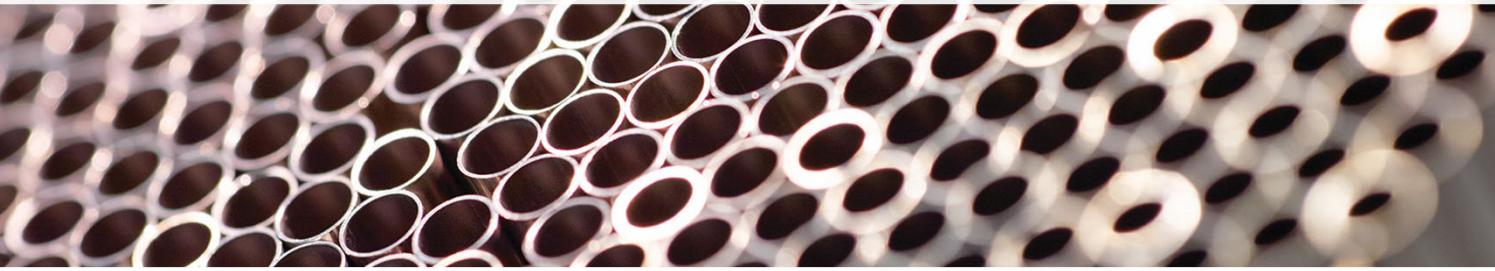


304/304L Stainless Steel



General Description

Type 304/304L stainless steel, with its chromium-nickel content, is the most versatile and widely used of the austenitic stainless steels. No other grades of stainless steel come in so many forms and finishes or is used with such diverse applications. These grades can be severely deep drawn without intermediate annealing, which has made these grades the industry standard in the manufacture of drawn stainless parts. The lower carbon content in 304L grade increases resistance to intergranular corrosion following welding or stress relieving. These grades of stainless steel are the most economical and readily available.

Applications

- Curettes
- Screws / prostheses / plates
- Medical needles
- Medical syringes
- Sensor probes
- Catheters
- Heat exchangers

Reference Standards

- AMS 5566
- AMS 5569
- AMS 5647
- AMS 6845
- ASTM A213
- ASTM A269
- ASTM A312
- ASTM A632
- ASTM F899
- Mil-T 8504
- Mil-T 8606

Characteristics

- Cold working will achieve higher tensile strengths as well as leaving the material slightly magnetic.
- Annealing will result in little to no magnetism—perfect for operating theatres or implants within the body.
- The properties can easily be manipulated to allow for forming of complex shapes.
- Most economical and readily available stainless steel
- Good general corrosion resistance

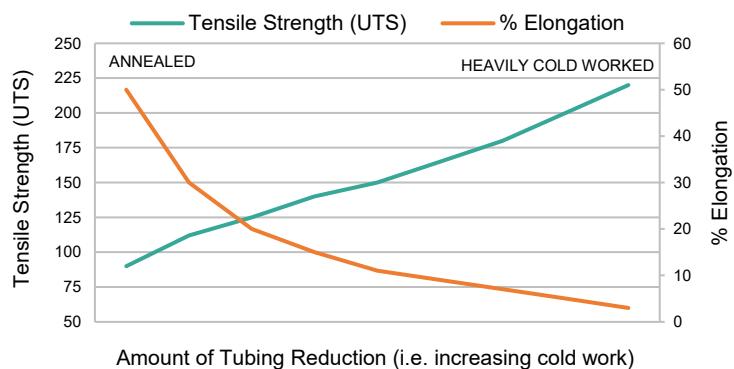
Typical Chemistry

Element	Minimum	Maximum
Carbon		0.07%*
Manganese		2.00%
Phosphorous		0.045%
Sulfur		0.03%
Silicon		0.75%
Chromium	18.00%	20.00%
Nickel	8.00%	10.50%
Nitrogen		0.10%

*304L has a lower carbon content of .03% max

Possible Mechanical Properties

Attribute	Annealed	Typical As Drawn
Hardness	82 HRB	38 HRC
Tensile Strength	90 ksi	170 ksi
Elongation	50%	5%



General Properties

Attribute	English
Density	.289 lb/in³
Elastic modulus	28000 ksi
Shear modulus	11200 ksi
Mean specific heat (32-212F)	.120 Btu/lb/F
Thermal conductivity (32-212F)	112 BTU-in/hr-ft² - F
Mean CTE (32-1200F)	10.4x10-6 in/in/F
Electrical resistivity (68F)	72 microohm-cm
Magnetic Permeability (Annealed)	1.020

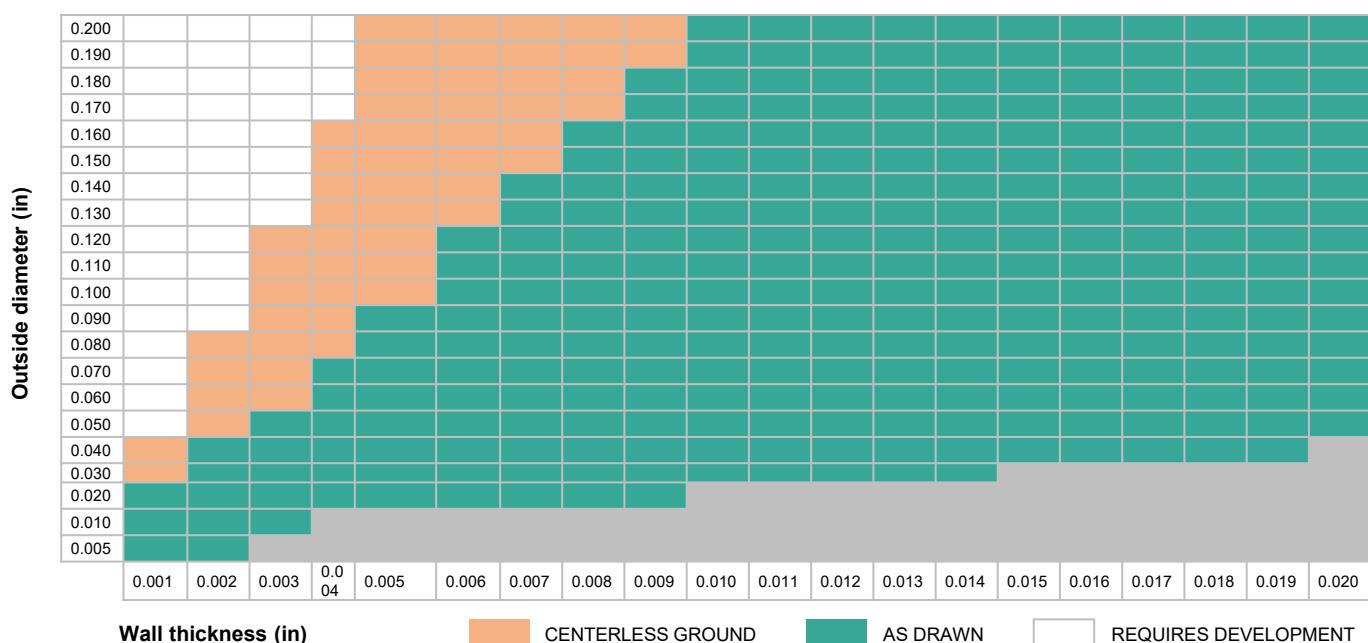
Tubing-specific Requirements

- Lengths:** Tubing is normally furnished in mill lengths of 5 ft, but it can be supplied in up to 20 ft lengths with a shear cut end.
- Cut End Finish:** Precision cut-to-length pieces with burr-free ends can be furnished when specified.
- Roundness:** Difference in minimum and maximum OD measurements must be equal or less than half the OD tolerance.
- Surface Finish:** OD and ID surface finish (Rq or RMS) limits may be specified. ID and OD surface finish values are only reported for dimensions >0.020".
- Typical OD Surface:** < 20 μ in Rq.
- ID Surface finish:** Depends on the reduction (drawing) method. Free sunk tubing has a typical ID surface finish <150 μ in Rq. Plug drawn tubing can have an ID surface finish range with values as low as < 20 μ in Rq.
- Straightness:** No deflection greater than 5% of the outside diameter for tubing with OD > 0.020" or 0.001" maximum deflection for tubing with OD <0.020". Any special straightness requirements shall be agreed upon between the purchaser and supplier. Tubing should not "wobble" as defined per ASTM F2819

Additional tubing specification information can be found in *K001-15a Standard Specification for Miniature Laser Welded and Drawn Stainless Steel and Nickel-Chromium Alloy Tubing for General Use* on the K-Tube's website at <https://www.k-tube.com/downloads-documents/>

Available Dimensions

K-Tube has the capability to make tubing with the wall thickness and outside diameter combinations in the table below. Tubing with an OD/Wall ratio lower than 20:1 can be drawn to the final dimensions. Tubing with an OD/Wall ratio between 20:1 and 40:1 must be centerless ground to the final dimensions. K-Tube's capabilities are constantly improving, please inquire if your dimensions are outside of the listed dimensions.



Contact Information

Our professional staff is available to assist you with custom projects and provide you with the direction you need to complete your project to specification and on time. We look forward to working with you.

K-Tube Technologies
13400 Kirkham Way
Poway, CA 92064 USA

Toll free | 800.394.0058
Local | 858.513.9229
Fax | 858.513.9459

Hours | 7:00 am-4:30 pm (PST)
General questions and inside sales | sales@k-tube.com



The data and information provided are based on work conducted principally by K-Tube Technologies and occasionally supplemented by information from the open literature, and are believed to be reliable. However, we do not make any warranty or assume any legal liability or responsibility for its accuracy, completeness or usefulness, nor do we represent that its use would not infringe upon private rights. Any suggestions as to uses and applications for specific alloys are opinions only and K-Tube Technologies makes no warranty of results to be obtained in any particular situation.