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TECHNICAL DATA SHEET

ALLOY B-2

UNS N10665 / W.Nr. 2.4617

Description

Alloy B-2 is a solid solution strengthened, nickel-molybdenum alloy typically used in extreme reducing conditions. Alloy B-2 has significantly lower carbon, silicon and iron compared to the predecessor, alloy B (UNS N10001). Compared to alloy B, alloy B-2 is less susceptible to weld zone corrosion in the as-welded condition. Controlling other alloying elements such as iron and chromium resolved potential issues with forming and shaping. Stringent chemistry control in the production of alloy B-2 allows the alloy to be used in the welded condition, and it is less susceptible to stress corrosion cracking under many conditions. Care must be taken in selecting the right alloy for the desired application. Alloy B-2 should not be used at temperatures between 1000°F and 1600°F as the alloy forms secondary phases that could decrease the ductility of the material.

Industries & Applications

Alloy B-2 is suitable for use in the chemical processing industry, specifically in areas where hydrochloric acid, phosphoric and sulfuric acid are used or processed. Alloy B-2 has also been used in the production of pharmaceuticals, acetic acid, alkylation of ethylene and herbicides. Typical end use applications include pumps, valves, mechanical seals, rupture discs, flanges, fittings, tanks and vessels.

Resistance to Corrosion

The high molybdenum content in alloy B-2 gives this alloy excellent resistance to hydrochloric acid over a wide range of concentrations and temperatures. Alloy B-2 also shows good resistance to hydrogen chloride, sulfuric acid and phosphoric acids and has excellent resistance to pitting and stress corrosion cracking in the heat affected zone. Uniform corrosion rates in various environments are similar compared to the other nickel-molybdenum alloys such as alloy B-3®. The presence of any oxidizing media, even in trace amounts, will significantly increase corrosion. Alloy B-2 should not be used in oxidizing media, as these alloys show little to no resistance in such environments.

Fabrication and Heat Treatment

Welding alloy B-2 can be performed by TIG, MIG and coated electrode. Dissimilar metal welding alloy B-2 to alloy B-3® is possible using AWS ERNiMo-10 for GTAW and GMAW operations and ENiMo-10 for SMAW welding. The work piece should be thoroughly cleaned with acetone or other suitable cleaners to ensure that all contaminants and markings are removed. Grinding prior to welding can be performed with a clean alumina wheel; not previously used on any iron-based materials. There is no need for pre or post heat treatment processes unless the work piece has been formed or welded. A full solution anneal before welding is required on pieces that have been formed. Hot working should be performed in a temperature range between 1700°F to 2250°F with heavy deformation performed toward the upper end of the range. Reheating of the work piece may be necessary. A full solution anneal should be performed on all hot-worked, welded and any cold-worked pieces with more than 15% deformation followed by a water quench. Solution annealing of alloy B-2 is performed at 1950°F for 30 minutes per inch thickness followed by a water quench. Subject material should be charged into a hot furnace and monitored closely for accurate time at temperature. Contact thermocouples are preferred.

Chemical Composition (%)

(Ni) Nickel	Remainder
(Mo) Molybdenum	26.0 to 30.0
(Fe) Iron	2.00 max
(Cr) Chromium	1.00 max
(Co) Cobalt	1.00 max
(Mn) Manganese	1.00 max
(Si) Silicon	0.10 max
(P) Phosphorus	0.040 max
(S) Sulfur	0.030 max
(C) Carbon	0.02 max

Mechanical Properties

Product Form	Tensile (min. ksi)	0.2% Yield (min. ksi)	Elong. (min. %)	Hardness* (HRB)
Bar ¹	110	51	40	85-100
Plate & Sheet ²	110	51	40	85-100
Pipe & Tube	110	51 ¹	40	85-100

All properties in this table are for material in the solution annealed condition and are from the governing ASTM specification.

*Hardness is shown for information purpose only.

¹0.312" to and including 3.5" in diameter

²Up to and including 3.5" thick

¹Seamless

¹Welded

Physical Properties

Density @ Room Temp.	0.333 lb/in. ³
Elastic Modulus @ Room Temp.	31.4 x 10 ³ ksi
Melting Range	2430°F to 2520°F
Specific Heat @ Room Temp.	0.090 Btu/lb•°F
Permeability @ Room Temp. of Annealed Material	≤1.001 (200 Oersted)
Coefficient of Thermal Expansion @ 68°F to 400°F	6.0 µin/in•°F
Thermal Conductivity @ Room Temp.	72 Btu•in/ft ² •hr•°F

The information contained in this technical data sheet is intended to be used as a guide and may be revised at any time without prior notice. The information is believed to be reliable and accurate, however Corrosion Materials does not make any warranty or assume any legal liability with respect to the accuracy, completeness or usefulness of the information.

Aqueous Corrosion Data

Media	Common Name	Corrosion Rate (mpy)
10% C ₂ H ₄ O ₂	Acetic Acid	0.5
30% C ₂ H ₄ O ₂	Acetic Acid	0.4
50% C ₂ H ₄ O ₂	Acetic Acid	0.4
70% C ₂ H ₄ O ₂	Acetic Acid	0.3
99% C ₂ H ₄ O ₂	Acetic Acid	0.3
10% CH ₂ O ₂	Formic Acid	0.3
20% CH ₂ O ₂	Formic Acid	0.6
30% CH ₂ O ₂	Formic Acid	0.7
40% CH ₂ O ₂	Formic Acid	0.7
60% CH ₂ O ₂	Formic Acid	0.5
89% CH ₂ O ₂	Formic Acid	0.5
1% HCl	Hydrochloric Acid	0.8
2% HCl	Hydrochloric Acid	3
5% HCl	Hydrochloric Acid	5
10% HCl	Hydrochloric Acid	7
15% HCl	Hydrochloric Acid	11
20% HCl	Hydrochloric Acid	15
10% H ₃ PO ₃	Phosphoric Acid	2
30% H ₃ PO ₃	Phosphoric Acid	3
50% H ₃ PO ₃	Phosphoric Acid	6
85% H ₃ PO ₃	Phosphoric Acid	25
2% H ₂ SO ₄	Sulfuric Acid	0.5
5% H ₂ SO ₄	Sulfuric Acid	3
10% H ₂ SO ₄	Sulfuric Acid	2
20% H ₂ SO ₄	Sulfuric Acid	0.7
30% H ₂ SO ₄	Sulfuric Acid	0.7
40% H ₂ SO ₄	Sulfuric Acid	0.9
50% H ₂ SO ₄	Sulfuric Acid	1

1. Material in the annealed condition and tested at boiling for 120 hours.

Applicable Specifications*

Form	ASTM	ASME	Other
Bar	B335, B564 ¹	SB335, SB564 ¹	DIN 17752, ISO 9723
Sheet & Plate	B333	SB333	DIN 17750, ISO 6208
Welded Pipe	B619, B775	SB619, SB775	DIN 17751
Seamless Pipe & Tube	B622	SB622	DIN 17751, ISO 9722
Welded Tube	B626	SB626	DIN 17751

¹On diameters above 3.5", B564/SB564 is dual certified.

* EN10204-3.1 applies to all product forms.

Please contact Corrosion Materials for a complete list of items available from our extensive inventory, as well as our value-added processing services.

We supply a complete range of items in many alloys, including C-276, 22, B-2, B-3®, 200/201, 400, 405, K-500, 625, 600, 800H/HT®, 20, F255, 6B, Titanium Gr. 2 and Titanium Gr. 5.

Our machine shop, welding shop and processing departments are equipped with state-of-the-art manufacturing equipment allowing Corrosion Materials the ability to provide the service you desire along with the economic and technical advantages you need and deserve.

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