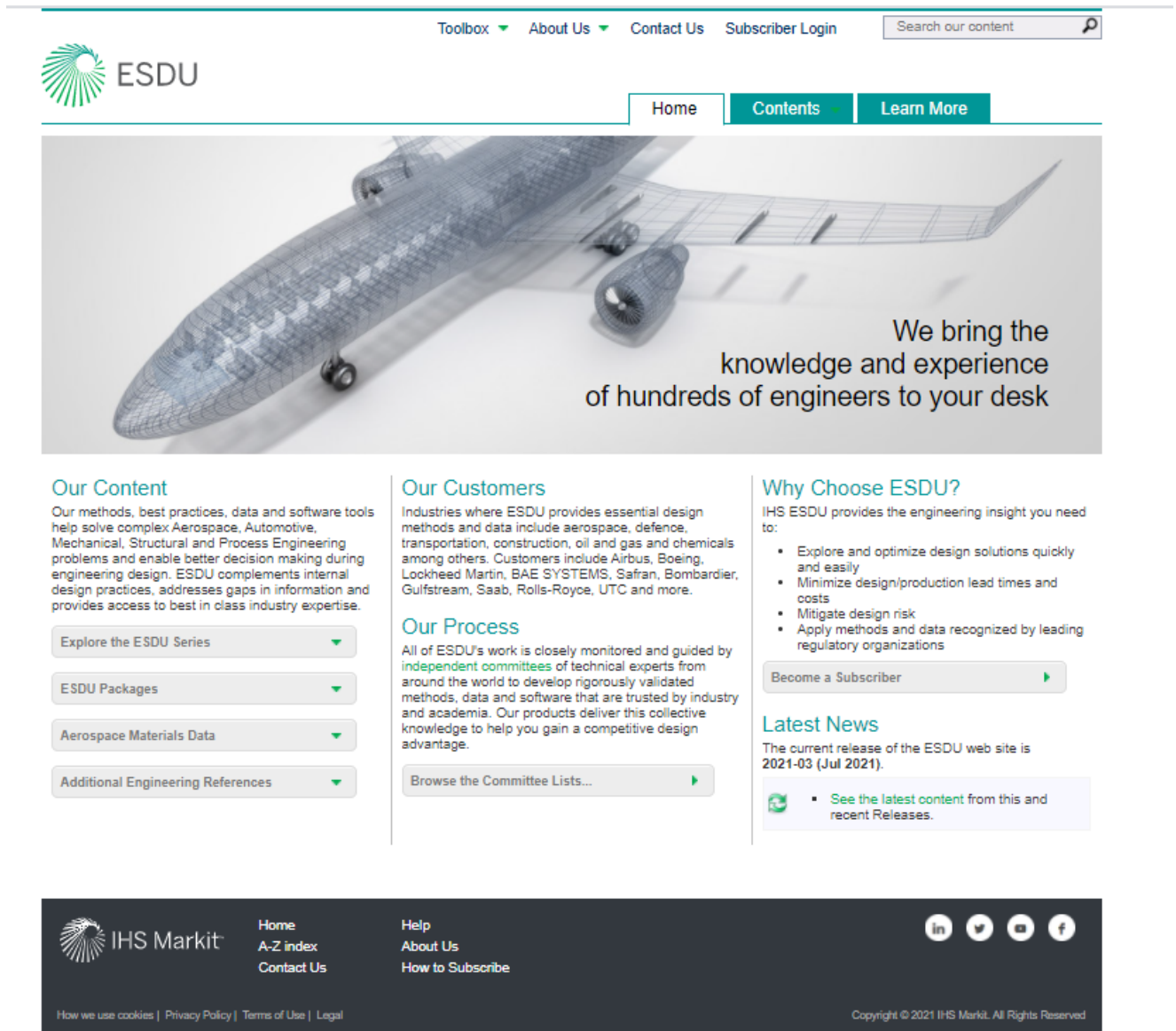


ESDU Website Guide

This guide will provide you with useful information on the navigation of the ESDU Website



The screenshot shows the ESDU website homepage. At the top, there is a navigation bar with links for Toolbox, About Us, Contact Us, and Subscriber Login, along with a search bar. Below this is the ESDU logo and a main navigation bar with Home, Contents, and Learn More. The main content area features a large image of a transparent aircraft model with the text "We bring the knowledge and experience of hundreds of engineers to your desk". Below this, there are three columns: "Our Content" with links to Explore the ESDU Series, ESDU Packages, Aerospace Materials Data, and Additional Engineering References; "Our Customers" with a list of industries and a link to Browse the Committee Lists...; and "Why Choose ESDU?" with a list of benefits and a link to Become a Subscriber. A "Latest News" section at the bottom right mentions the current release of the ESDU web site is 2021-03 (Jul 2021). The footer contains the IHS Markit logo, navigation links, social media icons, and copyright information.

Our Content

Our methods, best practices, data and software tools help solve complex Aerospace, Automotive, Mechanical, Structural and Process Engineering problems and enable better decision making during engineering design. ESDU complements internal design practices, addresses gaps in information and provides access to best in class industry expertise.

- Explore the ESDU Series
- ESDU Packages
- Aerospace Materials Data
- Additional Engineering References

Our Customers

Industries where ESDU provides essential design methods and data include aerospace, defence, transportation, construction, oil and gas and chemicals among others. Customers include Airbus, Boeing, Lockheed Martin, BAE SYSTEMS, Safran, Bombardier, Gulfstream, Saab, Rolls-Royce, UTC and more.

Our Process

All of ESDU's work is closely monitored and guided by independent committees of technical experts from around the world to develop rigorously validated methods, data and software that are trusted by industry and academia. Our products deliver this collective knowledge to help you gain a competitive design advantage.

Browse the Committee Lists...

Why Choose ESDU?

IHS ESDU provides the engineering insight you need to:

- Explore and optimize design solutions quickly and easily
- Minimize design/production lead times and costs
- Mitigate design risk
- Apply methods and data recognized by leading regulatory organizations

Become a Subscriber

Latest News

The current release of the ESDU web site is 2021-03 (Jul 2021).

See the latest content from this and recent Releases.

IHS Markit

Home
A-Z index
Contact Us

Help
About Us
How to Subscribe

How we use cookies | Privacy Policy | Terms of Use | Legal

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1. Browsing ESDU Website

You will not need a username or password if you are browsing the ESDU Website. You can almost find what you are looking for in exactly the same way as if you were a subscriber, the only difference is that you will not have access to download ESDU Data Items or run the software.



2. Subscriber Login Procedure

In August 2020, there was a new login experience for users accessing products within the Engineering Resource Center. With this new process, you can expect:

- Improved security of IHS Markit solutions, providing a more robust security control to protect data and intellectual property
- A modern and streamlined user experience
- Easy, self-service user creation

Users are required to complete a one-time registration process to resume using products within the Engineering Resource Center. This will synchronize with user profiles within the products, preserving any previous account settings and saved content.

For assistance, please view this short [registration video](#), or contact our [Customer Care team](#) for assistance.

Registration Process

Step 1: From the Login screen, click **Create a New Account**.

Step 2: Enter your organizational email, select the **I'm not a robot** check box, and click **Continue**.

IHS Markit

Create Your Account

Enter your organizational email

Enter your organizational email address

To continue, we will send a verification code to your email.

☐ I'm not a robot

reCAPTCHA
Privacy - Terms

[Back](#) [Continue](#)

Step 3: An email will be sent providing an **Activation code**. Copy and paste this code in the **Activation code** box and **Continue**.

Welcome to IHS Markit

To create your password and activate your account, copy and paste the Activation Code below:

Activation Code: Abcdefg-1234-hijk-5678-lmnop

If you have received this email in error, or have any other questions, contact Customer Care at: <https://ihsmarkit.com/about/contact-us.html>

Thank you,
[IHS Markit Customer Care](#)

IHS Markit

Activate Your Account

✓ Activation code sent to user@user.com
If you did not receive this email, check your Junk folder.

Activation code

Enter code sent to your email

[Resend Code](#)

[Cancel](#) [Continue](#)

Step 4: Enter your **First name** and **Last name**, then click **Create Account**. Enter in a password that meets the password criteria, re-enter, and click Create Password.

IHS Markit

Create Your Account

Email: user@user.com

First name *

Last name *

Cancel Create Account

Step 5: Create a password that meets the password criteria, **Re-enter password**, and click **Create Password**.

IHS Markit

Create Your Password

Log in as: user@user.com

Create a password *

Re-enter password *

Cancel Create Password

Password must contain:

- Minimum 8 characters
- No spaces
- 1 lowercase letter
- 1 uppercase letter
- 1 number
- 1 special character
- No more than 2 repeating characters

Step 6: Log in by entering your **Password**, click **Continue**, and access the Engineering Resource Center Main Menu.

IHS Markit

Enter Password

Log in as: user@user.com

Password

☐ Keep me logged in

[Forgot Password?](#)

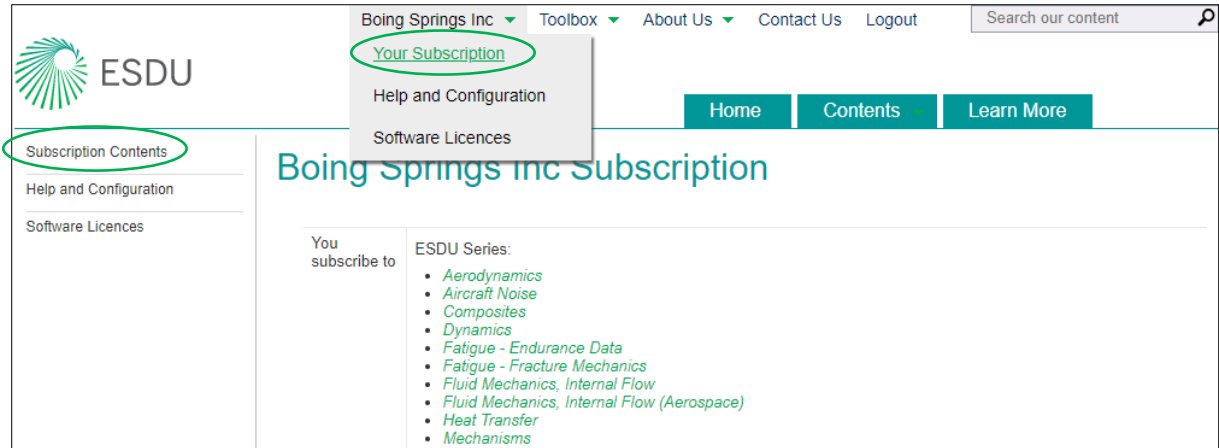
[Create a New Account](#)

Back Continue

3. Your Subscription

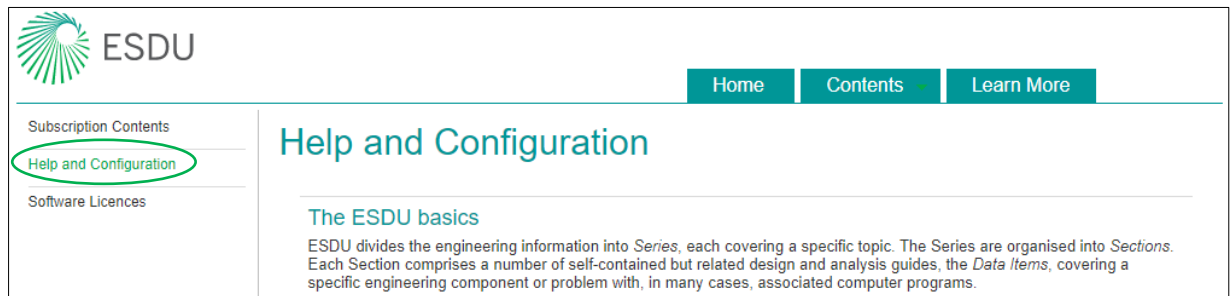
a. Subscription Content

- This section provides details of the content included in the licence
- Your user name
- Subscription expiration date and
- A link to the relevant license keys



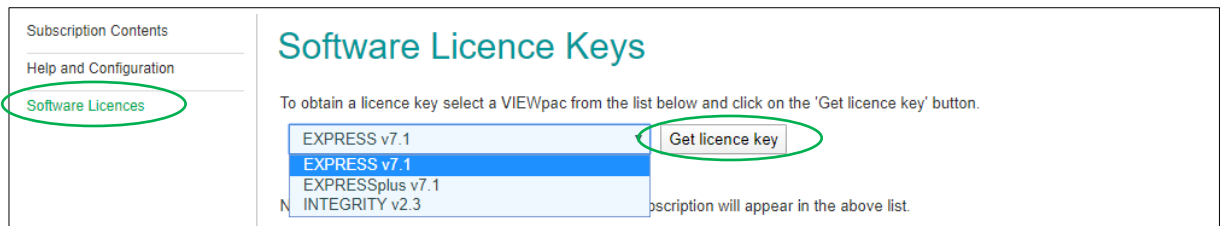
b. Help and Configuration

The ESDU website is a mix of HTML, Adobe Acrobat PDF's, Executable programs and ESDUpacs online. This section explains the technical configuration requirements.



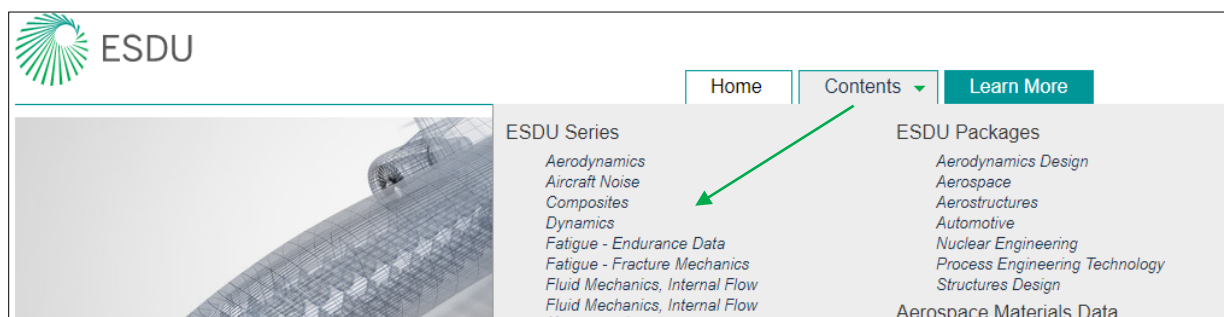
c. Software License

If your subscription permits, this section enables you to request a licence key access to EXPRESS, EXPRESSplus or the INTEGRITY program.



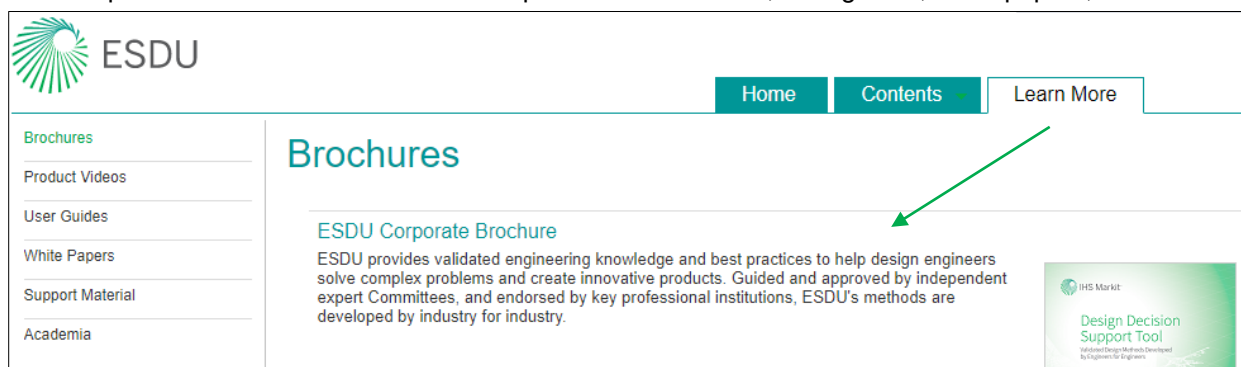
4. Contents Menu

The contents tab lists the ESDU Series, packages and additional content available on our website. Italic text will indicate content included in your subscription as shown in the example below.



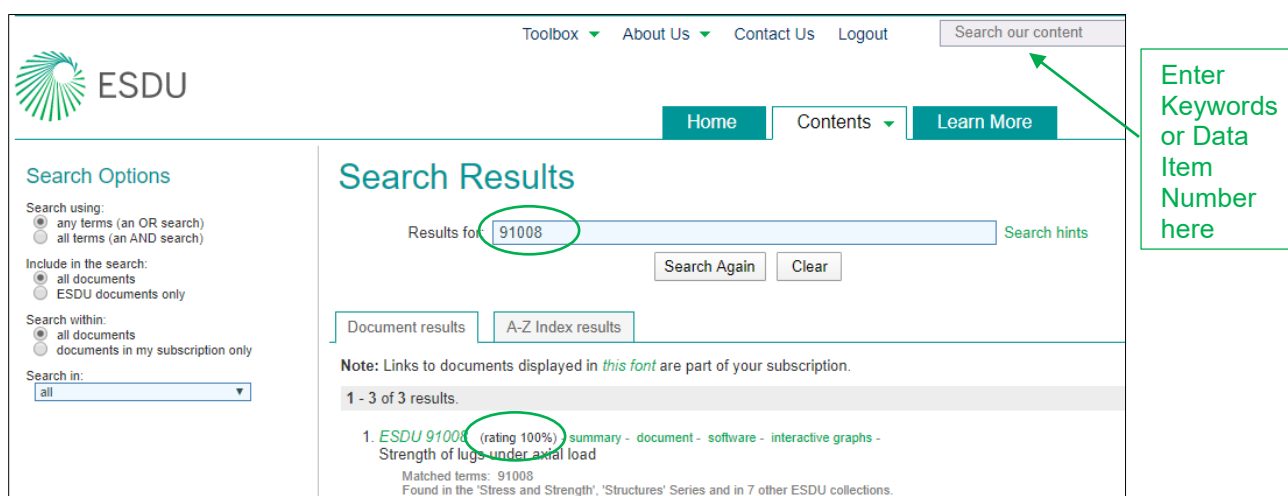
5. Learn More Menu

This tab provides further information on our products - brochures, user guides, white papers, case studies



6. Search Facility

There are different ways of searching data dependent upon the information you already have or you require. Search by Data Item Number or Keyword; Browse the Series, or using the A-Z Index.



Search Facility (cont'd)

The results appear in order of relevance. The ranking is based on the number of requested words or item numbers found and where it was found for example a hint in the title ranks highest followed by a keyword hit and lastly, a hit within the item summary.

Search Options

Search using:

- ☒ any terms (an OR search)
- ☐ all terms (an AND search)

Include in the search:

- ☒ all documents
- ☐ ESDU documents only

Search within:

- ☒ all documents
- ☐ documents in my subscription only

Search in:

Search Results

Results for: [Search hints](#)

Note: Links to documents displayed in *this font* are part of your subscription.

1 - 12 of 12 results.

1. [ESDU 08007](#) (rating 80%) - [summary](#) - [document](#) - Strength of lugs under oblique load
Matched terms: LUG
Found in the 'Stress and Strength', 'Structures' Series and in 7 other ESDU collections.
2. [ESDU 06021](#) (rating 80%) - [summary](#) - [document](#) - [interactive graphs](#) - Strength of lugs under transverse load.
Matched terms: LUG
Found in the 'Stress and Strength', 'Structures' Series and in 7 other ESDU collections.
3. [ESDU 91008](#) (rating 80%) - [summary](#) - [document](#) - [software](#) - [interactive graphs](#) - Strength of lugs under axial load
Matched terms: LUG
Found in the 'Stress and Strength', 'Structures' Series and in 7 other ESDU collections.

The "Search Hints" link further explains these options

The search can be narrowed by using the Search Options such as "any" and "all" terms when using keywords. You can also narrow your search to items published by ESDU only or only items included in your subscription.

7. Toolbox "apps"

These apps perform various engineering calculations.

ESDU

[Toolbox](#) [About Us](#) [Contact Us](#) [Logout](#)

[Home](#) [Contents](#) [Learn More](#)

ESDU Toolbox

Listed below are the ESDU 'Toolbox Apps'. These provide user friendly web-based interfaces to some ESDU programs. Some Toolbox Apps are only available to subscribers, others are freely available to subscribers and non-subscribers alike.

Subscriber Toolbox Apps

- [ESDU 74036: Drag due to a circular cavity in a plate with a turbulent boundary layer at subsonic, transonic and supersonic speeds](#)

From Data Item [ESDU 74036](#).

This app implements ESDUpac A7436, which, in turn, is based correlations of experimental results obtained on a plate at zero incidence, for predicting the increment in drag for Mach numbers less than 3. The methods apply to a cavity with sharp edges, walls normal to the plate, flat bottom and no through-flow; no information is available on rounding or chamfering of the corners, but such edge modifications should not be assumed to be beneficial. The depth/diameter ratio varied from 0.04 to 1.5 but a method of dealing with a cavity in which the ratio is less than 0.04 and based on the method of [ESDU 75031](#) is utilised. The data apply strictly in zero pressure gradient flows, but guidance on their use where there is a pressure gradient is given in the Data Item.

[Run app](#)

Click onto 'Run app' a screen will appear - the input for your coordinates.

Below is an example

Cavity geometry definitions

Summary

ESDU 74036 is based on correlations of experimental results obtained on a plate at zero incidence, for predicting the increment in drag for Mach numbers less than 3. The methods apply to a cavity with sharp edges, walls normal to the plate, flat bottom and no through-flow; no information is available on rounding or chamfering of the corners, but such edge modifications should not be assumed to be beneficial. The depth/diameter ratio varied from 0.04 to 1.5 but a method of dealing with a cavity in which the ratio is less than 0.04 and based on the method of ESDU 75031 is presented. The data apply strictly in zero pressure gradient flows, but guidance on their use where there is a pressure gradient is given in the Data Item.

ESDU 73017 and 77021 provide atmospheric data, if required. These Items are complemented by a [Toolbox App](#).

ESDU 68020 provides data for a turbulent boundary layer on a flat plate, if required. Estimates for local and mean skin friction coefficients may be obtained from the [Toolbox App](#).

General

Notes

Flow conditions at edge of boundary layer

Local Mach number, M_1

Unit Reynolds number, R_1 1/m

Circular Cavity Excrescence

Cavity depth, h mm

Cavity diameter, d mm

Surface

Local skin friction coefficient, C_f

Enter your values and run calculation

Here are your calculation results

Results

General

For this case $0.04 \leq h/d \leq 1.5$

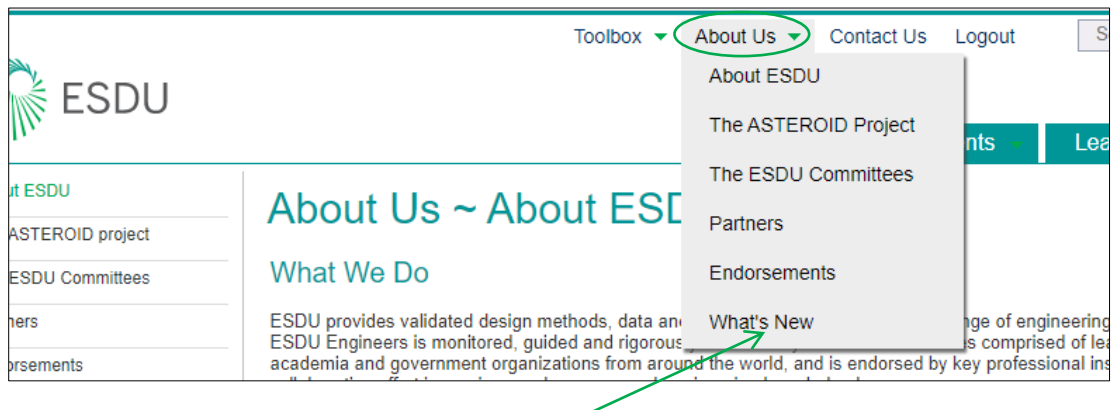
Drag coefficient based on cavity planform area, C_D	0.0055628
Cavity planform area, $\pi d^2/4$	7853.982 mm ²
Reynolds number based on cavity diameter, R_d	520000
Cavity depth to diameter ratio, h/d	0.2

Intermediate results

Function in ESDU 74036 Table A2.1, A	0.059930
Function in ESDU 74036 Table A2.2, B	0.47592

8. About Us – including ‘What’s New’ feature

This section includes information on ESDU, who we are what we do, the benefits of ESDU as well as information on Projects, Committees, Partners and Endorsements



Another important feature is the ‘What’s New’ feature.

‘What’s New’ is a good way of finding out new and amended content that has been added to the database. This content is available to view and is updated on a quarterly basis.

Release 2020-04 (Oct 2020)

- **18005** : Mass flow rate of a leak into a plenum from an external stream
New.
Series: *Aerodynamics*
Other collections: *Aerodynamics Design Collection, Aerospace Package*
- **18006** : Drag due to a leak into a plenum from an external stream
New.
Series: *Aerodynamics*
Other collections: *Aerodynamics Design Collection, Aerospace Package*
- **20005** : Introduction and guide to ESDU data on acoustic fatigue
New.
Series: *Vibration and Acoustic Fatigue*
Other collections: *Aerospace Package, Aerostructures Package, Automotive Collection, Vibration and Acoustic Fatigue*
- **20007** : Aircraft performance from flight test. Part 4: calibration of pressure air data systems, determining true airspeed and wind speeds
New.
Series: *Performance*
Other collections: *Aerospace Package*

9. Data Item and Results

Data Items that are included within your subscription will appear in italic text.

Click onto the Data Item number to be taken to the 'Abstract' of that particular document.

Search Results

Results for: [Search hints](#)

Note: Links to documents displayed in *this font* are part of your subscription.

1 - 3 of 3 results

1. **ESDU 91008** (rating 100%) - summary - document - software - interactive graphs -
Strength of lugs under axial load

Matched terms: 91008
Found in the 'Stress and Strength', 'Structures' Series and in 7 other ESDU collections.

Below are all the icons associated with this Data Item, as you will note with this document there is software associated to it. However, if there is no software associated with a particular document you will not see the 'software' icon.

ESDU 91008
Strength of lugs under axial load

included in *your subscription*

Abstract:
ESDU 91008 provides data to determine the minimum load to cause failure by rupture or maximum permissible permanent deformation of parallel-sided and tapered lugs with round or square ends under axial loading. The consideration of the effects of pin bending in a double shear joint is also included. The data on axial failure apply to any metallic material. The data include empirical factors that are geometry and material dependent and are presented as curves. The theory on which its calculation is based is outlined. A Fortran computer program, ESDUpac A9108, is provided to determine it for lugs fabricated from any metallic material. The program requires input of the material characteristics and an elastic stress concentration factor that may be found from *ESDU 81006*. A complete lug strength analysis calculation is included to illustrate the use of the program and data. Information on the analysis of lugs under transverse and oblique loads is provided in *ESDU 06021* and *ESDU 08007* respectively.

[See also 'Design of Lugs' white paper](#)

Indexed under:

- Lugs (Static Strength)

ESDU Series

- Stress and Strength
Section 15
↔
91008
↔
- Structures
Section 26
↔
91008
↔

Here you will note that ESDU 91008 belongs in the ESDU Structures as well as Stress and Strength Series.

Details:

Data Item ESDU 91008

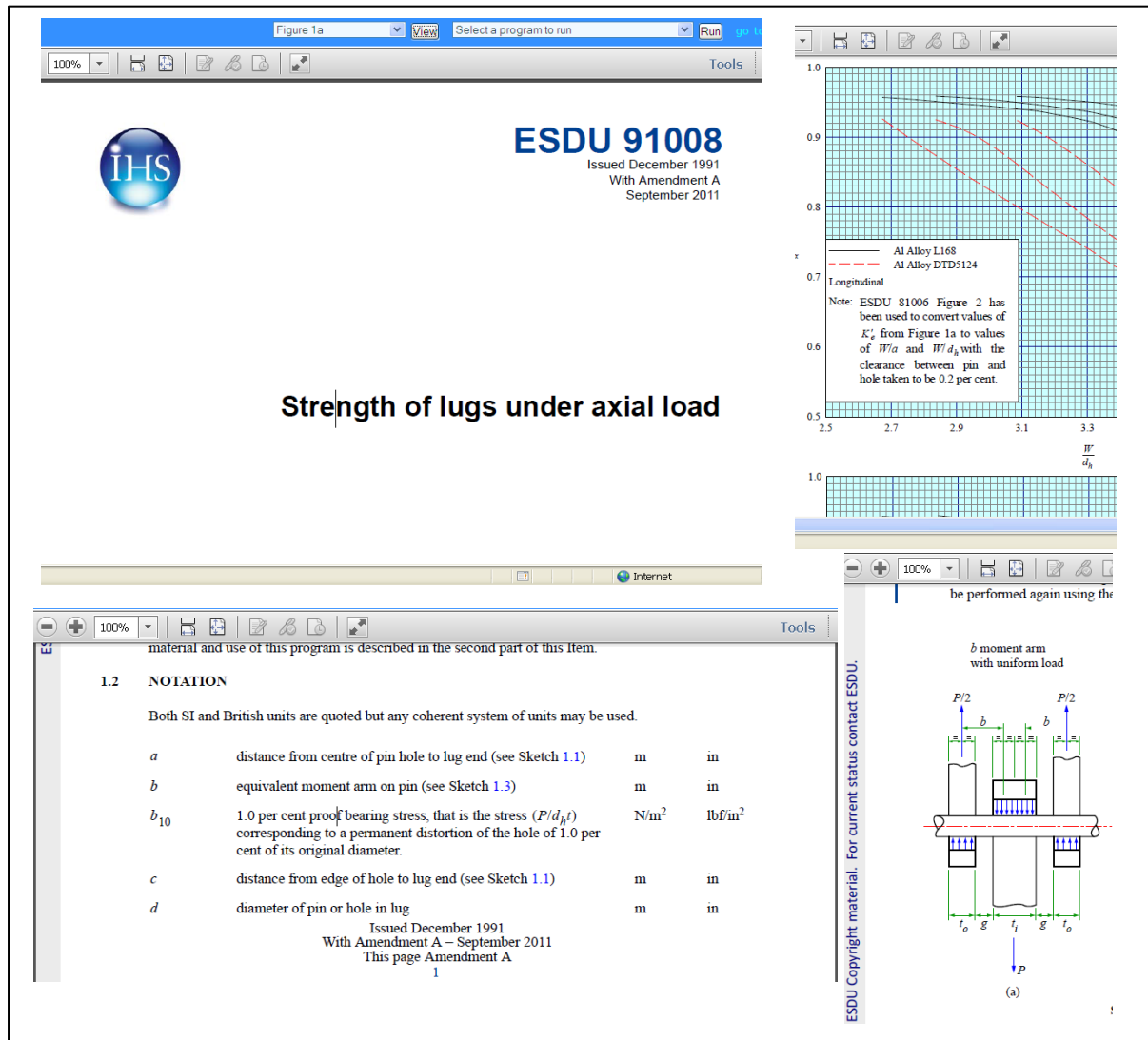
Format:	<ul style="list-style-type: none">PDFwith softwarewith interactive graphs
Status:	<ul style="list-style-type: none">Amendment (A), 01 Sep 2011Published in Release 2011-10 (Oct 2011)
Previous Releases:	<ul style="list-style-type: none">ESDU 91008
ISBN:	<ul style="list-style-type: none">978 0 85679 770 5

Important information on this Data Item is shown here including any previous releases.

10. Format of Data Items and accessing available Software and Graphs

a. Data Items

ESDU Data Items are available as PDF documents consisting of Notation and Units, Worked Examples, Figures and Sketches.



b. ESDUpac online

An ESDUpac is a computer program designed to perform a specific engineering calculation associated to a Data Item. This allows you to run the ESDUpac code without having to download or install onto your computer via online. Where available, click on the "Run" link in the Programs Tab.

Aerospace Materials Data

Additional Engineering References

Explore the A-Z Index

See this document in context

IHS INFORMATION

Summary

Document

Software

Interactive Graphs


This Data Item is complemented by the following software:

Programs

Name	Details
ESDUpac A9108	Title Lugs under axial tensile loading; tensile rupture factor.
	Version 1.0
	Type ESDUpac

Run

A text box is provided to insert your input file, or you can select one of the example data sets from the drop down and click “get example data”.



ESDUpac A9108 v1.0

Lugs under axial tensile loading: tensile rupture factor.

Input

Results

Construct your input data set in the box below, as per the instructions in the Data Item. When you are ready click the 'Run' button.
Alternatively select one of these example input data sets from the Data Item.

Select an example ▼

Get example data

Clear

Run calculation

RESULTS

Characteristic values			
m=	34.931	Fn=	0.3904E+03
Stress concentration		Axial rupture	
factor	Ke	factor	Ktux
2.620		0.9592	
2.896		0.9521	
3.171		0.9441	

c. ESDUpac downloadable file

In very few cases software is available as a downloadable .zip file which contains an executable file (.exe.). Click on the download link to be taken to the zip file. Further instructions on how to run the software are provided through the link “How to run an ESDUpac from the command line”.

ESDU 96015

Design and material selection for dry rubbing bearings (use of computer program A9615).

Summary

Document

Software

included in *your subscription*

This Data Item is complemented by the following software:

Programs

Name	Details
ESDUpac A9615	Title Design and material selection for dry rubbing bearings
	Version 1.1
	Type ESDUpac

Download

ESDUpac A9615

from Data Item ESDU 96015

Summary

included in *your subscription*

- Return to Data Item 96015

You can download the zip file [ep_a9615v11.zip](#) (215.7 KB) containing:

- a PC specific executable file (.exe),
- any example files,
- any data files

This ZIP file contains a PC executable version (a .exe file) of the ESDUpac which can be immediately used on any Microsoft PC operating system.

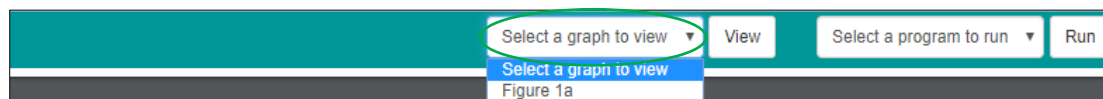
Note that in almost all cases the ESDUpac executable file is a 'file-input/file-output' program with *no* user interface and is run via the command line.

If you are uncertain how to run a command-line program you may find [How to run an ESDUpac from the command line](#) useful. The associated [Data Item](#) may also give details on how to use this program.

d. Interactive Graphs

There are several ways of accessing the Interactive Graphs

From the Data Item:



From the Search Results.

Results for: [Search hints](#)

Note: Links to documents displayed in *this font* are part of your subscription.

1 - 3 of 3 results.

1. [ESDU 91008](#) (rating 100%) - [summary](#) - [document](#) - [software](#) - [interactive graphs](#) -
Strength of lugs under axial load
Matched terms: 91008
Found in the 'Stress and Strength', 'Structures' Series and in 7 other ESDU collections.

From the Interactive Graphs Tab:

Links to

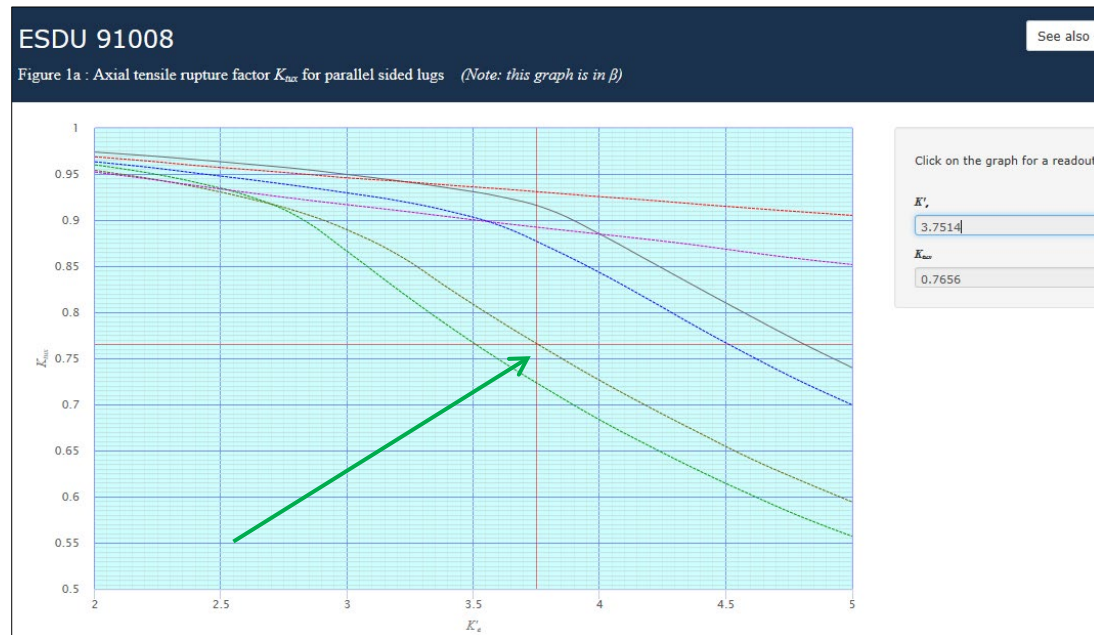
As an example click onto [Figure 1a](#) and a separate window will open and will load the graph.

included in *your su*

This Data Item contains 7 interactive graph(s) as listed below.

Graph	Title
Figure 1a	Axial tensile rupture factor K_{tux} for parallel sided lugs
Figure 1b - Part 1	Axial tensile rupture factor K_{tux} for parallel sided lugs (round end)

Clicking anywhere in the graph will populate the coordinate fields with calculated values.



Additional information on graphs can be found on the Learn More tab under Product Videos

11. Additional Navigation Options

a. Browse the series – hover over the contents tab and click on a particular series

[Toolbox ▾](#)
[About Us ▾](#)
[Contact Us](#)
[Logout](#)

[Home](#)
[Contents ▾](#)
[Learn More](#)

ESDU Series

- Aerodynamics
- Aircraft Noise
- Composites
- Dynamics
- Fatigue - Endurance Data
- Fatigue - Fracture Mechanics
- Fluid Mechanics, Internal Flow
- Fluid Mechanics, Internal Flow (Aerospace)
- Heat Transfer
- Mechanisms
- Performance
- Physical Data, Chemical Engineering
- Stress and Strength
- Structures
- Transonic Aerodynamics
- Tribology
- Vibration and Acoustic Fatigue
- Wind Engineering

ESDU Packages

- Aerodynamics Design
- Aerospace
- Aerostructures
- Automotive
- Nuclear Engineering
- Process Engineering Technology
- Structures Design

Aerospace Materials Data

- MMDH
- MMPDS

Additional Engineering References

- Bruhn
- NACA Collection
- NASA Collection
- USAF DATCOM

See also

- A-Z Index

The Series pages display an expandable table of contents of topics covered.

ESDU Aerodynamics Series

Summary

Table of Contents

included in *your subscription*

Locate a Data Item number or title in this Series

Expand all: + Collapse all: -

- Section 1: Organisational Documents

ESDU 00001

Aerodynamics Series: Record of Documents

- summary - document -

ESDU CFA

Conversion factors.

- summary - document -

+ Section 2: Properties of Gases

+ Section 3: Isentropic Flow and Shock Waves

b. Explore the A-Z index located in the Contents tab

Fluid Mechanics, Internal Flow (Aerospace)	Aerospace Materials Data
Heat Transfer	MMDH
Mechanisms	MMPDS
Performance	Additional Engineering References
Physical Data, Chemical Engineering	Bruhn
Stress and Strength	NACA Collection
Structures	NASA Collection
Transonic Aerodynamics	USAF DATCOM
Tribology	See also
Vibration and Acoustic Fatigue	A-Z Index
Wind Engineering	

ESDU A-Z Index: A-AE

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

| A-AE | af-al | am-az |

Abandoned Take-off
see also
[Ground Performance in Take-off and Landing](#)
[Landing](#)
[Take-off](#)
Considerations With All Engines Operating or After Engine Failure, [85029](#)
Detailed Example Calculation Procedure and Results for Typical Transport Aircraft
definition of segments and their end points, [87018](#)
influence of airworthiness requirements on, [87018](#)
taking account of all factors affecting applied forces and moments, [87018](#)
Prediction of Aircraft Stopping Distance on Wet Runway
from statistical analysis of aircraft stopping distance data, [99015](#)
from statistical analysis of friction ground-test machine, [99015](#)
Reaction Times
sequence and values for typical transport aircraft, [85029](#)

12. For Additional Support

Click on the 'Contact Us' Link

