

DATA SHEET



**LATROBE SPECIALTY
STEEL COMPANY**

Latrobe, PA 15650-0031 USA

LESCALLOY[®] 15-5 VAC-ARC[®] PRECIPITATION HARDENING STAINLESS STEEL

Typical Composition	C	Si	Mn	Cr	Ni	Cu	Cb
	0.04	0.35	0.70	14.75	4.75	3.50	0.30

GENERAL CHARACTERISTICS

LESCALLOY 15-5 VAC-ARC steel is a precipitation hardening martensitic stainless steel commonly considered to be a compositional modification of 17-4 with minimal delta ferrite. A wide range of mechanical properties is available via simple aging within a 900-1150°F (482-621°C) temperature range. Vacuum arc remelting provides low gas content, superior cleanliness and optimum transverse properties.

PHYSICAL PROPERTIES*

(H900 CONDITION)

Density: 0.282 lb./in³ (7.80 g/cm³)

Electrical Resistivity: 30.3 μΩ-inch

Specific Heat: 0.11 Btu/lb/°F (32-212°F)

460 J/kg/K (0-100°C)

Modulus of Elasticity:

Tension - 28.5x10⁶ psi (196.5 GPa)

Torsion - 11.2 x10⁶ psi (77.2 GPa)

Poissons Ratio: 0.272

COEFFICIENT OF THERMAL EXPANSION

Temp Range		in / in / °F	mm / mm / °C
°F	°C	(x 10 ⁻⁶)	(x 10 ⁻⁶)
-100 - 70	-73 - 21	5.8	10.4
70 - 200	21 - 93	6.0	10.8
70 - 400	21 - 204	6.1	11.0
70 - 600	21 - 316	6.3	11.3
70 - 800	21 - 427	6.5	11.7

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

HEAT TREATMENT

Lescalloy 15-5 Vac-Arc steel is solution heat treated by heating to 1900°F (1038°C) ±25°F (14°C), holding 30-60 minutes at temperature, followed by an air cool or oil quench. The austenite to martensite transformation starts at about 250°F (121°C) and finishes at about 80°F (27°C). For optimum property response it is important the alloy be cooled to below 80°F (27°C) following solution treatment.

Precipitation hardening (aging) is conducted at a variety of temperatures within the 900-1150°F (482-621°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 of the H900, H925 and H1025 conditions. For H1150, expect 0.0018 - 0.0022 in/in (mm/mm).

HARDNESS INFORMATION

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

Condition	Hardness HBW
Solution Treated	≤363
H900	388 - 444
H925	375 - 429
H1025	331 - 401
H1075	311 - 375
H1100	302 - 363
H1150	277 - 352
H1150M*	≤302

*Overaged for sawing and cold forming

WORKABILITY

Hot Working: Lescalloy 15-5 Vac-Arc steel is readily forged from 2000-2100°F (1093-1150°C); the low side of this range is favored for control of grain size. This alloy can 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® 15-5 VAC-ARC®

Welding: Lescalloy 15-5 Vac-Arc 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. For section thickness up to ½" (13mm), welding can be done in the solution treated condition. H1150 is recommended when dealing with heavier sections. For optimum post weld properties the component should be solution treated and precipitation hardened after welding. AMS 5826 weld wire and AMS 5827 covered electrodes are suitable.

Machining: This alloy can be machined in any of the several thermal conditions, most easily 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

In this condition Lescalloy 15-5 Vac-Arc steel can be expected to machine similar to free machining Type 303 stainless steel. 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. As an added guide, the H900 condition can be machined at approximately 60% of the solution treated condition.

CORROSION RESISTANCE

The corrosion resistance of Lescalloy 15-5 Vac-Arc steel is similar to that of Type 304 stainless steel in most media and superior to that of the 400 series stainless steel. Likewise, the corrosion resistance is similar to that 17-4, though specific studies in salt fog and chlorine solutions have shown it to be superior to 17-4.

MECHANICAL PROPERTY DATA

A convenient way to appreciate the tensile property capabilities of Lescalloy 15-5 Vac-Arc steel is to consider the minimum guarantees of the popular AMS5659 document. The following has been extracted from AMS5659.

The solution treated product, 12 in (300mm) and under in nominal diameter or maximum cross-sectional dimension, precipitation heat treated to a particular condition in accordance with the corresponding temperatures and times shown here and cooled in air, shall have the properties specified here for that particular condition.

Condition	Temperature		Time hrs
	°F ±10	°C ±5	
H900	900	480	1 ± 0.1
H925	925	495	4 ± 0.3
H1025	1025	550	4 ± 0.3
H1075	1075	580	4 ± 0.3
H1100	1100	595	4 ± 0.3
H1150	1150	620	4 ± 0.3

Condition	Specimen Orientation	Tensile Strength (min)		0.2% Yield Strength (min)		El in 4D (min)	RA (min)
		ksi	MPa	ksi	MPa	%	%
H900	Longitudinal	190	1310	170	1170	10	35
	Transverse	190	1310	170	1170	6	20
H925	Longitudinal	170	1170	155	1070	10	38
	Transverse	170	1170	155	1070	7	25
H1025	Longitudinal	155	1070	145	1000	12	45
	Transverse	155	1070	145	1000	8	32
H1075	Longitudinal	145	1000	125	860	13	45
	Transverse	145	1000	125	860	9	33
H1100	Longitudinal	140	965	115	793	14	45
	Transverse	140	965	115	793	10	34
H1150	Longitudinal	135	931	105	724	16	50
	Transverse	135	931	105	724	11	35

APPLICATIONS

Typical applications for Lescalloy 15-5 Vac-Arc steel include aircraft and missile structural components, gears, valves, fasteners, jet engine parts and nuclear reactor parts. It is favored above 17-4 when transverse properties are of concern.

SPECIFICATIONS

The following specifications are offered for general reference and should not be considered a complete listing.

AMS 5659

ASTM A564



**LATROBE SPECIALTY
STEEL COMPANY**

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