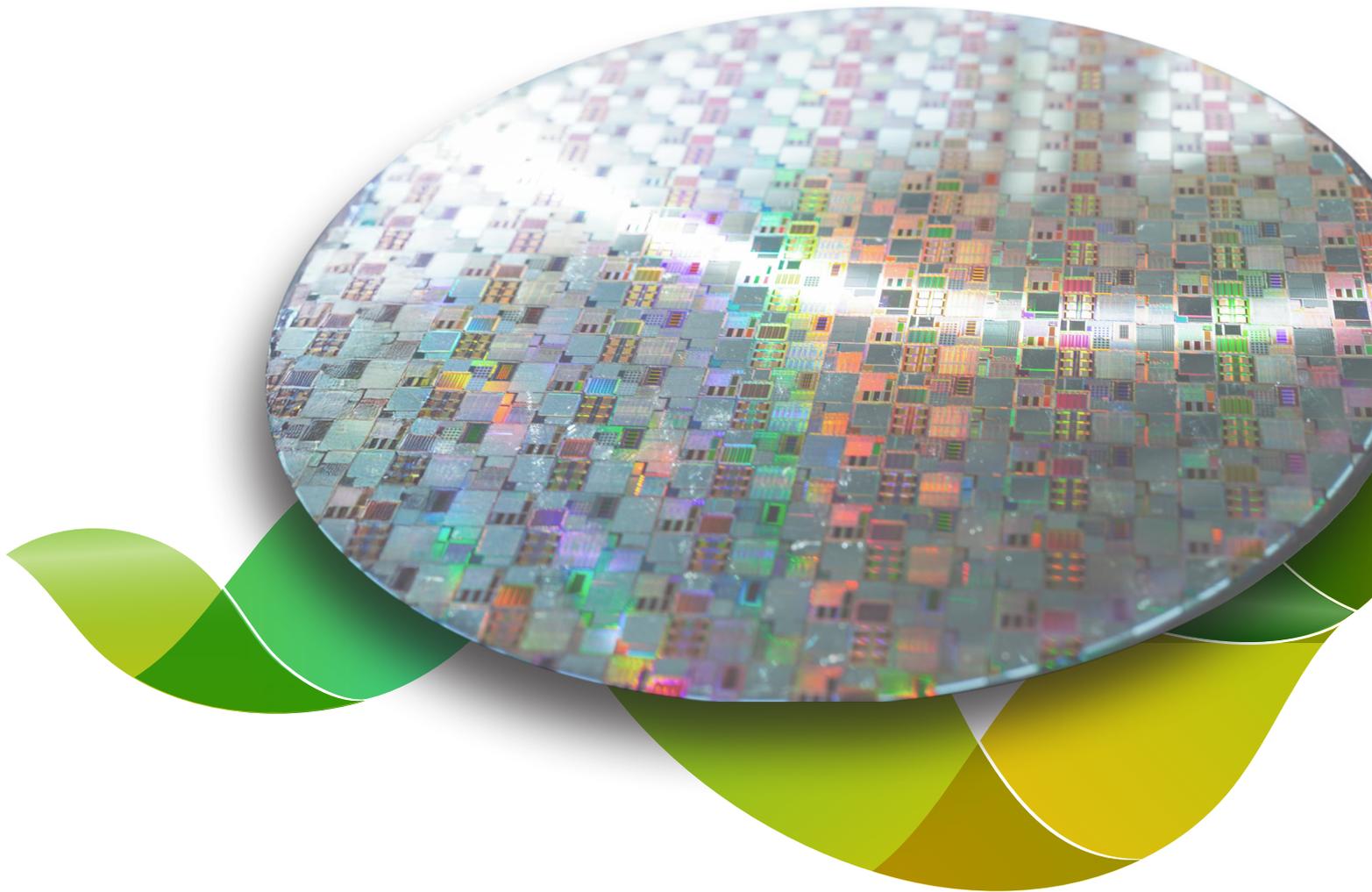
- The MTR (Material Test Reports) are supplied with the finished products.
  - Inspection documents certification to be according to standards in page 6.
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## Inspection Tests and Documentation

Summary table of testing, inspection and certification that can be given per our process.

Description	Standard / Value		
		SCiMax10	SCiMax20
Material Composition	ASTM A269, A270, A632, A-213, SA-213	✓	✓
Mechanical Tests	ASTM A269, A632	✓	✓
Visual Inspection 100%	Internal procedure	✓	✓
Dimensional Measurements	ANSI B31.3	✓	✓
Hydrocarbon Cleaning Inspection	CGA G-4.1	✓	✓
Helium Leak Test for Welded Fittings	1*10 <sup>-9</sup> scc/sec	✓	✓
Inspection Certification	EN 10204 3.1	✓	✓
Ra Measurements	ASME B46.1	✓	✓
Particles Test	<10 particles (greater than 0.1µ ft <sup>3</sup> )	✓	
Moisture Test for Tube: Additional Moisture on UHP N2 Purged Gas	Δ0.5 ppm	✓	
Ultra Pure Water Resistivity	18 MΩ	✓	
SEM TEST - Scanning Electron Microscopy for Defects	SEMATECH 90120401B 50 defects (magnification*3600)	✓	
XPS TEST - X Ray Photoelectron Spectroscopy for Analysis of Cr / Fe	SEMATECH 90120403B > 1.5/1	✓	
XPS TEST - X Ray Photoelectron Spectroscopy for Analysis of Cr ox / Fe ox	SEMATECH 90120403B > 2/1	✓	
AES TEST - Auger Electron Spectroscopy for Measuring of Oxide Thickness	SEMATECH 91060573B > 20A	✓	





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