

UDIMET® alloy L-605 (UNS R30605) is a solid solution strengthened cobalt-chromium-tungsten-nickel alloy with excellent high-temperature strength and excellent oxidation resistance to 2000°F (1093°C). The alloy also offers good resistance to sulfidation and resistance to wear and galling. Alloy L-605 is useful in gas turbine applications such as rings, blades and combustion chamber parts (sheet fabrications) and can also be used in industrial furnace applications such as muffles or liners in high-temperature kilns.

Table 1 - Limiting Chemical Composition, wt %

Carbon.....	0.05-0.15
Manganese.....	1.0-2.0
Silicon.....	0.40 max.
Chromium.....	19.0-21.0
Nickel.....	9.0-11.0
Tungsten.....	14.0-16.0
Phosphorus.....	0.040 max.
Sulfur.....	0.030 max.
Iron.....	3.0 max.
Cobalt.....	Balance*

*Reference to the 'balance' of a composition does not guarantee this is exclusively of the element mentioned but that it predominates and others are present only in minimal quantities.

Mechanical Properties

Table 4 - Rupture Strength of UDIMET alloy L-605 (1000 hr)

Temperature		Rupture Strength	
°F	°C	ksi	MPa
1200	649	39	270
1300	704	32	220
1400	760	24	165
1500	816	17	120
1600	871	10	72
1700	927	6	44
1800	982	4	25

Physical Constants and Thermal Properties

Table 2 - Physical Constants

Density, lb/in ³	0.335
g/cm ³	9.27
Melting Range, °F.....	2426-2570
°C.....	1330-1410
Specific Heat at 70°F, Btu/lb°F.....	0.092
at 21 °C, J/kg°C.....	385
Permeability at 200 oersted.....	1.002
Thermal Conductivity, Btu•in/ft ² •h•°F.....	65
W/m•°C.....	9.4
Electrical Resistivity (75°F), ohm•circ mil/ft.....	533.2
(24°C), microohm-m.....	0.886

Table 3 - Thermal Properties

Temperature		Linear Expansion	Coefficient of Thermal Expansion
°F	°C	in/in x 10 ⁻³	in/in x 10 ⁻⁶
200	93	0.891	7.24
300	149	1.640	7.36
400	204	2.400	7.43
500	260	3.193	7.55
600	316	4.007	7.66
700	371	4.844	7.78
800	427	5.701	7.89
900	482	6.573	7.99
1000	538	7.444	8.06
1100	593	8.296	8.11
1200	649	9.303	8.28
1300	704	10.391	8.5
1400	760	11.486	8.68
1500	816	12.567	8.83
1600	871	13.618	8.94

UDIMET® alloy L-605



Mechanical Properties (continued)

Table 5 - Typical Room Temperature Mechanical Properties of annealed UDIMET alloy L-605 Sheet

Tensile Strength		Yield Strength		Elongation
ksi	MPa	ksi	MPa	%
145	994	68	466	50

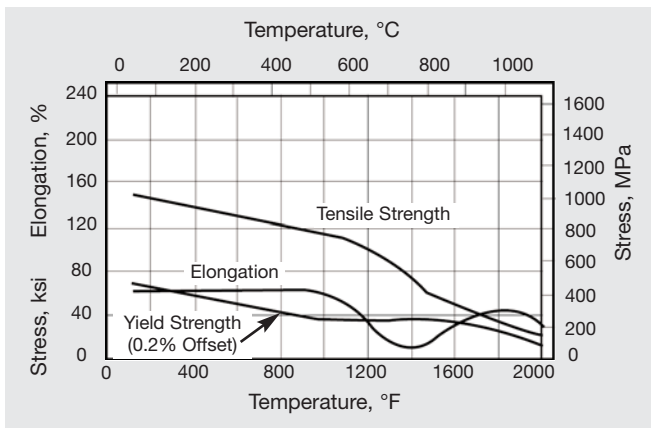


Figure 1 - Tensile properties of UDIMET alloy L-605

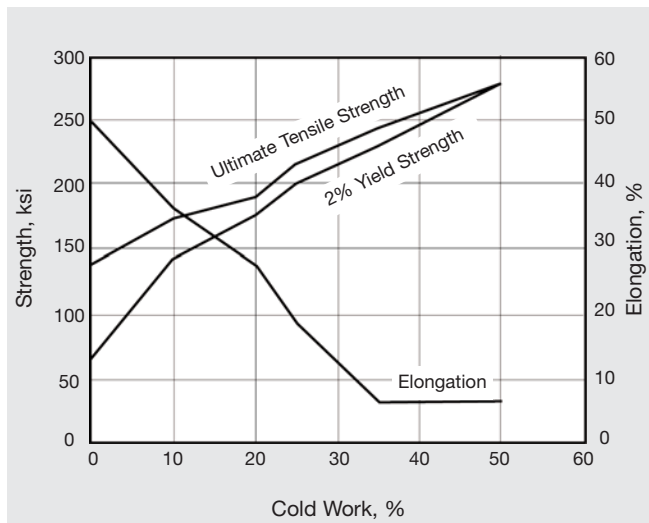


Figure 2 - Effect of cold work on UDIMET alloy L-605 material initially annealed 0.275-in plate.

Heat Treatment

UDIMET alloy L-605 is normally solution-treated in the range of 2150°F-2250°F (1175°-1230°C) and rapid air-cooled or water-quenched to attain optimum properties. Annealing at lower temperatures may cause some precipitation of carbide, which is undesirable for the achievement of many properties.

The alloy can be given a strain aging treatment at 900°F to enhance its strength and resistance to creep as long as the final temperature remains below 1300°F.

Hot Working

The metal temperature during hot working should be greater than 1900°F but less than 2300°F to avoid ductility loss and subsequent cracking. In this temperature range, the alloy is readily hot formable. Above this range, nil ductility will prevent any formation and below this range, the alloy will harden quickly.

Cold Forming

It is preferable to cold-work the alloy for bending, deep drawing and spinning of components. This is facilitated by the excellent as annealed ductility of the alloy, however, high forces may be required to achieve such processing, due to the inherent strength of the alloy. It may therefore be necessary to interstage anneal the material after each step of processing due to the work hardening of the alloy that will be encountered. Annealing at 2150°F - 2250°F (1175-1230°C) is required to allow for subsequent working of cold-worked material. The hardness of the alloy reaches the mid 40s on the Rockwell 'C' scale by 25% cold work and can reach the upper 50s.

Fabricating

UDIMET alloy 188 has good fabricability. Forming, machining and welding can be carried out by standard methods.

Joining

UDIMET alloy L-605 can be welded by shielded metal-arc, gas tungsten-arc (TIG) and gas metal-arc (MIG) methods.

Applicable Specifications

UDIMET alloy L-605 is designated as UNS R30605. Contact Special Metals for information on available product forms.

Flat products: AMS 5537

Bar: AMS 5759

Welding wire: AMS 5796

Covered welding rod: AMS 5797

Publication Number SMC-071

Copyright © Special Metals Corporation, 2006 (Sept 06)

UDIMET is a trademark of the Special Metals Corporation group of companies.

The data contained in this publication is for informational purposes only and may be revised at any time without prior notice. The data is believed to be accurate and reliable, but Special Metals makes no representation or warranty of any kind (express or implied) and assumes no liability with respect to the accuracy or completeness of the information contained herein. Although the data is believed to be representative of the product, the actual characteristics or performance of the product may vary from what is shown in this publication. Nothing contained in this publication should be construed as guaranteeing the product for a particular use or application.



www.specialmetals.com



U.S.A. Special Metals Corporation

Billet, rod & bar, flat & tubular products
3200 Riverside Drive
Huntington, WV 25705-1771
Phone +1 (304) 526-5100
+1 (800) 334-4626
Fax +1 (304) 526-5643

Billet & bar products
4317 Middle Settlement Road
New Hartford, NY 13413-5392
Phone +1 (315) 798-2900
+1 (800) 334-8351
Fax +1 (315) 798-2016

Shape Memory Alloys
4317 Middle Settlement Road
New Hartford, NY 13413-5392
Phone +1 (315) 798-2939
Fax +1 (315) 798-6860

United Kingdom

Special Metals Wiggin Ltd.
Holmer Road
Hereford HR4 9SL
Phone +44 (0) 1432 382200
Fax +44 (0) 1432 264030

Special Metals Wire Products
Holmer Road
Hereford HR4 9SL
Phone +44 (0) 1432 382556
Fax +44 (0) 1432 352984

Germany

Special Metals Deutschland Ltd.
Postfach 20 04 09
40102 Düsseldorf
Phone +49 (0) 211 38 63 40
Fax +49 (0) 211 37 98 64

Hong Kong

Special Metals Pacific Pte. Ltd.
Unit A, 17th Floor, On Hing Bldg
1 On Hing Terrace
Central, Hong Kong
Phone +852 2439 9336
Fax +852 2530 4511

India

Special Metals Services Ltd.
No. 60, First Main Road,
First Block
Vasantha Vallabha Nagar
Subramanyapura Post
Bangalore 560 061
Phone +91 (0) 80 2666 9159
Fax +91 (0) 80 2666 8918

The Netherlands

Special Metals Service BV
Postbus 8681
3009 AR Rotterdam
Phone +31 (0) 10 451 44 55
Fax +31 (0) 10 450 05 39

China

Special Metals Pacific Pte. Ltd.
Room 1802, Plaza 66
1266 West Nanjing Road
Shanghai 200040
Phone +86 21 3229 0011
Fax +86 21 6288 1811

Special Metals Pacific Pte. Ltd.
Room 1409
United International Building
No. 19 DongSanHuanNanLu
Chaoyang District
Beijing 100021, China
Phone +86 10 8766 7100
Fax +86 10 8766 7101

Special Metals Pacific Pte. Ltd.
Room 16B, Yuntian Bldg.
#12 Fengcheng Er Road
Xi'an Economic & Industrial
Development Zone
Xi'an 7100016 China
Phone +86 29 8210 6151
Fax +86 29 8652 4031

Singapore

Special Metals Pacific Pte. Ltd.
24 Raffles Place
#27-04 Clifford Centre
Singapore 048621
Phone +65 6532 3823
Fax +65 6532 3621

Affiliated Companies

Special Metals Welding Products
1401 Burris Road
Newton, NC 28658, U.S.A.
Phone +1 (828) 465-0352
+1 (800) 624-3411
Fax +1 (828) 464-8993

Canada House
Bidavon Industrial Estate
Waterloo Road
Bidford-On-Avon
Warwickshire B50 4JN, U.K.
Phone +44 (0) 1789 491780
Fax +44 (0) 1789 491781

Controlled Products Group
590 Seaman Street, Stoney Creek
Ontario L8E 4H1, Canada
Phone +1 (905) 643-6555
Fax +1 (905) 643-6614

A-1 Wire Tech, Inc.
A Special Metals Company
4550 Kishwaukee Street
Rockford, IL 61109, U.S.A.
Phone +1 (815) 226-0477
+1 (800) 426-6380
Fax +1 (815) 226-0537

Rescal SA
A Special Metals Company
200 Rue de la Couronne des Prés
78681 Epône Cédex, France
Phone +33 (0) 1 30 90 04 00
Fax +33 (0) 1 30 90 02 11

DAIDO-SPECIAL METALS Ltd.
A Joint Venture Company
Daido Shinagawa Building
6-35, Kohnan 1-chome
Minato-ku, Tokyo 108-0057, Japan
Phone +81 (0) 3 5495 7237
Fax +81 (0) 3 5495 1853