CINDAS LLC
www.cindasdata.com

Industry Benchmark for Critically Evaluated Materials Properties Data

Now available on-line—CINDAS High Performance Alloys Database (HPAD)

The HPAD web-based database allows the user to instantly see the properties and relationships for 170 metal alloys with more than 51,850 data curves. This user-friendly interface enables HPAD subscribers to quickly select and compare the attributes of the alloys for which they are looking.

The HPAD provides numeric and graphic information as part of the database, including a comprehensive PDF consisting of additional information for each alloy.

HPAD Users

Universities	Course Material Aid
Technical Schools	Project Reference & Guide
Government Agencies	New Material Research
Aerospace Industry	Turbine Design
Automotive Industry	Developing Engines & Frame
Industrial Suppliers	Manufacturing/Machinery
Research Corporations	Research & Development

And many others...

About the Data

Upon requests from engineers and others in the oil/gas, petroleum, transportation and power generation industries, CINDAS LLC developed the High Performance Alloys Database (HPAD). Some content was taken from the widely used and highly respected Aerospace Structural Metals Database (ASMD).

Search and Browse the High Performance Alloys Database by

Material Group
(Aluminum, Titanium, Nickel Alloys, Stainless Steels, etc.)
Material Name
(Al6061, Ti-6Al-4V, Inconel 706, etc.)
Property Group
(Mechanical, Thermophysical, etc.)
Property Name
(Yield Strength, Elongation, Fracture Toughness, Corrosion Rate, etc.)

Property Groups

The HPAD contains over 635 different properties. These properties are separated into 20 easy-to-navigate property groups. Alternatively, you can search the property names by using keywords which would bring you directly to the property you're interested in.

Thermophysical

Thermoradiative

Electrical and Nuclear

Mechanical Properties

> Strength, Stress, Hardness, Fatigue & Crack Growth, Impact Energy, Strain, Area Reduction, Deformation and others

Temperature

Time, Life to Failure

Corrosion, Oxidation, and Weight Change

Length, Thickness, Diameter, Size, and Grain Size

Content of Component, Phase

Plus others...

Purdue Technology Center-Aerospace, 1801 Newman Road, Suite 1150, West Lafayette IN 47906-4524 USA
Phone: 765-807-6052 • 765-807-5400 • Fax: 765-807-5291 • www.cindasdata.com

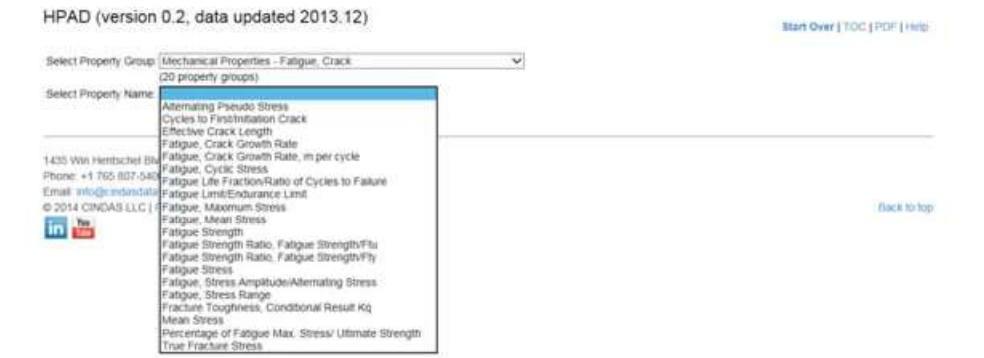
August 2021

Searching and Browsing:
High Performance Alloys Database (HPAD)
Finding Information

Search: Enter the full or partial name of the property or material.

Browse: Use the drop-down menu to find the property or material.

The High Performance Alloys Database contains 170 metal alloys in 18 metal groups and 636 properties in 20 property groups.



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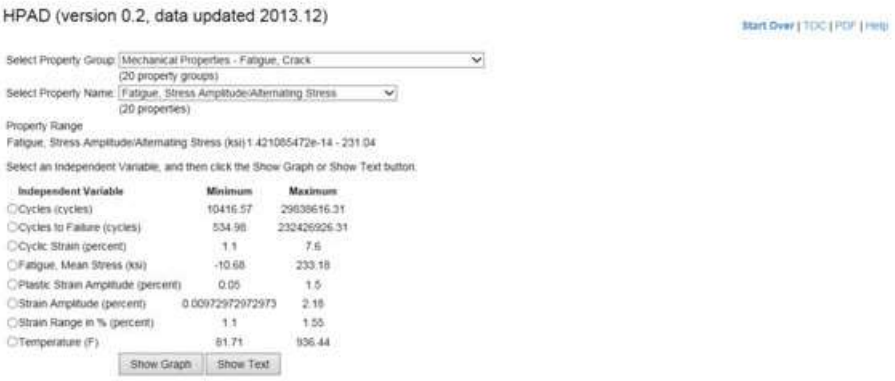
Customizing Information

Select: The independent variable.



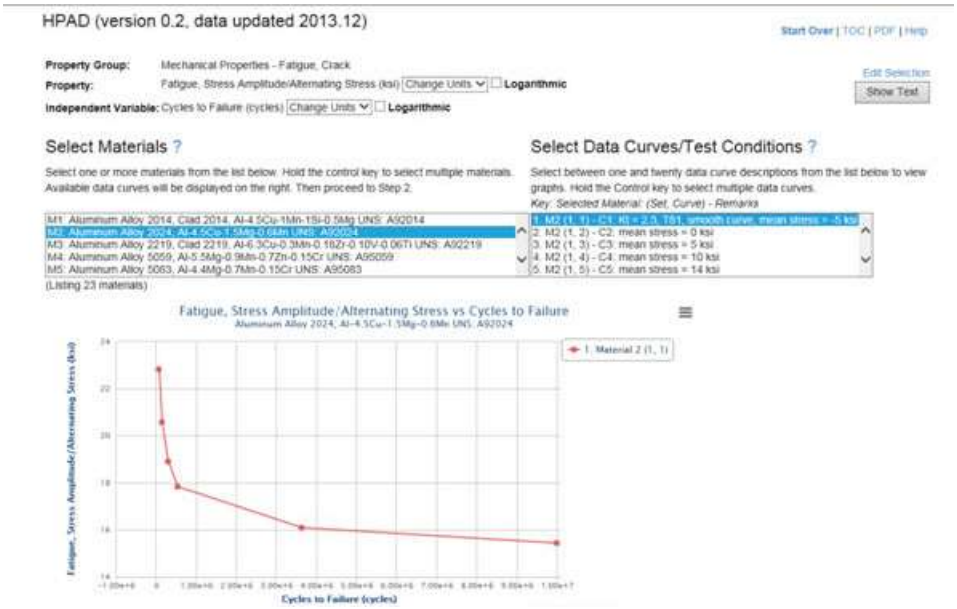
Viewing Information

The HPAD allows the user to view a property of multiple materials on one graph.

Step 1: Select Materials.

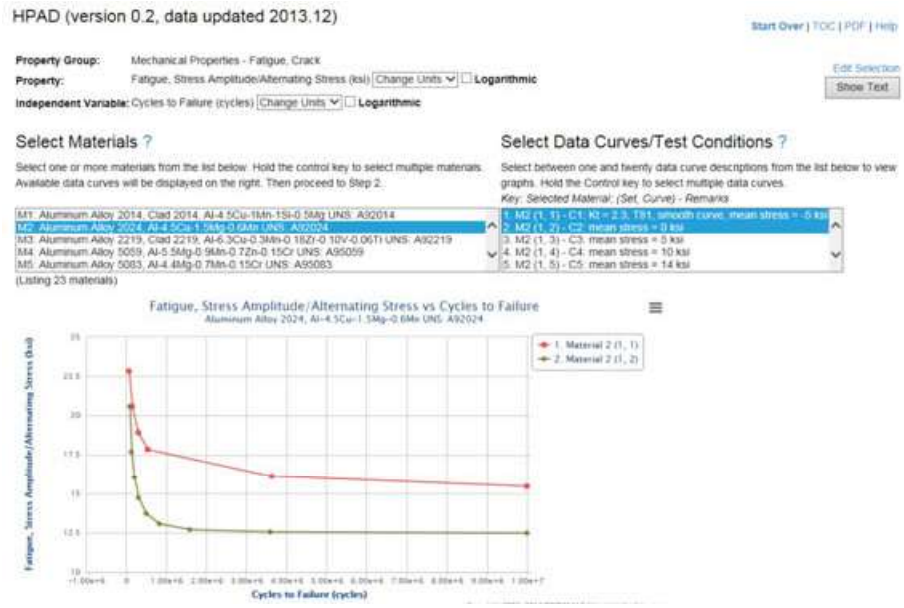
Step 2: Select Data Curves or Test Conditions.

Note: At any time, the user can click on the "Show Text" button to see the values of the data points, text description, references, etc.



Results: Graphic and Numeric

- More than 51,850 data curves
- Color-coded data curves
- Multiple curves of different materials per graph
- Hovering cursor to show X and Y values of each data point
- Unit conversion package
  - Contains both English and SI units
  - Shows all typically used units for the variables
  - Allows both X-axis and Y-axis selection



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Materials Cross Index

The materials cross index contains the commercial and alternative designations for all the metal alloys in the database. This feature can be used to find the correct metal alloy when only the trade name or commercial designation is available.

MCode	MName	Commercial and Alternate Designations
1201	High Strength Steel 4130	4130; AISI 4130; SAE 4130; 4130H; UNS G41300;
1203	High Strength Steel 4140	4140; AISI 4140; SAE 4140; 4140H; UNS G41400;
1204	High Strength Steel 4330V	4330V; 4330; 4330 Mod; 4330V Mod; 4330V (Mod
1206	High Strength Steel 4340	4340; AISI 4340; SAE 4340; E 4340; 4340 H; UNS
1208	High Strength Steel 8630	8630; AISI 8630; SAE 8630; 8630H; UNS J13042;
1218	High Strength Steel H-11 Mod	H-11 Mod; AISI Type H-11; SAE Type H-11; UNS
1225	High Strength Steel 18Ni (300) Maraging	18Ni Maraging Steel; 18Ni-Co-Mo; 18-9-5; Vascom
1228	High Strength Steel Maraging T-250	Maraging T-250; Maraging MS 250; Maraging Free
1230	High Strength Steel H-13	Grade CH-13; GX40CrMoV5-1; X40CrMoV5; ESR I
1301	Stainless Steel Types 301 and 302	Type 301; SAE 30301; UNS 30100
1305	Stainless Steel Types 310, 310S	Type 310 (UNS S31000); 310S (UNS S31008); CK
1307	Stainless Steels Types 316 and 317	Type 316, 316L, 317, 317L; CF3M; CF8M
1308	Stainless Steel Type 321	Type 321, 321H (11); UNS J92630, S32100, S3210
1311	Stainless Steel 19-9DL	19-9 DL; AISI 651; UNS J92843, K63198, K63199;
1312	Stainless Steel Type 201	Type 201; AISI 201; UNS S20100; SAE 30201
1314	Stainless Steel 21-6-9	21-6-9; Nitronic 40; ASTM XM-11; UNS S21904; AI
1330	Stainless Steel 15-15HS, SCF 260, Datalloy 2	Capenter 15-15HS, Carpenter SCF 260 Alloy, ATI [

On-line Handbook

The High Performance Alloys Database includes an interactive on-line version. The on-line PDF handbook supplements the HPAD by providing additional information about the metal alloys.

- General Overview
- Commercial Designations
- Alternative Designations
- Metal Specifications
- Composition
- Heat Treatment
- Forms & Conditions
- Melting & Casting
- Fabrication
- Metal Treatments

And many others...

High Performance Alloys Database

Non-Ferrous • AlWT
7050Al

Author: W. F. Brown, Jr. June 1984

1 GENERAL

Age-hardenable aluminum alloy 7050 has a good combination of strength, fracture toughness and corrosion resistance in both thick and thin wrought sections. In relatively thick forgings, extrusion and plate, it provides a combination of strength, stress-corrosion resistance and toughness superior to that of 7075. In sheet and relatively thin extrusions, 7050 in the T76 type temper provides strength comparable to that of 7075-T6 with superior exfoliation resistance and fracture toughness. Its chemical composition differs from that of other Al-Zn-Mg-Cu alloys in two significant respects: one, it contains zirconium in place of chromium as a recrystallization and grain-control addition, and two, it has a copper-magnesium ratio greater than 0.8. The absence of chromium contributes to low quench sensitivity, and the relatively higher copper content results in additional strengthening during second-step aging. Alloy 7050 has close controls on its iron and silicon contents and is one of the newer high-purity aluminum alloys that combine high strength with good fracture toughness.

7050 is generally available in three tempers: (a) T73, which provides the highest resistance to stress-corrosion cracking and the highest fracture toughness along with the lowest tensile strength. (b) T76, which provides the highest strength but stress corrosion resistance and fracture toughness inferior to that in the T73 temper, and (c) T74 (previously T736), which provides properties intermediate between the T73 and T76 tempers. 7050 should be considered for any aerospace application requiring strength levels in the range provided by 7075-T6 and 7079-T6 alloys along with high resistance and good toughness (4, 8, 11).

1.01 Commercial Designations

7050, Alcoa MA15

1.02 Alternate Designations

SAE-ASTM-UNS A97050

1.03 Specifications

	Al
6.2	Zn
2.25	Mg
2.3	Cu
0.12	Zr

the temperature of the quench bath and soaking times are given in Tables 1.056 and 1.057. Plate is generally spray quenched and particular attention should be given to the proper orientation of the spray equipment to avoid soft areas in the product (see Code 3221, Section 1.09).

Forgings are sometimes quenched in a mixture of water and polyalkylene glycol, which exhibits inverse solubility in water. It is soluble at room temperature but when the temperature is raised above about 165 F, a precipitate separates from the solution in the form of an organic polymer, which will be deposited on the surface of a quenched part. Under these circumstances, cooling is somewhat slower than with a water quench but more uniform. Consequently, residual stresses and distortions are significantly reduced. For 7050 the following recommendations are given concerning glycol quenching (40): (a) maximum thickness of 3 inch, (b) mechanical agitation of the part or quench medium, (c) quench time of 2 minutes per inch, (d) maximum glycol concentration of 12 percent and (e) maximum quench temperature of 90 F.

1.052 Stress relief. Relief of quenching stresses for all products except die forgings, wire, rod and rivets is accomplished by plastic deformation of 1 to 5 percent depending on the product form as shown in Table 1.056.

1.053 Aging. Some specifications (e.g., AMS 2770D) call for aging to be delayed several days at room temperature following quenching. However, for 7050, the magnitude of the delay time has an insignificant effect on the aged properties. For all products, a double aging is employed. The aging conditions for all products except sheet are given in Tables 1.056 and 1.057 for the AMS and MIL specifications, respectively.

Producer's recommendations for aging are shown in Table 1.058. Note that there are variations

We Are Confident in Our Products

The HPAD is quick, efficient, and frequently updated, and is currently used by a growing list of universities, corporations and research facilities. Please visit www.cindasdata.com for a demo.

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