DATA SHEET

LATROBE SPECIALTY STEEL COMPANY
Latrobe, PA 15650-0031 USA

LESCALLOY® D6AC VAC-ARC®

HIGH STRENGTH ALLOY STEEL

Typical Composition	C	Si	Mn	Cr	Ni	Mo	V
	0.46	0.25	0.75	1.10	0.60	1.00	0.10

GENERAL CHARACTERISTICS

LESCALLOY D6AC VAC-ARC steel is a medium carbon, low alloy, ultra high strength steel primarily designed for high strength structural applications requiring strength levels up to 280,000 psi. This alloy provides a high yield strength to tensile strength ratio, combined with good ductility. A tough and fibrous fracture is exhibited to as low as -210F (-134°C) in impact testing; also the notch toughness is excellent. It has been selected for fracture toughness critical applications at a variety of strength levels. The deep hardening characteristics of D6AC steel make it applicable for fairly large sections.

Lescalloy D6AC Vac-Arc steel is produced by consumable electrode vacuum arc remelting process to provide optimum cleanliness and preferred ingot structure, which in turn provide optimum transverse mechanical properties.

PHYSICAL PROPERTIES

Density: 0.284 lb/in^3 (7.87 g/cm^3)

Coefficient of Thermal Expansion

Temperature Range °F	Temperature Range °C	in / in / °F (x 10^{-6})	mm / mm / °C (x 10^{-6})
0 - 100	-18 - 38	7.38	13.28
0 - 600	-18 - 16	7.61	13.70
100 - 200	38 - 93	7.31	13.16
600 -700	316 - 371	9.70	17.46
600 - 1300	316 - 704	8.95	16.11

Modulus of Elasticity

Temperature °F (°C)	psi (x 10^6)	MPa (x 10^3)
80 (27)	30.5	210
400 (204)	24.4	168
600 (316)	25.7	177
800 (427)	23.7	163
1000 (538)	23.2	160
1200 (649)	11.1	77

HEAT TREATMENT

Hardening: 1550-1650°F (843-899°C) is recommended for hardening. Measures should be taken to provide a protective atmosphere to avoid carburization or decarburization.

Small sections up to 1 in (25 mm) cross section can be air cooled, but larger sizes require either an oil quench or a salt quench at 400-420F (204-218°C) followed by an air cool.

Tempering: Temper at 300-1200°F (149-649°F) to desired hardness, using appropriate times for the section size involved. Double tempering is recommended.

Annealing: Heat uniformly to 1500-1550°F (816-843°C). Furnace cool 50°F (28°C) per hour to 1000°F (538°C). Air cool to room temperature.

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WORKABILITY

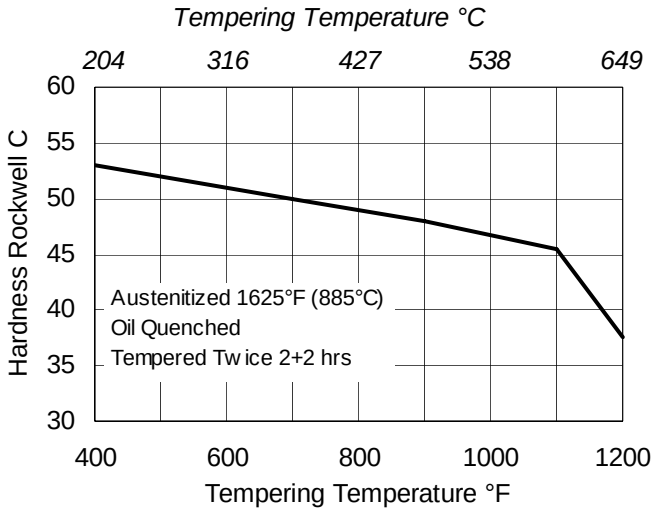
Forging: Heat thoroughly to 2000-2250°F (1093-1232°C). Favor high side of range for closed die work. 1700°F (927°C) is recommended as a minimum finishing temperature.

Cooling Cycle: Place in furnace at 1200-1300°F (649-704°C) equalize, and soak as section size requires. Furnace cool to 1000°F (538°C) and air cool.

Machining: Lescalloy D6AC Vac-Arc steel has machinability rating of 50-55% that of AISI B1112 screw stock. Either high speed steel or carbide cutting tools are applicable. Sulfurized or chlorinated oils containing sulfur are recommended.

Weldability: Lescalloy D6AC Vac-Arc steel is weldable, even in heavy sections. Techniques that are normally recommended for welding medium carbon low alloy steels of high hardenability should be employed.

TEMPERING DATA



MECHANICAL PROPERTY DATA

TYPICAL SPECIFICATION REQUIREMENTS

*Tempering Temperature		Tensile Strength		0.2% Yield Strength		Elongation	Red. of Area	Hardness
°F	°C	ksi	MPa	ksi	MPa	%	%	HRC
600	316	280	1931	250	1724	7	23	53
950	510	228	1572	195	1345	7	25	46

* Heat treatment before temper: Austenitized at 1650°F (899°C). Oil quenched and air cooled, or salt quenched at 400-425°F (204-218°C) for ten minutes and air cooled.

EXAMPLES OF ACTUAL TEST DATA**

Heat	Ingot Location	Tensile Strength ksi	Tensile Strength MPa	0.2% Yield Strength ksi	0.2% Yield Strength MPa	Elong. 4D %	R. of A. %
A	Top	237.5	1638	229.5	1583	12.3	47.7
	Bottom	235.1	1621	215.7	1488	13.5	48.8
B	Top	244.3	1685	235.5	1624	11.1	45.5
	Bottom	240.2	1657	226.8	1564	12.3	47.3
C	Top	236.4	1630	217.0	1497	11.7	39.2
	Bottom	236.8	1633	214.8	1481	11.7	42.9

** These data are representative of forgings made from a 17 in (432 mm) RCS billet, which in turn came from a 30 in (762 mm) diameter Vac-Arc ingot. The heat treatment employed is that described above, using a 950°F (510°C) temper.

SPECIFICATIONS

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

AMS 6431
AMS-S-8949
FMS1011 (General Dynamics)
GM 1013 (Grumman)
STM 05-500 (Lockheed)
LCM 05-2190 (Lockheed)
TL-428 (MAN Technology)

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