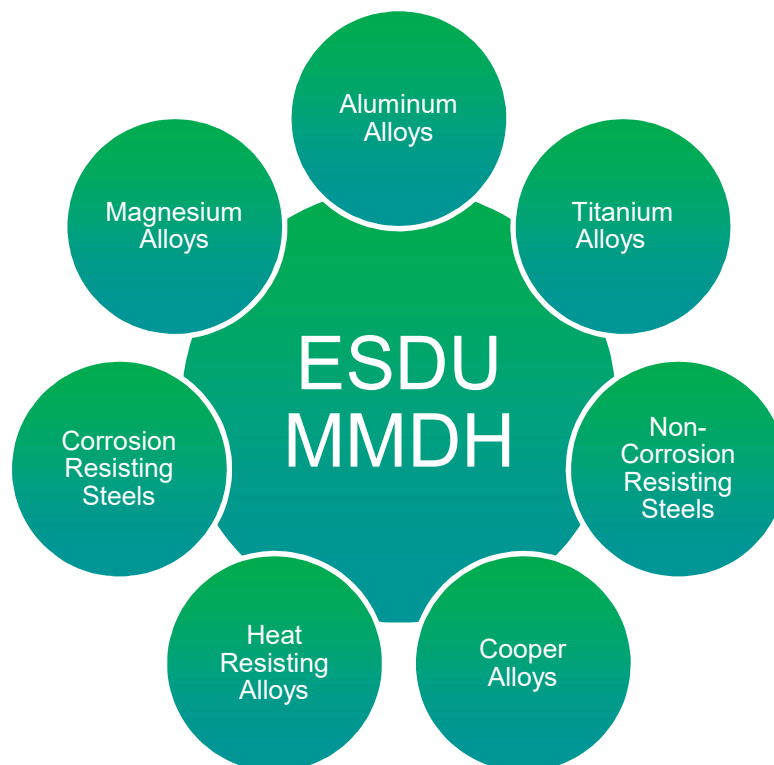


ESDU Metallic Materials Data Handbook (MMDH)

Database User Guide



MMDH Database

MMDH is a database of information for more than 500 European Aerospace Metallic Materials which are broken up into Sections 1 to 12. Within the main page you will note the 'Table of Contents' and the 'Summary' icons. Sections 1 to 5 are supplementary information on the notes about the data presented.

ESDU

Home Contents Learn More

MMDH

- Advanced Search
- Notation Synopsis

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Aerospace Materials Data

Additional Engineering

Metallic Materials Data Handbook

Table of Contents Summary included in

- Introduction
 - Preface
 - Location of relevant Data Sheets for superseded or withdrawn specifications
 - Conversion factors
- Section 1: Derivation and use of design data
- Section 2: Notation and definitions
- Section 3: Property relationships
- Section 4: Limitations and variations of allowable stresses
- Section 5: Standardised test procedures

Supplementary information on the notes about the data presented

Section 6 to 12 presents the materials data themselves.

At the beginning of each of Sections 6 to 12 is a table of related specifications, these are very useful sources of information and what they provide is a cross reference between the materials specifications presented in MMDH and other material specifications. Click onto Section 6.

References

Explore the A-Z Index

- Section 6: Aluminium alloys
- Section 7: Copper alloys
- Section 8: Heat resisting alloys
- Section 9: Magnesium alloys
- Section 10: Corrosion resisting steels
- Section 11: Non-corrosion resisting steels
- Section 12: Titanium alloys

Section 6-12 presents the materials data themselves

Using Section 6 as an example, below the column 'Support Documentation', are useful sources of information.

Metallic Materials Data Handbook

Section 6. Aluminium alloys

Document

Preamble:

Support Documentation

Table of related specifications for aluminium alloys

Check list of Data Sheets on aluminium alloys

Click onto 'Table of related specifications for aluminium alloys' you will see the table below. These are all linked to material data sheets and over on the right-hand side are the basic condition, material description and then you have the American, French and German specifications for related materials. A version of this table appears for all the data sections of MMDH so there is one for titanium alloys, steel, magnesium and one for copper alloys.

Metallic Materials Data Handbook

Support Documentation for Section 6. Aluminium alloys

- return to main Section page -

Document

included in your subscription

TABLE OF RELATED SPECIFICATIONS FOR ALUMINIUM ALLOYS

NOMINAL COMPOSITION	DTD, AECMA OR BS AEROSPACE SERIES SPECIFICATIONS FOR WHICH DATA ARE PROVIDED						BASIC CONDITION	MATERIAL DESCRIPTION OR COMMERCIAL NAME	Similar material specifications or designations (reference only)				
	SPECIFICATIONS COVERING VARIOUS FORMS								Designation		American	French	German
	Sheet and Strip	Plate	Bar and Section	Tube	Forgings	Castings			UNS*	AECMA†			
AI-PURE													
99Al			L34		L34		F	1200	A91200	AL-P1200-			
	L16			L54			O						
							H/CD						
AI-COPPER													
1.5Cu-1Si-0.8Mg			L84				T4						
			L85		L85		T6						
2Cu-1Ni-1Mg-0.9Si-0.9Fe			L83		L83		T6	2031	A92031	AL-P2031-			

Specific specifications are presented, below is an example of DTD, EN and L specification

DTD specifications:

Spec	Form	Condition	Suitable for
<i>DTD150</i>	Forgings	T4	airscrew blades
<i>DTD297</i>	Bar, Extruded section, Forgings	O	
<i>DTD372</i>	Extruded bar, Extruded section	T4	welding

EN specifications:

Spec	Form	Condition	Suitable for
<i>prEN2085</i>	Forgings	T6	
<i>EN2087</i>	Clad sheet, Clad strip	T6, T62	
<i>EN2088</i>	Clad sheet, Clad strip	T4, T42	
<i>EN2089</i>	Sheet, Strip	T62, T6	

L specifications:

Spec	Form	Condition	Suitable for
<i>L16</i>	Sheet, Strip	H14, H24	welding
<i>L33</i>	Sand castings, Chill castings	F	
<i>L34</i>	Bar, Extruded section, Forgings	F, O	welding

Typical Data Sheet

Below is a typical data sheet, we have used (L72) as an example.

Available is a 'summary of the information', the 'issue date and status', 'form of material condition' as well as a revision history (for audit trail purposes) and a link for previous versions.

Here, again is a complete listing of all the changes that were made when this data sheet was last amended.

Metallic Materials Data Handbook

Specification L72

Spec
included in yd

Summary:

Data Sheet Issue	3, Amendment A, November 2002
Specification Issue	3
Previously	DTD610
Superseded by	L163,L164
Form	Clad sheet, Clad strip
Condition	T3
Suitable for	
Revision History	Revised at Supplement Level 43 (details). Replaces L72 Issue 3 .

Then there is some statistical information relating to the values given for Physical Properties, Principal Elements, Mechanical, Sample and Characteristic Properties.

Click onto Physical Properties

Tables:

- [Physical Properties](#)
- [Principal Alloying Elements](#)
- [Mechanical Properties](#)
- [Sample Statistics](#)
- [Characteristic Properties](#)

And you will be taken to a typical table (see below)

Physical Properties - print table -			
Temp °C	at 20	20 - 100	
α 10 ⁻⁶ /°C		23	
k W/m K		151	
ρ Mg/m ³	2.79		
σ MS/m	20.4		
c kJ/kg K	0.92		

Lastly, you will note that there are figures relating to L72

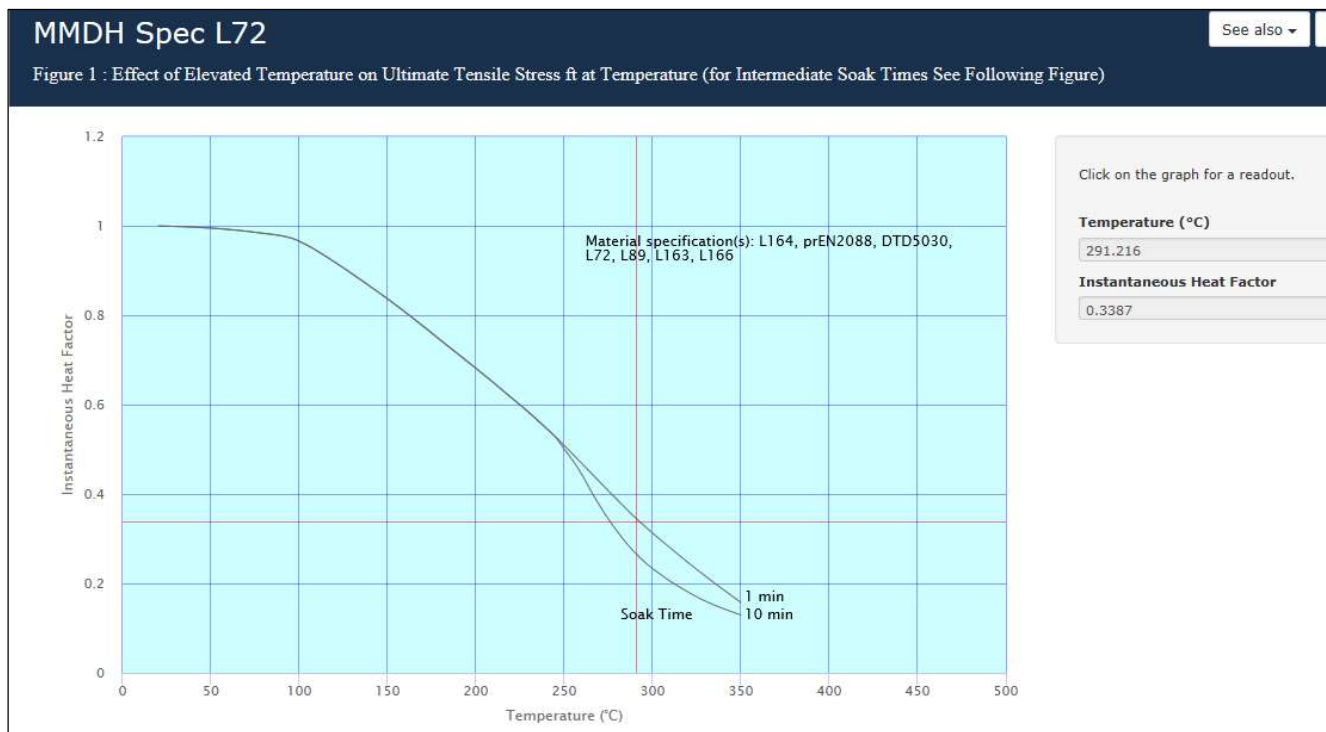
The Figures are provided in two forms – Interactive graph and Classic graph

Figures:

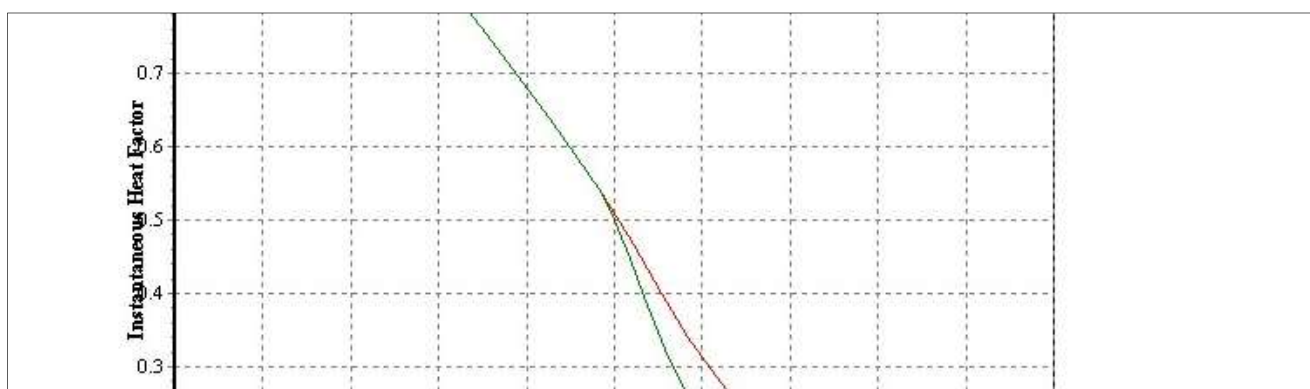
- Figure 1: Effect of Elevated Temperature on Ultimate Tensile Stress f_t at Temperature (for Intermediate Soak Times See Following [interactive graph](#) - [classic graph](#))
- Figure 2: Effect of Elevated Temperature on Ultimate Tensile Stress f_t at Temperature
- [interactive graph](#) - [classic graph](#) -
- Figure 3: Effect of Elevated Temperature on Ultimate Tensile Stress f_t on Recovery
- [interactive graph](#) - [classic graph](#) -

Interactive Graph

This graph enables you to click onto the point required and it will automatically provide you with the Temperature output

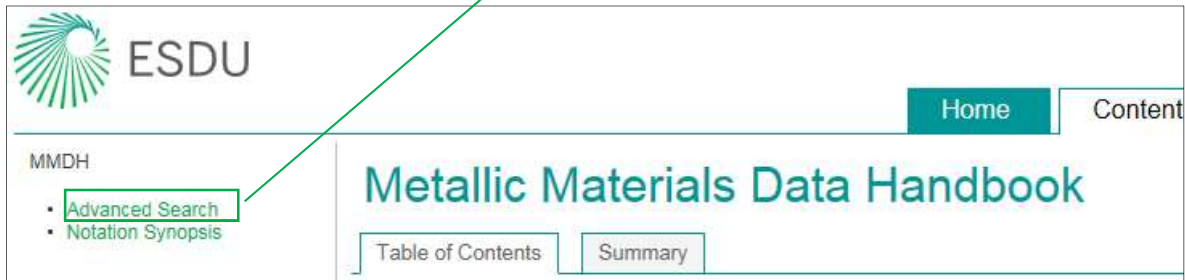


Classic Graph (this is a static image)



MMDH also has an 'Advanced Search' facility

On all the MMDH pages there is an advanced search option which is specific to MMDH



General

This feature allows a search to be performed on anything on criteria relating to any of the information presented in MMDH so you can search on material types, material forms just by selecting these boxes suitable for applications, below we have an example for Bearings in the 'General tab'.

The screenshot shows the 'General' search tab selected. It contains the following search criteria:

- Material types:** any (dropdown)
- Material forms:** any (dropdown)
- Find materials suitable for:** selected (dropdown) applications
- Airscrew blades
- Bearing shells
- Bearings (highlighted with a green box)

Principal Alloying Elements

You can also search on composition by going through the elements and specifying a minimum or maximum % or you can specify the element must be present in some amount.

The screenshot shows the 'Principal Alloying Elements' search tab. It includes a table for specifying constraints on material composition:

Element	Min (%)	Max (%)	Any amount
Ag	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>

Physical Properties

Similarly, for the Physical Properties you can chose a temperature range.

The screenshot shows the 'Physical Properties' search tab. It includes the following search criteria:

- Operating temperature range:**
 - Minimum: °C
 - Maximum: °C
- Minimum: Maximum: $10^{-6}/^{\circ}\text{C}$ any non-null value

Mechanical Properties

For the Mechanical Properties as above you can specify the form and orientation and again specify minimum or maximum.

Search for specifications where mechanical properties (at least one of the A, B or S values) meet all of the following criteria

Test piece: any

Orientation: any

	Minimum	Maximum	Any non-null value
f_y	<input type="text"/>	<input type="text"/>	<input type="checkbox"/> MPa
f_t	<input type="text"/>	<input type="text"/>	<input type="checkbox"/> MPa
f_1	<input type="text"/>	<input type="text"/>	<input type="checkbox"/> MPa
e	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>

Characteristic Properties

You can also search on Characteristic Properties and that is a powerful search engine.

General Principal Alloying Elements Physical Properties Mechanical Properties **Characteristic Properties** Search Results

Weldability

Electron Beam:

Arc (Inert Gas):

Flame:

Brazing:

Corrosion:

If you do require further support on MMDH please email customercare@ihsmarkit.com or alternatively you may wish to contact the engineer responsible adam.quilter@ihsmarkit.com.

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