Legal notice

1. edition
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1. About this document

This user guide has been produced for users of the FreqCalc online calculation program developed by Getzner Werkstoffe GmbH. Users are assumed to be familiar with the use of the internet and to have a basic technical knowledge of the field.

1.1 Layout

Sidebar

The sidebar contains general safety notes on avoiding errors, particularly operating errors, together with background information on the physical principles and important information about vibration isolation.

Symbols

This user guide explains how to use FreqCalc in the appropriate way. The following symbols are used:

![WARNING](image)

This safety note warns of the risk of serious errors in operating the program. Operating errors can lead to serious design faults and hence to damage to installed machines or components. At these points always check that you have entered your data correctly. If you need help with technical questions, consult a trustworthy source with technical expertise or contact Getzner Werkstoffe GmbH.

![CAUTION](image)

This safety note warns of the risk of errors in operating the program that could lead to a misinterpretation of the results or to a loss of data and indicates safety-related aspects of data management. At these points double-check the data you have entered.

![NOTE](image)

This note offers tips to simplify the use of the program or provides background information on calculating or interpreting results.
1.2 What does FreqCalc do?

Appropriate usage

FreqCalc is used for calculating elastic polyurethane materials from Getzner Werkstoffe GmbH.

The calculations are based on the physical model of an SDOF oscillator with a weightless spring on a solid, smooth foundation. The calculation program FreqCalc makes calculations based on the assumption of loading with a rigid mass in the centre of gravity. The calculated values are relevant for the degree of freedom in the vertical direction (1st degree of freedom), taking into consideration the non-linear behaviour of the material. The latest material data is always applied, taking shape factor dependence into account. Calculations that do not fall within this model cannot be performed with FreqCalc.
2. Requirements and safety

FreqCalc is a web-based solution and operates in a web browser. All values for the calculation are entered in an input screen. The calculation is performed on the server. Then the results are returned to the program. FreqCalc operates independently of any operating system. No installation on your computer is required. You do not need administrator rights. All you need is internet access and a standard web browser.

2.1 General safety notes

In order to use FreqCalc, you need a basic technical understanding of the field. Only use the program if you are able to interpret the results correctly.

2.2 Web browser recommendations

You can use any web browser, provided it supports the following functions:

- Cookies
- JavaScript

Optimum results for error-free operation are obtained with the following web browsers:

- Microsoft® Internet Explorer® Version 7 or higher - http://www.microsoft.com
- Mozilla Firefox® Version 3 or higher - http://www.mozilla-europe.org
2.2.1 Configuring trusted sites

FreqCalc operates with JavaScript. The default security level in Microsoft® Internet Explorer® can prevent pages containing ActiveX or Script elements and plug-ins from displaying correctly. If you use Microsoft® Internet Explorer®, add http://www.getzner.com to your list of trusted sites.

Start Microsoft® Internet Explorer®.
- Select Tools>Internet options.
- The Internet options dialog opens.
- Select the Security.
- Select the Trusted sites zone and then click Sites.
- The Trusted sites dialog opens.
- Enter http://www.getzner.com in the input field and click Add.
- The site now appears under Websites.
2.2.2 Configuring the pop-up blocker

FreqCalc allows you to export calculations in PDF format. The export function uses pop-ups. If you use Microsoft® Internet Explorer® it is advisable to configure the pop-up blocker to allow pop-ups from http://www.getzner.com. To configure the pop-up blocker, proceed as follows.

› Start Microsoft® Internet Explorer®.
› Select Tools>Internet options.
› The Internet options dialog opens.
› Select the Privacy
› Tick the Turn on Pop-up Blocker checkbox and then click Settings.
› Enter http://www.getzner.com in the input field and click Add.
› The site now appears under Allowed sites.
› Pop-ups from this website are allowed.
2.3 PDF reader

You can export calculations in PDF format and save them on your computer or print them. This allows you to display the input values and calculated results in an organised fashion. In order to read or print the PDF files you need a standard PDF reader. These are available on the internet for download from the manufacturers' websites and are normally free of charge.

Standard PDF readers:
• Adobe® Reader®: http://www.adobe.com
• Foxit® Reader: http://www.foxitsoftware.com
• PDF-XChange Viewer: http://www.tracker-software.com

2.4 User account

FreqCalc can only be used if you have an active user account on the Getzner Werkstoffe homepage. This user account gives you access to the closed website area, with specific information about materials and products. This information includes:

• General material data
• Background information about material properties and vibration isolation
• Chemical resistance of materials
• Material data sheets for the Sylomer® and Sylodyn® product ranges
• Product data sheets from the railway and construction sectors
• FreqCalc calculation program
2.4.1 Creating a user account

To create a user account on the Getzner Werkstoffe homepage, proceed as follows.

› In the address line of your web browser type the address http://www.getzner.com.
› In the menu at the bottom left of the screen select Login.
› In the text underneath the input fields select the word here.

This will take you to the registration page.
› Enter your personal details in the required fields and read the note in the right-hand column.
› Tick the checkbox to confirm that you have read the note in the right-hand column.
› To complete the registration process click Create account.
You will shortly receive an email sent to your nominated email address. Click on the confirmation link in the email to confirm your registration. This will take you to the Getzner Werkstoffe homepage. The text confirms that you have completed the registration process. You will also receive a confirmation email. Your login details are already shown in the two input fields.

- The registration process is now complete.
- Your user account has been created.
- To access the closed user area, click Login select.

By sending us your data you agree to your data being stored on our server and possibly to being contacted by a member of the Getzner Werkstoffe team. We will not pass on your data to third parties.

Your password is sent to the server in encrypted form. For that reason the string of characters displayed in the input field is longer than your password.

Store your password separately from your email address. Choose a location which nobody else can access. Getzner Werkstoffe will never ask you for your user details over the telephone or by email. If you receive a suspicious email, do not reply to it. Instead please notify us immediately by calling us on +43-5552-201-0.
2.4.2 Changing your user settings and password

You can change your details in the closed user area at any time.

› In the address line of your web browser type the address http://www.getzner.com.
› In the menu at the bottom left of the screen select Login.
› In the Login screen enter your email address and your password.
› Click Login.
   - This takes you to the closed user area.
   - In the grey column on the right is the Settings area.
› Click on the word here.
- You will see your personal details displayed in the centre column of the homepage.
› Enter any changes in the corresponding fields and confirm by clicking Update profile now.
- The text will confirm that your details have been updated. You will also receive a confirmation email.

2.4.3 Logging out

You can leave the closed user area at any time.

› In the menu at the bottom left of the screen select Logout.
- The text will confirm that you have logged out.

Logout
Contact
Sitemap
Imprint
RSS-Feed
You can reset your password at any time.

› In the address line of your web browser type the address http://www.getzner.com.
› In the menu at the bottom left of the screen select Login.
› In the grey column on the right select Password lost
› Type your email address in the input field and click Reset password.
› You will shortly receive a new password sent to your nominated email address.

NOTE
Remember to change your password again once it has been reset.
3. How it works

FreqCalc is an online solution. This means that you do not have to install the program on your computer in order to use it. So no program data or material values are stored on your computer, and the program does not access your computer to perform a calculation.

All the input values needed for a calculation are entered in an input screen (the user interface). There are a number of different functions and input options.

Once you have finished entering your data, clicking the Calculation button in the user interface sends all values to the Getzner Werkstoffe server. The calculation is then performed on the server. The results are returned to the user interface and displayed as numerical values and graphs.

All connections are encrypted and ensure the highest security standards.
4. Accessing the program

4.1 Applying for user permission

You need a user permission in order to use the FreqCalc calculation program. You can request this if you have, or would like, direct business dealings with Getzner Werkstoffe. The application is first reviewed by a member of the Getzner Werkstoffe team. Getzner Werkstoffe reserves the right to deny access to the calculation program.

To apply for user permission for FreqCalc, proceed as follows.

› Log in to the closed user area on the Getzner Werkstoffe homepage.
› Click Downloads>Materials>FreqCalc.
   - The text sets out the conditions for permission.
› Click >I would like to use FreqCalc.
   - You will receive an email confirming your request, which will be processed by a member of the Getzner Werkstoffe team.
   - You will then receive another email telling you whether you have been granted user permission for the calculation program.

FreqCalc user permission

You are not yet authorized to use FreqCalc.

In order to obtain authorization for FreqCalc you must already have a business relation with Getzner Werkstoffe GmbH or with a distribution partner of Getzner Werkstoffe GmbH or enter into such.

We will review your request and reserve the right to refuse authorization to use the calculation program.

You will receive notification on the status of your request at the e-mail address you have provided.

If you would like to request authorization, please click on the following link.

*I want to use FreqCalc*
4.2 Starting FreqCalc

The first time you start the calculation program you will see the conditions for using FreqCalc. Read them through carefully and accept them. You can also download and store the conditions for use in PDF format. To start the program, proceed as follows.

› Log in to the closed user area on the Getzner Werkstoffe homepage.
› Click Downloads>Materials>FreqCalc.
- The conditions for use will appear.
› Read through the conditions for use carefully.
› Tick the I accept the conditions checkbox and then click Continue to FreqCalc.
- The FreqCalc calculation program starts.

6. The calculations are based on the physical model of a SDOF oscillator with a weightless spring on a solid, smooth foundation. The calculation program FreqCalc makes calculations based on the assumption of loading with a rigid mass in the centre of gravity. The calculated value are relevant for the degree of freedom in the vertical direction (1st degree of freedom), taking into consideration the non-linear behavior of the material. Used will be the latest material data in consideration of the shape factor dependency. The latest state of the material data will be indicated in the FreqCalc and also in the footnote of the print-out. The information in the Getzner data sheets (tolerances, testing methods, temperature, etc.) must be taken into account. Further information on the basis for calculations can be found in the Getzner data sheet "Material properties and technical information in relation to vibration isolation".

7. In order to ensure proper use of the calculation program FreqCalc, Getzner recommends training by its technical department, which is offered to interested User of the calculation program FreqCalc.

8. The legal relationship created between the User and Getzner by user of the calculation program FreqCalc is subject to Austrian law. Sole jurisdiction for all legal disputes stemming from this legal relationship shall be A-6700 Bludenz.

Status: September 2009
4.3 Customising your profile

You can customise your profile in the Settings area. To do so, proceed as follows.

› In the FreqCalc user interface select the menu option >Settings.
  - The Settings dialog opens.
› Choose your language in the dropdown menu. The following languages are available:
  • German
  • English
  • Spanish
  • Danish
  • French
› Address: If you want to customise your PDF exports to show your address, enter the details in the input field.
› Choose your preferred number format in the dropdown menu. The following options are available:
  • Comma as decimal separator
  • Dot as decimal separator
› Choose a unit system in the dropdown menu. The following options are available:
  • SI units
  • Angloamerican units
› Logo: If you would like to customise your PDF exports to include a logo (e.g. company logo), click the Browse button and select the appropriate logo from your data file structure.
  › Click Open.
    - The path to your logo on your computer appears in the input field.
› To accept your settings, click Update profile now.
  - The text will confirm that your details have been updated.
› To return to the FreqCalc user interface, click >back to FreqCalc.
Language *: English
Address: Getzner Werkstoffe GmbH
Herrenau S
6706 Bürs / Austria
Number format *: Comma as decimal separator
Unit system *: SI units
Logo (jpg,gif,png / max 500KB / 7:3): [Image]

Update profile now!
5. User interface

- Menu bar
- Project area
- Input area (Input main bearing)
- Calculation of pre-stressed bearing | Input bushing
- Results area (Bushing results)
- Results area (Main bearing results)
- Graphs
  - Deflection curve and graph of isolation
- Table
- Graph of pre-stressed bearing
- Download buttons
- Basis of calculation
5.1 Menu bar

> back to Getzner Homepage: Exits the program and takes you to the Getzner Werkstoffe homepage.

News bar: Shows news and information about Getzner Werkstoffe GmbH (publications, press releases, events, etc.).

> Settings: Opens the Settings dialog, where you can customise your profile.

5.2 Project area

Project: Input field for the name of your project.

Remark: Input field for additional comments about the project.

Address: Ticking the checkbox loads the specified address. You can also enter an alternative address in the input field.

Author: Shows the name under which you registered.

NOTE

If you do not want an address to be included in the printed output, leave this field blank.
5.3 Input area

If you ticked the checkbox for the pre-stressed bearing calculation function, the title changes to „Input main bearing“.

Material:
Dropdown menu for selecting different product ranges. The product ranges available to you will depend on your user rights.

Quantity:
Defines the number of bearings used.

Thickness:
Dropdown menu for selecting a standard material thickness. You can also enter a custom material thickness in the field.

Load type:
Dropdown menu for selecting the load type. The available load types are Load, Mass and Force. The input field determines the value of the specified load.

Holes:
Checkbox to activate the Holes function. The centre point of a hole is aligned centrically with the bearing.

Shape:
Dropdown menu for selecting a bearing shape. The following shapes are available: Rectangle and Cylinder.

Length:
[Condition: Shape = Rectangle]: Defines the length of your bearing.

Width:
[Condition: Shape = Rectangle]: Defines the width of your bearing.

Diameter:
[Condition: Shape = Cylinder]: Defines the diameter of your bearing.

Secant:
Checkbox to activate the Secant stiffness function. The input fields determine the lower and higher limits.

Units
Disregarding the units can have serious consequences for the calculation. Always check the unit when you enter the load value.

The specified thicknesses are standard material production thicknesses. Custom thicknesses may give rise to additional production costs, with implications for delivery time and price.
Buttons:

- **Calculate** button: Starts the calculation using your specified values.
- **Reset** button: Restores the input fields and dropdown boxes to their original status.
- **Save** button: Saves the current calculation under the specified project name.
- **Archive** button: Opens the calculation archive, in which up to ten calculations can be stored.
5.4 Results area

Choose material:
Shows the material calculated on the basis of your inputs. Use the orange arrows to the left and right of the dropdown menu to select the next softest or stiffest material. The results are refreshed each time you change the material type.

If a material is the best one based on your inputs, the word “Best” is displayed below the dropdown menu, against a green background.

Shape factor:
The shape factor is a geometric measure of the shape of an elastomer bearing and is defined as the quotient of the surface area under load and the curved surface area of the bearing. The deflection curve for elastomers is dependent on the shape factor (already taken into account in the calculation).

Surface:
The surface area under load of the (main) bearing.

Cellular materials such as Sylomer® SR 11, SR 18 and SR 28 are volume-compressible, so the influence of shape factor on stiffness can be disregarded. As the elastomer compactness increases, however, the shape factor becomes increasingly important.

NOTE
www.getzner.com
**Static load limit:**
Indicates the value up to which the material can be used under a permanent static load. This value is dependent on the shape factor.

**Capacity:**
The capacity of the material under the specified load.

**Deflection:**
Distance by which the material is compressed when the specified load is applied.

**Natural frequency:**
Lowest vertical natural frequency of the elastically supported system. The lower the natural frequency, the higher the vibration isolation.

**Dynamic bedding modulus:**
Ratio of the dynamic stiffness to the surface area under load. This is also known as stiffness per unit area.

<table>
<thead>
<tr>
<th>Data category</th>
<th>Value 1</th>
<th>Value 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Static load limit</td>
<td>0.11 N/mm²</td>
<td></td>
</tr>
<tr>
<td>Capacity</td>
<td>73%</td>
<td></td>
</tr>
</tbody>
</table>

**Different load values**
The values for dynamic loads or peak loads are different from those for static loads. Please refer to the individual product data sheets for exact values.

**Overload**
The calculated material overload is given as a percentage. The field is shown with a red background. Check your inputs and choose the next highest material type from the dropdown menu. In case of doubt please contact Getzner Werkstoffe.
Dyn. modulus of elasticity:
The result shows the dynamic modulus of elasticity under the specified load for the defined material type.

Secant stiffness:
This result is only displayed if the Secant checkbox is ticked in the Input (or Input main bearing) area and the lower and upper limits have been entered. Secant stiffness is an additional value that is not absolutely necessary for a load rating. Experience shows that this value is mainly used in the railway sector.

5.5 Archive

The archive can be used for storing, opening and deleting calculations.

<table>
<thead>
<tr>
<th>Project</th>
<th>Date</th>
<th>Open</th>
<th>Delete</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number 2</td>
<td>25.06.2012 15:13</td>
<td>Open</td>
<td>Delete</td>
</tr>
<tr>
<td>Number 1</td>
<td>25.06.2012 15:13</td>
<td>Open</td>
<td>Delete</td>
</tr>
</tbody>
</table>

Project: Shows the name under which the calculation was saved.

Date: Shows when the calculation was saved.

Open button: Inserts the stored values in the input fields in the user interface.

Delete button: Deletes the stored calculation from the archive.

X: Closes the Archive dialog.
5.5.1 Saving a calculation

You can save calculations in the archive. To do so, proceed as follows.

› Enter your details in the input fields.
› Click the Save button.
- The calculation is saved in the archive under the specified project name.

5.5.2 Opening a saved calculation

To open a saved calculation from the archive, proceed as follows.

› Click the Archive button.
- The Archive dialog opens. The saved calculations are listed as a table in date order. Each record shows the project name, date and time.
› Next to the record you wish to open, click the Open button.
- The input values are inserted in the input fields.

5.5.3 Deleting a saved calculation

To delete a saved calculation from the archive, proceed as follows.

› Click the Archive button.
- The Archive dialog opens. The saved calculations are listed as a table in date order. Each record shows the project name, date and time.
› Next to the record you wish to delete, click the Delete button.
- The record is deleted from the archive.
› To close the Archive dialog, click X.
5.6 Graphs

5.6.1 Deflection curve

The deflection curve (1) maps the relation between load and deflection for the material type. The horizontal blue line (2) shows the static load limit for the selected material type. The horizontal green line (3) shows the specified load. The area below is shown in green. A material overload occurs at the point at which the specified load exceeds the static load limit. An overload is indicated in the chart by a red line (5). The area below is shown in red.

If a secant is specified, this is shown as a straight orange line (4) from the defined lower limit to the defined upper limit.
Expanding areas of the deflection curve

You can expand the view of areas of the deflection curve. To do so, proceed as follows.

› Move your mouse pointer over the chart.
  - The mouse pointer turns into a cross.
› Position the centre point of the **cross at the top left corner** of the area you wish to expand.
› Hold down the left mouse button and drag the centre point of the **cross to the bottom right corner** of the area you wish to expand.
› Release the left mouse button.
  - An expanded view of the selected area is displayed.

Alternative: Centred zoom

You can expand or reduce the size of the chart view using the zoom icons on the right-hand edge of the chart.

› To zoom in, select +
› To zoom out, select –
› To restore the chart to its original size, select 🔁
5.6.2 Graph of isolation

The isolation curve maps the relation between isolation (in dB) and frequency (in Hz) of the vibrating system. The calculated natural frequency is located at the highest point of the curve (1). The vibrating system is at resonant frequency here. At the point of natural frequency $\sqrt{2}$, the isolation curve intersects with the horizontal zero line (2). Up to this point, an elastic mounting intensifies the vibration rather than improving it (area shown in red). Beyond this point of intersection, vibration isolation is effective. The greater the difference between the excitation frequency and the natural frequency of the system, the more effective the vibration isolation (degree of isolation).
Expanding areas of the graph of isolation

You can expand the view of areas of the graph of isolation. To do so, proceed as follows.

› Move your mouse pointer over the chart.
  - The mouse pointer turns into a cross.
› Position the centre point of the **cross at the top left corner** of the area you wish to expand.
› Hold down the left mouse button and drag the centre point of the **cross to the bottom right corner** of the area you wish to expand.
› Release the left mouse button.
  - An expanded view of the selected area is displayed.

Alternative: Centred zoom

You can expand or reduce the size of the chart view using the zoom icons on the right-hand edge of the chart.

› To zoom in, select ↗
› To zoom out, select ↙
› To restore the chart to its original size, select 🔴
5.7 Table

The table under the graph of isolation shows the frequency spectrum, isolation and degree of isolation for the calculation. A negative degree of isolation denotes a worsening of the situation, a positive degree of isolation an improvement.

Example:
At an excitation frequency of 40 Hz the system isolation is -15.8 dB. This corresponds to a degree of isolation of +84%.
Download buttons:

Download:  [English]  [Calculation]  [Product datasheet]

Language selection:
Dropdown menu for choosing the language in which the calculations are to be downloaded. This allows you to create a PDF of the calculation in a different language from the input language.

Calculation button:
Creates a PDF file of the entire calculation and starts the download process. The file includes the Project, Input and Results areas and the basis of calculation.

Product datasheet button:
Starts downloading the calculated product datasheet.

Basis of calculation:

The basis of calculation describes the exact assumptions on which the FreqCalc calculation is based (see also Appropriate usage). It also includes the date on which the material data was last updated and the software version number.

Material data
The date on which the material data was last updated may vary depending on the material type. Users are not notified if the material data is changed. Check the date of the material data at regular intervals, especially if you have saved calculations in the archive. Changes to the material data may cause the calculation results to vary.
5.8 Additional option for pre-stressed bearing calculation

Schematic diagram of a pre-stressed bearing:

A pre-stressed bearing is a bearing designed to prevent transmission of structure-borne noise in mountings. Each pre-stressed bearing consists of a main bearing and a bushing.

5.8.1 Input bushing area

Calculation of pre-stressed bearing | Input bushing:

Checkbox to activate the pre-stressed bearing calculation function and the input fields for bushings.
Owing to the differing loads, the material type used for the bushing is not dependent on the material type used for the main bearing. The choice of material type is governed by the required preload force.

The specified thicknesses are standard material production thicknesses. Custom thicknesses may give rise to additional production costs, with implications for delivery time and price.

**Material:** Dropdown menu for selecting a material type. The material types available to you will depend on your user rights.

**Bushings per main bearing:** Defines the number of bushings per main bearing.

**Thickness:** Dropdown menu for selecting a standard material thickness. You can also enter a custom material thickness in the field.

**Shape:** Dropdown menu for selecting a bearing shape. The following shapes are available: **Rectangle** and **Cylinder**.

**Quantity:** [Condition: Holes per bushing checkbox ticked]: Defines the number of holes in the bushing.

**Length:** [Condition: Shape = **Rectangle**]: Defines the length of your bearing.

**Width:** [Condition: Shape = **Rectangle**]: Defines the width of your bearing.

**Diameter:** [Condition: Shape = **Cylinder**]: Defines the diameter of your bearing.

**Holes per bushing:** Checkbox to activate the Holes function.

**Diameter:** [Condition: Holes per bushing checkbox ticked]: Defines the diameter of the holes.

**Deflection under preload:** Defines the desired deflection under preload.
5.8.2 Bushing results area

**Shape factor:**
The shape factor is a geometric measure of the shape of an elastomer bearing and is defined as the quotient of the surface area under load and the curved surface area of the bearing.

**Surface (*):**
The surface area under load of the pre-stressed bearing.

**Load of bushing:**
Calculated from the preload force and the surface area.

**Capacity:**
The material capacity with the calculated preload force.

**Preload force (*):**
The force acting on the bushing.

**Dyn. Stiffness (*):**
Determined from the selected material and the calculated preload.

(*) refers to all bushings per main bearing.
Additional results in the main bearing area

<table>
<thead>
<tr>
<th>Additional load on main bearing:</th>
<th>0.066 N/mm²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total load:</td>
<td>0.066 N/mm²</td>
</tr>
</tbody>
</table>

**Additional load on main bearing:**
Additional load acting on the main bearing if a bushing is used.

**Total load:**
Sum of the additional load on the main bearing and the load.
5.8.3 Graph of pre-stressed bearing

This graph only appears if the Calculation of pre-stressed bearing checkbox is activated.

The graph shows the deflection curve for the main bearing (1) and bushing (2). The purple line (3) indicates the load on the main bearing as a force. The turquoise line (4) represents the preload force arising from the deflection under preload.
Expanding areas of the pre-stressed bearing graph

You can expand the view of areas of the pre-stressed bearing graph. To do so, proceed as follows.

› Move your mouse pointer over the chart.
  - The mouse pointer turns into a cross.
› Position the centre point of the **cross at the top left corner** of the area you wish to expand.
› Hold down the left mouse button and drag the centre point of the **cross to the bottom right corner** of the area you wish to expand.
› Release the left mouse button.
  - An expanded view of the selected area is displayed.

Alternative: Centred zoom

You can expand or reduce the size of the chart view using the zoom icons on the right-hand edge of the chart.

› To zoom in, select
  ![Zoom In Icon](image)
› To zoom out, select
  ![Zoom Out Icon](image)
› To restore the chart to its original size, select
  ![Restore Original Size Icon](image)
6. Case studies

6.1 Case study 1: Simple bearing calculation

**Scenario:**
A machine with a dead weight of 9 tonnes is to be elastically supported. The machine stands on four feet, each with a bearing surface of 250 x 250 mm. The disruptive vibrations start at an excitation frequency of 50 Hz. Isolation of at least -15 dB is required.

**Step 1: Enter data**
- In the Quantity field in the Input area enter 4.
- In the Length and Breadth fields enter 250.
- In the Load type dropdown menu select Mass and in the input field enter 9000.
- Click the Calculation button.

**Step 2: Results**
- Sylomer® SR 450 was calculated to be the best material.
- The material capacity is 81%.
- The natural frequency was calculated at 11,8 Hz.
- The graph of isolation shows the degree of isolation at an excitation frequency of 50 Hz.
- The table indicates an isolation of -24,2 dB at an excitation frequency of 50 Hz. The degree of isolation is 94%. This satisfies the minimum required value.
### Deflection Curve

- **Legend:**
  - Blue line: Deflection curve
  - Green or red (overload) line: Load type

- **Graph of Isolation**

<table>
<thead>
<tr>
<th>Frequency [Hz]</th>
<th>Isolation [dB]</th>
<th>Degree of Isolation [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>1.1</td>
<td>-13</td>
</tr>
<tr>
<td>5.0</td>
<td>1.7</td>
<td>-22</td>
</tr>
<tr>
<td>6.2</td>
<td>2.9</td>
<td>-40</td>
</tr>
<tr>
<td>8.0</td>
<td>5.3</td>
<td>-63</td>
</tr>
<tr>
<td>10.0</td>
<td>10.8</td>
<td>-334</td>
</tr>
<tr>
<td>13.8</td>
<td>19.0</td>
<td>-858</td>
</tr>
<tr>
<td>12.5</td>
<td>15.9</td>
<td>-821</td>
</tr>
<tr>
<td>16.0</td>
<td>1.6</td>
<td>-21</td>
</tr>
<tr>
<td>20.0</td>
<td>-5.2</td>
<td>45</td>
</tr>
<tr>
<td>25.0</td>
<td>-10.6</td>
<td>71</td>
</tr>
<tr>
<td>31.5</td>
<td>-15.6</td>
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<tr>
<td>40.0</td>
<td>-20.1</td>
<td>90</td>
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<tr>
<td><strong>50.0</strong></td>
<td><strong>-24.0</strong></td>
<td><strong>94</strong></td>
</tr>
<tr>
<td>60.0</td>
<td>-28.0</td>
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<td>80.0</td>
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<tr>
<td>125.0</td>
<td>-40.0</td>
<td>99</td>
</tr>
<tr>
<td>160.0</td>
<td>-44.1</td>
<td>99</td>
</tr>
<tr>
<td>200.0</td>
<td>-47.7</td>
<td>100</td>
</tr>
</tbody>
</table>
6.2 Case study 2: Pre-stressed bearing calculation

Scenario:
A machine with a dead weight of 9 tonnes is to be elastically supported. The machine stands on four feet, each with a bearing surface of 250 x 250 mm. The disruptive vibrations start at an excitation frequency of 50 Hz. An isolation value of at least -15 dB is required. Owing to a lifting force of 3 kN, the machine must be anchored to the foundation. This is to be achieved by means of one preload element per machine foot (120 x 70 mm) and two bolts (M20).

Step 1 – Step 2: Use values from case study 1

Step 3: Enter bushing data
› Tick the Calculation of pre-stressed bearing | Input bushing
› In the Thickness dropdown menu select 12.5.
› In the Length field enter 120 and in the Width field enter 70.
› Tick the Holes per bushing
› In the Quantity field enter 2.
› In the Diameter field enter 22.
› In the Deflection under preload field enter 1.

Step 4: Adjust the main bearing input
› In the Input main bearing area tick the Holes per pre-stressed element
› In the Quantity field enter 2.
› In the Diameter field enter 22.
› Click the Calculation button.

Lifting force
This causes the structure to „lift“ in the support area unless it is anchored down or a corresponding load is applied in the support area.

Holes
An M20 bolt has a diameter of 20 mm. To make it easier to pass the bolt through the hole on assembly, it is advisable for the hole to be larger than the bolt. In this case an empirical value of +2 mm is chosen.
**Step 5: Main bearing results**
- The natural frequency has changed and is now 11.7 Hz.
- The capacity is 91%.

**Step 6: Bushing results**
- The bushing capacity is 72%.
- The preload force was calculated at 2.15 kN. Given the lifting force of 3 kN, the preload force is too low.

**Step 7: Adjust the bushing input**
- In the Material area select the next stiffest material, in this case **Sylomer® SR 850**.
- Alternative 1: Enter a different value in the Deflection under preload field.
- Alternative 2: Adjust the bushing dimensions.
- Click the **Calculation** button.
**Step 8: Results**
- The main bearing capacity is 98%.
- The natural frequency was calculated at 12.0 Hz.
- The bushing capacity is 77%.
- The preload force was calculated at 3.85 kN. This is high enough to counteract the lifting force.
- The graph of isolation shows the isolation effect at a disruptive frequency of 50 Hz.
- The table indicates an isolation of -24.0 dB at an excitation frequency of 50 Hz. The degree of isolation is 94%.
- This satisfies the minimum required value.
- The pre-stressed bearing graph shows the deflection curves for the main bearing and bushing. The purple line represents the dead weight of the machine as a force. The turquoise line represents the preload force.
7. Frequently asked questions

Is there an offline version of FreqCalc?
No. FreqCalc is only available online via the Getzner Werkstoffe homepage.

Do I have to register in order to use FreqCalc?
Yes. You need to set up a user account on the Getzner Werkstoffe homepage in order to use FreqCalc.

I have registered on the homepage but I still can’t use FreqCalc. Why not?
You need to request user permission first by selecting Downloads>Materials>FreqCalc

Is FreqCalc available in other languages too?
Yes. FreqCalc is available in German, English, French, Spanish and Danish. Other language versions are being developed.

Do I need to change the program language in order to print out a PDF file in another language?
No. In the footer of the Results area you can choose the download language.

Will I be notified of changes to the material data?
No. You will not be notified. The current date of the material data appears in the basis of calculation in the footer of the calculation program and of the PDF exports.

I have added a logo to customise my user profile. Why does the logo look distorted?
Check that the aspect ratio is correct. Your logo must have an aspect ratio of 7:3.

How many calculations can I store in the archive?
You can store up to ten calculations in the archive. To store new calculations, delete those that you no longer need.

I’ve forgotten my password! How can I request a new one?
Please refer to Resetting a password.

FreqCalc does not display correctly!
Check which version of your web browser you are using and update it if necessary. If you still experience problems, please contact online support. Email: onlinesupport.buers@getzner.com
8. Glossary

**Natural frequency**
Frequency at which an oscillating system oscillates freely after a single excitation; the attenuation time is dependent on the isolation.

**Vibration isolation**
Reduction in the transfer of mechanical vibrations by the installation of elastic intermediate components; a distinction should be made between reducing the transfer of vibrations from a vibration exciter to the environment (emission control, isolation of the exciter) and shielding an object against the effects of vibration from the environment (environmental control, shielding of an object).

**Polyurethane**
Abbreviation PUR or PU; polyurethanes are prepared by the polyaddition of isocyanates and polyalcohols and can range from cellular through to compact structures. A distinction should be made between polyether urethanes and polyester urethanes.

**Single degree-of-freedom (SDOF) oscillator**
Vibration isolation applications are often idealised on the basis of an oscillating system with a single degree of freedom, consisting of a mass and a spring.

**Deflection curve**
Describes the relation between load and deflection in graphical form; depending on the rate of loading it may be a quasi-static or a dynamic deflection curve.

**Degree of isolation**
In vibration isolation characterises the isolation effect as the ratio between the input and output forces or the input and output amplitudes.

**Pre-stressed bearing**
A pre-stressed bearing is a bearing designed to prevent transmission of structure-borne noise in mountings. Each pre-stressed bearing consists of a main bearing and a bushing.

Additional terms can be found in the Getzner Werkstoffe glossary at http://www.getzner.com

Downloads>Brochures>Glossary
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