Long Products Stainless Steel NAS 455	
ASTM Designation	EN Designation
416	
S41600	

DESCRIPTION

Type 416 is High Hardenability martensitic, 12 per cent chromium Stainless Steel, which is magnetic in all conditions. It contains high sulfur as a free machining additive. It can be hardened by heat treatment and then can be tempered to meet a wide range of mechanical properties.

CHEMICAL COMPOSITION

C	Si	Mn	P	S	Cr	Ni	Cu
≤ 0.15	≤ 1.00	≤ 1.25	≤ 0.060	≥0.15	12.00-14.00	≤ 0.75	≤ 0.50

NOMINAL MECHANICAL PROPERTIES IN ANNELED CONDITION

	Annealed and Cold Finished	Hardened and Tempered at 1200˚F
UTS	90 ksi [620 Mpa]	110 ksi [758 MPa]
0.2% YS	80 ksi [551 MPa]	85 ksi [586 MPa]
Elongation	15%	18%
Reduction of Area	50%	55%
Hardness	190 HRB	225 HRB

HEAT TREATMENT

FULL ANNEALING: Metal should be heated to 1550 - 1650°F, held for 1⁄2 hour per inch of thickness and furnace cooled to 50°F per hour maximum to 1100°F, then cooled in air, water or oil.

TEMPERING: After hardening, tempering in the range of 400 – 1400°F for from 1 to 4 hours will allow the steel to meet a wide range of mechanical properties. Tempering in the range of 750 – 1075°F is generally not recommended because of reduced corrosion resistance and impact strength.

HEAT RESISTANCE

Type 416 has fair resistance to scaling and is sometimes used for burner parts. Scaling temperature in air are 1400°F for intermittent use and 1250°F for continuous use.

HARDENABILITY

It can be hardened to Rockwell C40 minimum by air cooling or oil quenching from 1750 - 1850°F. Oil quenching is preferred for better impact properties.

MACHINABILITY

This grade has high machinability.

WELDING

High sulfur grades are generally not recommended to be fusion welded. If welded, a preheating and post heating is required to prevent cracking.

CORROSION RESISTANCE

Its corrosion resistance is inferior that other 430 ferritic stainless steel and in severe corrosive conditions will require additional protection. Maximum corrosion resistance is developed in the hardened condition but the surface must be free from scale and foreign matters to prevent galvanic corrosion. It is recommended to be passivated after final fabrication.

COLD WORKABILITY

Type 416 can withstand only minor cold working operation and is not recommended for parts requiring severe cold forming.

HOT WORKABILITY

It is inferior then other grades but can be forged. The temperature should not exceed 2200°F and should not be below 1700°F. Simple forgings can be air cooled but heavy or more complex shapes must be equalized at about 1300°F

and furnace cooled.