

Crucible 316L Data Sheet

Issue no. 1

CRUCIBLE 316L is a non-hardenable, low carbon austenitic chromium-nickel steel with superior corrosion and heat resisting qualities. CRUCIBLE 316L is designed for special applications requiring resistance to sensitization and intergranular corrosion. This grade is non-magnetic in the annealed condition but slightly magnetic when cold worked. Typical applications are screw machine products and all machined parts requiring good corrosion resistance or non-magnetic properties.

Analysis

Carbon 0.03% max.

Manganese 2.00% max.

Silicon 1.00% max.

Phosphorous 0.045% max.

Sulfur 0.03% max.

Chromium 16.00/18.00%

Nickel 10.00/14.00%

Molybdenum 2.00/3.00%

Typical applications

Screw machine products

Machined shafts

Valves and accessories

Food processing equipment

Pulp handling

for chemical handling

Photographic developing
equipment

equipment

equipment

Surgical implants

Architectural

applications

Note: These are some typical applications. Your specific application should not be undertaken without independent study and evaluation for suitability.

Forging

CRUCIBLE 316L should be forged at 1900 to 2100F and finished above 1700F. Reheating should be used if necessary.

Annealing

For maximum resistance to corrosion, CRUCIBLE 316L should be annealed at 2000F followed by a water quench. However, fully-annealed properties can be obtained by cooling rapidly from 1850/2050F to room temperature.

Hardening

CRUCIBLE 316L in small sections can be hardened by cold working. The effect of cold working is shown on Page 4.

Note: Temperatures throughout data sheet are steel temperatures.

Forming

CRUCIBLE 316L will withstand fairly severe cold working. Machining stock is supplied to a hardness for best machining.

Welding

CRUCIBLE 316L should be welded using CRUCIBLE 316L Electrodes. CRUCIBLE 317L Electrodes can also be used successfully for welding CRUCIBLE 316L.

Resistance to scaling

CRUCIBLE 316L scales at approximately 1650F. This temperature can vary with the type of atmosphere and application.

General corrosion resistance

CRUCIBLE 316L is a steel with even greater general corrosion resistance than CRUCIBLE 316. Detailed results of CRUCIBLE 316L corrosion tests are given in the CRUCIBLE Corrosion Resistance Data Sheet. CRUCIBLE 316L is particularly suited for use on sections which are welded and cannot be annealed after welding. Also for parts which are used in the temperature range of 800 to 1600F normally considered undesirable for stainless steels.

Contact Corrosion

Non-ferrous alloys, carbon steels and most of the stainless steels are attacked if exposed to a solution in which the air (or oxygen) content is not uniform, even though the solution might otherwise have no action on the metal. Usually this condition is brought about by deposits on the metal such as globs of pulp, solid matter in the solution, or other similar deposits, which exclude the oxygen from the surface of the part of the metal with which they are in contact. The attack is generally characterized by pits that occur under the deposit while the rest of the metal surface may be as bright as when it was originally placed in the solution. CRUCIBLE 316L is recommended for applications of this type due to its superior resistance to contact corrosion.

Specifications

CRUCIBLE 316L has found wide industry acceptance and meets the following specifications:

QQ-S-763d	ASTM A479	AMS 5653	ASTM A-276	ASTM A-580
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Machining data

Operation	Tool Width or Depth of Cut (in)	CRUCIBLE 316 L			
		High Speed Tooling*		Carbide Tooling	
		Speed (fpm)	Feed (in/rev)	Speed (fpm)	Feed (in/rev)
Turning single point	0.050	90	0.0055	200	0.010
	0.250	85	0.0050	200	0.020
	0.500	80	0.0045	175	0.025
Forming	1/2 wide	90	0.0015	180	0.0022
	1 wide	85	0.0012	170	0.0022
	1 1/2 wide	85	0.0012	170	0.0020
	2 wide	80	0.0010	160	0.0015
Cutoff	1/16 wide	80	0.0015	160	0.0020
	1/8 wide	80	0.0015	160	0.0020
	3/16 wide	85	0.0015	170	0.0022
	1/4 wide	85	0.0020	170	0.0030
Drilling	1/16 dia.	50	0.0015		
	1/8 dia.	50	0.0020		
	1/4 dia.	50	0.0030		
	1/2 dia.	50	0.0035		
	3/4 dia.	55	0.0040		
	1 dia.	55	0.0050		
Threading†		5-15	—		
Tapping†		5-15	—		

†Use the higher speeds for the finer threads.

*Details on tool life test techniques and Crucible High Speed and Tool Bit recommendations are described in the booklet, "Machining Crucible Stainless Steels."

Physical properties

Modulus of elasticity in tension - psi	28,000,000
Electrical resistivity	
Room temperature (microhm — centimeters)	72.39
Specific heat (Btu/lb./°F) 32-212°F	0.12
Specific gravity	7.91
Weight (lb./cu.in.)	0.286
Thermal conductivity (Btu/hr./sq.ft./°F/ft.)	
200°F	9.3
1000°F	12.4
Mean coefficient of thermal expansion (in/in/°F x 10 ⁻⁶)	
32- 212°F	8.9
32- 600°F	9.0
32-1000°F	9.7
32-1200°F	10.3
Melting point range (°F)	2500/2550

Mechanical properties

(All values are representative properties in the annealed condition)

Room Temperature

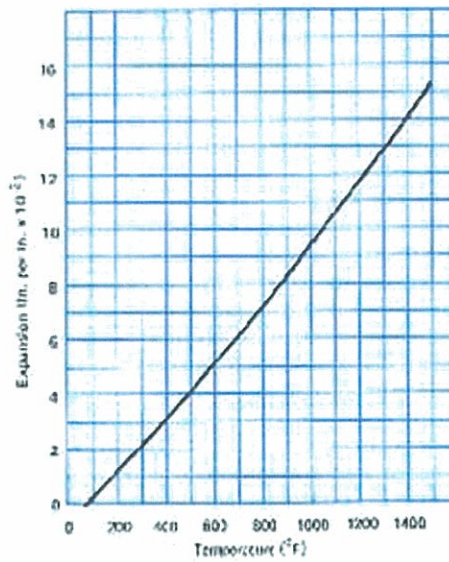
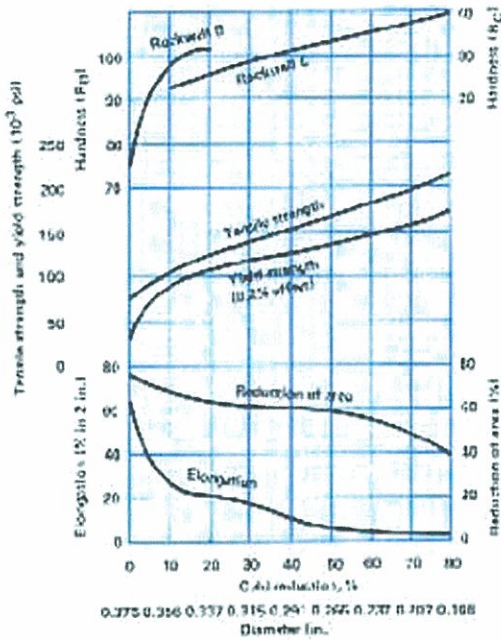
	Bar (1 in. rd.)
Tensile strength - psi	83,000
Yield strength (0.2% offset) - psi	33,000
Elongation in 2 in., (%)	55
Reduction of area, (%)	65
Izod impact resistance, (ft.lbs.)	100
Hardness (BHN)	160
Cold bend, (deg.)	180

Mechanical properties as cold worked

Heat Treatment: Annealed, 1950 F, Water Quench
 Size: 3/8 in. Rd., Unstraightened and Untempered

Thermal expansion

Annealed 2050°F, water quench.



Note: Properties shown throughout this data sheet are typical values. Normal variation in chemistry, size, and conditions of heat treatment may cause deviations from these values.



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