

# DATA SHEET



**LATROBE SPECIALTY  
STEEL COMPANY**

Latrobe, PA 15650-0031 USA

## **LSS™ 718 EP** *(Exploration & Production)*

**NICKEL-BASE SUPERALLOY**  
(UNS N07718)

Typical Composition	<b>C</b>	<b>Mn</b>	<b>Si</b>	<b>Fe</b>	<b>Cr</b>	<b>Mo</b>	<b>Co</b>	<b>Ti</b>	<b>Cb+Ta</b>	<b>Al</b>	<b>Ni</b>
	<b>0.03</b>	<b>0.06</b>	<b>0.08</b>	<b>18.0</b>	<b>18.5</b>	<b>3.0</b>	<b>0.25</b>	<b>1.0</b>	<b>5.0</b>	<b>0.55</b>	<b>Bal</b>

### **GENERAL CHARACTERISTICS**

LSS 718 EP is a precipitation hardening nickel-base superalloy specifically designed for use in the exploration and production of oil and natural gas. It exhibits superior corrosion resistance in hostile environments such as deep, hot wells containing CO<sub>2</sub>, H<sub>2</sub>S, chlorides and sulfur. LSS 718 EP offers an excellent combination of strength, toughness, ductility, corrosion and embrittlement resistance and formability. It can be used over a very wide temperature range - from cryogenic temperatures to 1400° (760°C). Another attractive feature of LSS 718 EP is the slow precipitation reaction which allows for welding even in the aged condition. LSS 718 EP is vacuum induction melted (VIM) followed by vacuum arc remelting (VAR) to provide superior cleanliness, ingot homogeneity, mechanical properties and corrosion resistance.

### **APPLICATIONS**

Typical uses for LSS 718 EP include valve stems, gates, seals and seats, packers, mandrels, fasteners, hangers and blow-out preventers (BOP) for oil and gas applications.

### **PHYSICAL PROPERTIES**

#### **Density:**

Annealed: 0.296 lb/in<sup>3</sup> (8.19 g/cm<sup>3</sup>)

Aged: 0.297 lb/in<sup>3</sup> (8.22 g/cm<sup>3</sup>)

#### **Electrical Restivity at 68°F (20°C):**

Annealed: 125 microhm/cm

Aged: 118 microhm/cm

#### **Specific Gravity:**

Annealed: 8.19

Aged: 8.22

#### **Thermal Conductivity:**

32 - 212°F: 6.5 Btu / ft-h-°F

0 - 100°C: 11.2 W / m-K

### **Elastic Modulus, Modulus of Rigidity and Poisson's Ratio**

Temperature °F	°C	Elastic		Rigidity		Poisson's Ratio
		10 <sup>6</sup> psi	GPa	10 <sup>6</sup> psi	GPa	
70	21	29.0	200	11.2	77	0.294
200	93	28.4	196	11.0	76	0.288
400	204	27.6	190	10.8	74	0.280
600	316	26.7	184	10.5	72	0.272
800	427	25.8	178	10.1	70	0.271
1000	538	24.8	171	9.7	67	0.271
1200	649	23.7	163	9.2	63	0.283
1400	760	22.3	154	8.5	59	0.306

### **Linear Coefficient of Thermal Expansion**

Temperature °F	°C	Thermal Expansion	
		x10 <sup>-6</sup> in/in/°F	x10 <sup>-6</sup> mm/mm/°C
70 - 200	21 - 93	7.1	12.8
70 - 400	21 - 204	7.5	13.5
70 - 600	21 - 316	7.7	13.9
70 - 1000	21 - 538	8.0	14.4
70 - 1200	21 - 649	8.4	15.1
70 - 1400	21 - 760	8.9	16.0

# LSS™ 718 EP

## WORKABILITY

**Forging:** A forging temperature of 1800 - 2050°F (982 - 1121°C) is recommended. It is essential to equalize the temperature throughout the cross section, but once this has been accomplished, only a short soak is necessary. Forging above 2050°F is not recommended. LSS 718 EP can be finished as low as 1650°F (899°C). In order to avoid duplex grain structure, reduction during the last forging operation should be approximately 25%.

**Machining:** LSS 718 EP is similar to other nickel-base alloys, being machinable in both the solution annealed and age-hardened conditions. Slightly better tool life will be obtained by machining in the annealed condition; however, a smoother finish will result when machining is carried out after age hardening.

**Welding:** LSS 718 EP should be welded using the tungsten inert gas process (TIG).

Although welding can be accomplished in both the solution treated and aged conditions, it is recommended that in critical areas welding be done in the solution treated state, since welding in the aged condition will produce a softened heat affected zone. LSS 718 EP has a slow age hardening response and does not age harden from the heat of welding. It is therefore considerably less susceptible to strain cracking than other similar nickel-base alloys.

## HEAT TREATMENT

A wide range of mechanical properties may be obtained depending on the heat treatment.

### For oil and gas applications:

Solution treat: 1870 - 1925°F (1021 - 1052°C) for 1 - 2½ hours at temperature; air, oil, polymer or water quench.

Age: 1425 - 1475°F (774 - 802°C) for 6 - 8 hours; air cool.

## TYPICAL LONGITUDINAL TENSILE PROPERTIES (Room Temperature)

Specification	Tensile		Yield		% El (4D)	% RA	HRC
	ksi	MPa	ksi	MPa			
API 6A 718 (≤ 10")	150 min	1034 min	120 - 145	827 - 1000	20 min	35 min	32-40
LSS 718 EP (Typical)	179	1234	132	910	33	52	37

## SPECIFICATIONS

The following list of popular industry specifications is offered for general familiarization and cross-reference purposes. This should not be considered a complete listing.

AMS 5662 Drill -Quip DQM No. 718-0513  
AMS 5663 Drill -Quip DQM No. 718-0507  
AMS 5664 Drill -Quip DQM No. 718-0526  
ASTM-B637 Schlumberger # SH619251

Halliburton #ES-MA-46  
Halliburton #70.94148  
Texas Oil Tools AE00-40\*5  
Sperry-Sun S00809  
API Spec. 6A 718  
NACE MR-0175  
UNS N07718



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The data presented herein are typical values, and do not warrant suitability for any specific application or use of this material. Normal variations in the chemical composition, the size of the product, and heat treatment parameters may result in different values for the various physical and mechanical properties.