

DATA SHEET



LATROBE SPECIALTY
STEEL COMPANY

Latrobe, PA 15650-0031 USA

LESCALLOY[®] 13-8 Mo VIM-VAR PRECIPITATION HARDENING STAINLESS STEEL

Typical Composition	C 0.04	Cr 12.60	Ni 8.30	Mo 2.15	Al 1.00
------------------------	-------------------------	---------------------------	--------------------------	--------------------------	--------------------------

GENERAL CHARACTERISTICS

LESCALLOY 13-8 Mo VIM-VAR steel is a precipitation hardening martensitic stainless steel offering excellent fracture toughness and transverse mechanical properties coupled with the resistance to stress-corrosion cracking and high strength characteristics common to the family of precipitation hardening steels. A wide range of mechanical properties can be realized by selecting various single cycle low temperature aging treatments. The alloy is double vacuum melted (VIM-VAR...vacuum induction melted followed by vacuum arc remelting) to consistently assure low gas content, improved homogeneity and superior cleanliness.

PHYSICAL PROPERTIES* (H1000 CONDITION)

Density: 0.279 lb./in³ (7.76 g/cm³)

Modulus of Elasticity: 28.3x10⁶ psi (195.1 GPa)

Poissons Ratio: 0.278

COEFFICIENT OF THERMAL EXPANSION

Temp Range		in / in / °F	mm / mm / °C
°F	°C	(x 10 ⁻⁶)	(x 10 ⁻⁶)
70 - 200	21 - 93	5.8	10.4
70 - 400	21 - 204	6.0	10.8
70 - 600	21 - 316	6.2	11.2
70 - 800	21 - 427	6.3	11.3

*A more extensive presentation of physical properties is available in the Aerospace Structural Metals Handbook and other industry reference publications.

HEAT TREATMENT

Lescalloy 13-8 Mo VIM-VAR steel is solution heat treated by heating to 1700°F (927°C) ±15°F (8°C), holding 15-30 minutes at temperature, followed by an air cool. The austenite to martensite transformation starts at about 250°F (121°C) and is completed for all practicality at approximately 60°F (16°C). Therefore, for optimum property response it is important the alloy be cooled to below 60°F (16°C) following solution treatment.

Precipitation hardening (aging) is conducted at a variety of temperatures with in the 950-1150°F (510-621°C) temperature range. See the tensile property section for details.

A dimensional change during aging can be anticipated. Shrinkage of approximately 0.0004-0.0006 in/in (mm/mm) is normal for the H950 condition. Up to 0.0030 in/in (mm/mm) can occur when aging to the H1150 condition.

HARDNESS INFORMATION

The following lists the hardness range that can be expected in the several thermal conditions.

Condition	Hardness HBW
Solution Treated	363 Max
H950	430 Min
H1000	400 Min
H1050	372 Min
H1100	313 Min
H1150	283 Min
H1150M*	302 Max

*Overaged for sawing and cold forming

WORKABILITY

Hot Working: Lescalloy 13-8 Mo VIM-VAR steel is readily forged from 2150-2200°F (1177-1204°C). To favorably control grain size the final 50% of reduction should be completed below 1900°F (1038°C). This alloy should be air cooled to room temperature after forging.

Cold Working: For severe cold forming operations it is recommended the material be in the H1150 or H1150M (overaged) condition.

LESCALLOY[®] 13-8 Mo VIM-VAR

Welding: Lescalloy 13-8 Mo VIM-VAR steel has excellent weldability. It requires no preheating or special cooling and can be welded using any of the usual electric arc or resistance welding techniques. Welding can be readily done in either the solution treated or any of the aged conditions. Smaller sections may be aged directly after welding; however, for optimum post weld properties the component should be solution treated and precipitation hardened after welding.

Machining: This alloy can be machined in any of the several thermal conditions. Machining is easiest in the H1150M overaged condition, which involves the following thermal cycle:

1400°F (760°C) - 2 hours - air cool

1150°F (621°C) - 4 hours/air cool

The rate of machining possible for the various thermal conditions relates to the hardness typical of each condition; see the Heat Treatment section for hardness information.

CORROSION RESISTANCE

The general corrosion resistance of Lescalloy 13-8 Mo VIM-VAR steel approaches that of Type 304 stainless steel in most media and is superior to the 400 series stainless steels. Corrosion resistance of the alloy is greatest in the H950 condition and decreases slightly with increasing aging temperatures.

MECHANICAL PROPERTY DATA

A convenient way to appreciate the tensile property capabilities of Lescalloy 13-8 Mo VIM-VAR steel is to consider the minimum guarantees of the popular AMS 5629 document. The following has been extracted from AMS 5659.

The solution treated product, 12 in (300mm) and under in nominal diameter or maximum cross-sectional dimension, when precipitation heat treated for 4 hours \pm 0.25 to a particular condition at the temperatures shown here and cooled in air, shall have the properties specified here for that particular condition.

Condition	Temperature	
	°F \pm 10	°C \pm 5
H950	950	510
H1000	1000	540
H1025	1025	550
H1050	1050	565
H1100	1100	595
H1150	1150	620

Condition	Specimen Orientation	Tensile Strength (min)		0.2% Yield Strength (min)		El in 4D (min)	RA (min)
		ksi	MPa	ksi	MPa	%	%
H950	Longitudinal	220	1515	205	1415	10	45
	Transverse	220	1515	205	1415	10	35
H1000	Longitudinal	205	1415	190	1310	10	50
	Transverse	205	1415	190	1310	10	40
H1025	Longitudinal	185	1275	175	1205	11	50
	Transverse	185	1275	175	1205	11	45
H1050	Longitudinal	175	1205	165	1140	12	50
	Transverse	175	1205	165	1140	12	45
H1100	Longitudinal	150	1035	135	931	14	50
	Transverse	150	1035	135	931	14	50
H1150	Longitudinal	135	931	90	620	14	50
	Transverse	135	931	90	620	14	50

APPLICATIONS

Typical applications for Lescalloy 13-8 Mo VIM-VAR steel include aircraft and nuclear reactor components, fasteners, gears, valves and jet engine parts. This alloy should be considered for applications requiring a combination of stress-corrosion resistance and high strength properties.

SPECIFICATIONS

Industry specifications for this alloy include:

AMS 5629, ASTM A564

BMS 7-332, BMS 7-349 (Boeing)

DMS 2100 (McDonnell-Douglas)

HMS 6-1105 (Boeing-Mesa)

RMS 150 (Rohr)

STM05-602 (Lockheed Georgia)

STO 160 LB 0013 (Rockwell International)



**LATROBE SPECIALTY
STEEL COMPANY**

Latrobe, Pennsylvania 15650-0031 U.S.A.
Phone: (724) 537-7711 Fax: (724) 532-6316
www.latrobesteel.com