

SS 316 / 316L / 316H / 316TI

STAINLESS STEEL GRADE 316 IS AN AUSTENITIC CHROMIUM-NICKEL STAINLESS STEEL INCLUDES MOLYBDENUM. THIS ADDITION INCREASES CORROSION RESISTANCE, ENHANCES RESISTANCE TO PITTING CHLORIDE ION SOLUTIONS AND GIVE EXPANDED STRENGTH AT HIGH TEMPERATURES. PROPERTIES ARE SAME AS TO THOSE OF TYPE 304 ASIDE FROM THAT 316 ARE SOMEWHAT STRONGER AT HIGH TEMPERATURES. CORROSION RESISTANCE IS ENHANCED, SPECIFICALLY AGAINST SULFURIC, HYDROCHLORIC, ACETIC, FORMIC AND TARTARIC ACIDS, ACID SULPHATES AND ALKALINE CHLORIDES.

STAINLESS STEEL GRADE 316L IS A LOW CARBON AUSTENITIC CHROMIUM-NICKEL STAINLESS STEELS WITH CORROSION RESISTANCE SAME AS TYPE 316 HOWEVER WITH RESISTANCE TO INTERGRANULAR CORROSION FOLLOWING WELDING.

STAINLESS STEEL GRADE 316H IS A HIGHER CARBON VARIATION OF 316 MAKING THE STEEL MORE SUITABLE FOR USE IN APPLICATIONS WHERE HIGH TEMPERATURES ARE AVAILABLE. BALANCED GRADE 316TI OFFERS COMPARABLE QUALITIES. THE EXPANDED CARBON CONTENT DELIVERS A GREATER TENSILE AND YIELD STRENGTH. THE AUSTENITIC STRUCTURE OF THE MATERIAL ALSO GIVES THIS GRADE EXCELLENT TOUGHNESS, EVEN DOWN TO CRYOGENIC TEMPERATURES.

STAINLESS STEEL GRADE 316TI IS TITANIUM BALANCED OUT AUSTENITIC CHROMIUM- NICKEL STAINLESS STEEL INCLUDES MOLYBDENUM. THIS EXTENSION INCREASES CORROSION RESISTANCE, ENHANCES RESISTANCE TO PITTING CHLORIDE ION SOLUTIONS AND GIVE EXPANDED STRENGTH AT HIGH TEMPERATURES. PROPERTIES ARE LIKE THOSE OF TYPE 316 WITH THE EXCEPTION OF 316TI BECAUSE OF ITS TITANIUM ADDITION CAN BE USED AT HIGH SENSITIZATION TEMPERATURES. CORROSION RESISTANCE IS ENHANCED, ESPECIALLY AGAINST SULFURIC, HYDROCHLORIC, ACETIC, FORMIC AND TARTARIC ACIDS, ACID SULPHATES AND ALKALINE CHLORIDES.

APPLICATIONS

- FOOD PREPARATION EQUIPMENT, ESPECIALLY IN CHLORIDE ENVIRONMENTS
- CHEMICAL PROCESSING, EQUIPMENT
- LABORATORY BENCHES AND EQUIPMENT
- RUBBER, PLASTICS, PULP & PAPER MACHINERY
- POLLUTION CONTROL EQUIPMENT
- BOAT FITTINGS, VALVE AND PUMP TRIM

CHARACTERISTICS

- HIGHER CREEP RESISTANCE
- EXCELLENT FORMABILITY
- RUPTURE AND TENSILE STRENGTH AT HIGH TEMPERATURES
- CORROSION AND PITTING RESISTANCE

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CORROSION RESISTANCE

TYPES 316 AND 316L STAINLESS STEELS DISPLAY PREFERABLE CORROSION RESISTANCE OVER TYPE 304. THEY PROVIDE SUPERB PITTING RESISTANCE AND VERY GOOD RESISTANCE TO MOST CHEMICALS INVOLVED IN TEXTILE, THE PAPER AND PHOTOGRAPHIC INDUSTRIES.

MACHINING

FOR WORK HARDEN, SLOW SPEEDS AND HEAVY FEEDS WILL MINIMIZE THIS ALLOY'S TENDENCY. BECAUSE OF LONG STRINGY CHIPS, THE UTILIZATION OF CHIP BREAKERS IS RECOMMENDED. MANY ORGANIZATIONS NOW OFFER PREMIUM MACHINABILITY GRADES, FOR EXAMPLE CARTECH WITH THEIR PROJECT 70 AND 7000 SERIES.

WELDING

ALL REGULAR FUSION AND RESISTANCE PROCESS ASIDE FROM OXYACETYLENE WELDING HAVE PROVEN SUCCESSFUL. FOR GETTING THE BEST RESULT, IT USES AWS E/ER316 OR 316L FILLER METAL.

HOT WORKING

ALL COMMON HOT WORKING PROCESS IS POSSIBLE WITH THIS ALLOY. HEAT TO 2100-2300 F (1149-1260 C). AVOID WORKING THIS MATERIAL BENEATH 1700 F (927 C). FOR IDEAL CORROSION RESISTANCE, A POST-WORK ANNEALING IS RECOMMENDED.

COLD WORKING

THIS ALLOY CAN BE SUCCESSFULLY PERFORMED WITH THE HELP OF SHEARING, STAMPING, HEADING AND DRAWING. POST-WORK ANNEALING IS RECOMMENDED TO REMOVE INTERNAL STRESSES.

ANNEALING

1850-2050 F (1010-1121 C) FOLLOWED BY FAST COOLING.

HARDENING

THIS ALLOY DOESN'T REPLY TO HEAT TREATMENT. COLD WORK WILL CAUSE AN INCREASE IN BOTH HARDNESS AND STRENGTH.

CHEMICAL PROPERTIES

Grade	C	Si	P	S	Cr	Mn	Ni	Cu	Mo	Ti	Fe
316	0.08 max	0.75 max	0.045 max	0.030 max	16.0- 18.0	2.0 max	10.0- 14.0	-	2.0-3.0	-	Remainder
316L	0.03 max	0.75 max	0.045 max	0.030 max	16.0- 18.0	2.0 max	10.0- 14.0	-	2.0-2.0	-	Remainder
316H	0.04- 0.10	0.75 max	0.045 max	0.030 max	16.0- 18.0	2.0 max	10.0- 14.0	-	2.0-3.0	-	Remainder
316Ti	0.08 max	1.0 max	0.040 max	0.030 max	16.0- 18.0	2.0 max	10.0- 14.0	0.075 max	2.0-3.0	5 x (C+N) –	Remainder

MECHANICAL PROPERTIES

Grade	Tensile Strength (ksi)	0.2% Yield Strength (ksi)	Elongation% in 2 inches
316 / 316H / 316Ti	75	30	40
316L	70	25	40

PHYSICAL PROPERTIES

Properties	Units	Temperature in °C
Density	7.99 g/cm ³	Room
Specific Heat	0.12 Kcal/kg.C	22°
Melting Range	1371-1421°C	-
Modulus of Elasticity	193 KN/mm ²	22°
Electrical Resistivity	74 μΩ.cm	Room
Coefficient of Expansion	16.0 μm/m °C	20-100°
Thermal Conductivity	16.2 W/m-°K	20°

ASTM SPECIFICATIONS

Pipe / Tube (SMLS)	Sheet / Plate	Bar	Forging	Fitting
A 213, A 249	A 167, A 240	A 276	A 182	A 403

AVAILABILITY

MANUFACTURING	RAW MATERIALS
Refractory anchors	Pipes
Fasteners	Tubes
Custom Machining	Bars
Custom Fabrication	Sheets
Piping / Spools	Plates
Stamped Parts	-
B/W Fittings	-
S/W Fittings	-
Flanges	-
Compression Fittings	-