ELASTIC SUPPORT – MADE IN GERMANY

Engines (SB72)
Welcome to Schwingungstechnik-Broneske GmbH

In 1972, our company’s founder, Erwin Broneske, introduced a revolutionary elastic support system to the German shipbuilding industry. His idea was to isolate diesel engines from the hull structure by way of applying the first modern vibration mounts for the maritime industry. During more than 40 years of existence, this idea has come a long way and today SB Broneske is an integral part of the worldwide shipbuilding industry.

The idea of taming vibrations and reducing noise levels on board of vessels and contributing to their undisturbed operation is still the heartbeat of SB Broneske and the elastic support of the engines and generators remains our main focus. We consider ourselves as elastic supports specialists and our scope and experience ranges from the support of on-board machinery to different on-shore applications such as power plants and wind turbines.

We produce all of our state-of-the-art physical products in our local factory in Quickborn near Hamburg, Germany. This enables us to always meet our own as well as our customer’s high quality demands. However, our business is not solely based on the unmatched quality of our equipment, it equally depends on our vast expertise in this field which we pass on to our clients in every single project by way of free engineering services. We thus aim to accompany every project as closely as possible from as early as the design of the exhaust system to the final installation of our equipment.

Please read the following pages to find out how you and your shipbuilding projects can benefit from SB Broneske.
Product Range

Range SB Vibration Mounts for Engines and Generator Sets

- SB75
- SB72
- SB71
- SB82004
- SB82003
- SB82002
- SB82001

dN (kg)

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Vibration absorbers are members of the rubber spring family and are an element of the resilient support technology. They diminish or eliminate structure-borne noise and vibrations. Machine parts are protected from excessive dynamic loads and with the aid of vibration absorbers noise exposure for humans can be reduced to tolerable levels.

The SB72 resilient mounts series was developed with the cooperation of major European engine builders to provide vibration absorbing supports for high speed and medium speed engines and generator sets. SB72 vibration mounts prevent the transmission of structure-borne noise to the adjacent environment and to protect the machinery.

The acoustic properties of Schwingungstechnik-Broneske GmbH vibration isolators are exceptional.

The SB72 resilient mount series was specifically designed for mounting main engines, auxiliary engines and generator sets in marine applications, but these isolators have found many additional applications in the industry. Vibration Mounts type SB72 are also used for the vibration isolation of boilers, silencers, waste heat boilers and as resilient support of deck housing.

These vibration absorbers stand out in requiring only minimal expenditure for calculations of spring rates, construction and installation.

Their geometric form and compact dimensions allows these mounts to absorb high dynamic forces and amplitudes.

Performance and quality of the Vibration Mount SB72 vibration mount is guaranteed by Schwingungstechnik-Broneske GmbH, manufacturers of vibration isolation systems for the shipbuilding industry, for the heavy engine builders and for the wind power industry for over 35 years.
1.1. Function of the Vibration Mount SB 72

1.1.1. Elastic Spring Rubber (Rubber Cone)

The central core and elastic spring element of the vibration mount SB72 is a seawater resistant rubber cone. The elastic spring is made of natural rubber, as natural rubber is still the best material for the isolation of structure-borne noise and vibration. The highest degree of isolation of structure-borne noise occurs, when the quotient of the adjacent elasticity modules is greatest, as is the case with rubber and metal.
The rubber cone is designed to transmit force and momentum in all three directions. This specific geometric form of the rubber cone provides for an optimum division of tension and compression loads. This ideal balance between tension and compression increases the rubber spring's specific load capacity to 390 Nm/N – 490 Nm/N. Rubber, when under compression only, can only absorb 150 Nm/N to 240 Nm/N. Steel leaf springs can only be loaded with 50 Nm/N.

The rubber cone is made from a rubber composition, developed by Schwingungstechnik-Broneske GmbH, specifically for resilient mounts for engines. The vibration mount SB72 is supplied in the following.

The rubber cone is supplied in two versions. SB72 K designates the rubber cone with an additional intermediate steel cone. SB72 G designates the rubber cone without the intermediate steel cone.

The rubber cone is made from a rubber composition, which were developed by Schwingungstechnik Broneske GmbH, specifically for resilient mounts for engines. The Vibration Mount SB72 is supplied in the following six standard Shore (A) hardnesses:

- 45° Shore (A)
- 50° Shore (A)
- 55° Shore (A)
- 60° Shore (A)
- 65° Shore (A)
- 70° Shore (A)

Standard rubber cone composition is used for operational temperatures between -30°C (-22°F) to 80°C (176°F). Temperatures above 80°C (176°F) accelerate the ageing process of rubber and can damage the elastomer and reducing the service life of the mount SB72.

In addition, special rubber can be supplied to withstand very high temperatures. Elastomers made of Neopren or Silopren are resistant to peak temperatures of 130°C (266°F) and 200°C (392°F). All listed elastomers were tested and have proven their effectiveness.

1.1.2. The Top Cover and the Base

The top cover and casting leg (base) of the Vibration Mount SB72, made of seawater resistant Aluminium alloy, holds and guides the rubber cone. The housing also serves to protect the elastomer from oil drops and ozones. The base also incorporates the inspection slot.
1.1.3. The Centre Bolt
The centre bolt and the nuts of the Vibration Mount SB72 are made of galvanised steel alloy. The bolt is height adjustable and also limits the horizontal and vertical movement of the mount SB72 from, for example, the vessel’s movement. This protects the rubber cone from overload.

1.2. Selecting the Correct Mount
More than 30 versions of the Vibration Mount SB72 can be supplied by selecting the mount SB72 with a specific Shore (A) hardness, top cover type and rubber cone type combination.

This gives the vibration engineer maximum control in designing a resilient support system for a variety of applications. Relevant engine data, dynamic and static load factors, the operating environment, isolation requirements and cost restraints can all be factored in, to obtain the optimum solution for a given project.

Calculating the loads and the layout for resilient mounts can be complex and time consuming. Schwingungstechnik-Broneske GmbH technical staff should be consulted to assist you with the selection of a resilient mount system.

A software program, specifically developed for the Vibration Mount SB 72 Series, is used to calculate load and vibration data. A list of input data required for these calculations is detailed in the appendix.

1.3. Notice
Modifications to the series Vibration Mount SB72 can be made without prior notice. We advise our customers to contact Schwingungstechnik-Broneske GmbH technical department prior to placing an order for vibration mounts.

1.4. Approvals
The Vibration Mount SB72 series meets specifications of allmajor classification societies.
2. Technical Data Vibration Mount SB72

2.1. Type Designation of the Vibration Mount SB72 Series

Schwingungstechnik-Broneske GmbH verifies the following mount designations:

SB72 indicates the mount series SB72

X = type of rubber spring

G indicates the application of a rubber spring without intermediate steel cone
K indicates the application of a rubber spring with intermediate steel cone

Y = type of engine attachment

H indicates the provision of height adjustment for fastening the engine
B indicates the drilled holes in top cover for fastening the engine
R indicates the round top cover for fastening the engine

Z = Shore hardness(A) of the rubber spring

45 indicates hardness 45° Shore(A) of the rubber spring
50 indicates hardness 50° Shore(A) of the rubber spring
55 indicates hardness 55° Shore(A) of the rubber spring
60 indicates hardness 60° Shore(A) of the rubber spring
65 indicates hardness 65° Shore(A) of the rubber spring
70 indicates hardness 70° Shore(A) of the rubber spring

+L = Flex – Stop Device

Examples:

SB72 KB70: Mount series 72 with intermediate steel cone, with drilled holes and rubber hardness 70° Shore(A)
SB72 GB55 +L: Mount series 72 without intermediate steel cone, with drilled holes and rubber hardness 55° Shore(A) and Flex-Stop Device
SB72 GR50: Mount Series 72 without intermediate steel cone, with round top cover and rubber hardness 50° Shore(A).
SB72 KH45: Mount series 72 with intermediate steel cone, with height adjustment and rubber hardness 45° Shore(A).
SB72 GH60 +L: Mount series 72 without intermediate steel cone, with height adjustment and rubber hardness 60° Shore(A) and Flex – Stop Device.
2.2. Geometric Data

Geometric data for the Vibration Mount SB72 can be found on the following pages. Figure 2 shows a FEM (Method of Finite Elements) analysis of the Vibration Mount SB72 under maximum load. For more information and complete FEM analysis, please contact Schwingungstechnik-Broneske GmbH.

Figure 2: Analyses of the Vibration Mount SB72 with the Method of Finite Elements.
2.2.1. Vibration Mount SB72 GB

Vibration Mount SB72 with (G) rubber cone and with (B) drilled holes. The components of Vibration Mount SB72 GB:

1. casting leg
2. top cover with drilled holes
3. centre bolt
4. rubber cone (elastic spring) without intermediate steel cone
5. welded central core
6. elastic rubber bushing
7. locking nut M30 x 1.5 (Wrench Size 46)
8. centre bolt with hexagon (Wrench Size 24) adjusting block
9. drilled holes in top cover
10. inspection slot for control of centre bolt

Figure 3: Vibration Mount SB72 GB

Weight SB 73 GB: 13 kg
2.2.2. Vibration Mount SB72 GH

Mount SB72 with (G) rubber cone and with (H) height adjustment. The components of Vibration Mount SB72 GH:

(1) casting leg
(2) top cover with drilled holes
(3) centre bolt
(4) rubber cone (elastic spring) without intermediate steel cone
(5) welded central core
(6) elastic rubber bushing
(7) locking nut M30 x 1,5 (Wrench Size 46)
(8) centre bolt with hexagon (Wrench Size 24) adjusting block
(9) lower fastening base
(10) upper fastening plate
(11) inspection slot for control of centre bolt

Figure 4: Vibration Mount SB72 GH

Weight SB 73 GB: 13 kg
2.2.3. Vibration Mount SB72 GR

Vibration Mount SB72 with (G) rubber cone and with (R) round top cover. The components of Vibration Mount SB72 GR:

1. Casting leg
2. Top cover with drilled holes
3. Centre bolt
4. Rubber cone (elastic spring) without intermediate steel cone
5. Welded central core
6. Elastic rubber bushing
7. Locking nut M30 x 1.5 (Wrench Size 46)
8. Centre bolt with hexagon (Wrench Size 24) adjusting block

Figure 5: Vibration Mount SB72 GR

Weight SB 73 GB: 13 kg
2.2.4. Vibration Mount SB72 KB

Vibration Mount SB72 with (K) rubber cone with intermediate steel cone and (B) drilled holes. The components of Vibration Mount SB72 KB:

1. casting leg
2. top cover with drilled holes
3. centre bolt
4. rubber cone (elastic spring) without intermediate steel cone
5. welded central core
6. elastic rubber bushing
7. locking nut M30 x 1.5 (Wrench Size 46)
8. centre bolt with hexagon (Wrench Size 24) adjusting block
9. drilled holes in top cover
10. inspection slot for control of centre bolt

Figure 6: Vibration Mount SB72 KB

Weight SB 73 GB: 13 kg
2.2.5. Vibration Mount SB72 KH

Vibration Mount SB72 with (K) rubber cone with intermediate steel cone and (H) height adjustment. The components of Vibration Mount SB72 KH:

1. casting leg
2. top cover with drilled holes
3. centre bolt
4. rubber cone (elastic spring) without intermediate steel cone
5. welded central core
6. elastic rubber bushing
7. locking nut M30 x 1.5 (Wrench Size 46)
8. centre bolt with hexagon (Wrench Size 24) adjusting block
9. lower fastening base
10. upper fastening plate
11. inspection slot for control of centre bolt

Figure 7: Vibration Mount SB72 KH

Weight SB 73 GB: 13 kg
2.2.6. Vibration Mount SB72 KR

Vibration Mount SB72 with (K) rubber cone with intermediate steel cone and (R) round top cover. The components of Vibration Mount SB72 KR:

1. casting leg
2. top cover with drilled holes
3. centre bolt
4. rubber cone (elastic spring) without intermediate steel cone
5. welded central core
6. elastic rubber bushing
7. locking nut M30 x 1.5 (Wrench Size 46)
8. centre bolt with hexagon (Wrench Size 24) adjusting block
9. lower fastening base
10. upper fastening plate
11. inspection slot for control of centre bolt

Figure 8: Vibration Mount SB72 KR

Weight SB 73 GB: 13 kg
2.2.7. Delivery

**Vibration Mount SB72, seawater resistant, assembled**
- 4 x hexagon bolt DIN 933 M20 x 50 (galvanised) for casting leg
- 4 x hexagon nuts DIN 934 M20 (galvanised) for casting leg
- 8 x spring washer DIN 127 – B20
- 1 x feeler gage (5mm)

**Vibration Mounts SB72 B (with drilled holes)**
- 4 x hexagon bolt DIN 933 M20 x 50 (galvanised) for casting housing

**Vibration Mounts SB72 H (with height adjustment):**
- 1 x adjusting rod (diameter: 8 mm, length: 150 mm) for adjusting height
2.3. Technical Data

2.3.1. Spring Rate Curves

Figure 9: Spring rate curve Mount SB72 G (no intermediate steel cone in rubber cone)
2.3.2. Spring Rate Curves

Figure 10: Spring rate curve Mount SB72 K (with intermediate steel cone in rubber cone)
### 2.3.3. Numeric Table Spring Rate

<table>
<thead>
<tr>
<th>Force (N)</th>
<th>SB72 G - Deflection (Hardness - Shore)</th>
<th>SB72 K - Deflection (Hardness - Shore)</th>
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<tr>
<td></td>
<td>45° (mm)</td>
<td>50° (mm)</td>
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<tr>
<td>5000</td>
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<td>15000</td>
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<tr>
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<td>7.8</td>
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<td>80000</td>
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<td>10.8</td>
</tr>
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</table>

Max Load: 35000N, 38000N, 42500N, 47500N, 50000N, 55000N

Max Load: 40000N, 45000N, 50000N, 57500N, 65000N, 80000N

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2.3.4. Spring Stiffness SB72

Spring Stiffness SB72 G (no intermediate steel cone in rubber cone)

Figure 11: Spring Stiffness SB72 G (no intermediate steel cone in rubber cone)

Spring Stiffness SB72 K (with intermediate steel cone in rubber cone)

Figure 12: Spring Stiffness SB72 K (with intermediate steel cone in rubber cone)
2.3.5. Creep Curve SB72

Elastomers, like rubber, are compressed under load, and under constant load a gradual deformation, called creep, can be observed.

With rubber this creep process terminates after approx. 2 days from the time it is subjected to the load. This setting process can be shown in a creep curve.

Creep curves for all mount types are available from Schwingungstechnik-Broneske GmbH

![Typical Creep Curve SB72](image-url)
2.3.6. Dynamic Resonance Factors

The table of dynamic resonance factors is measured under vertical and horizontal load. Tables with dynamic resonance factors for all SB mount types can be obtained by request from Schwingungstechnik-Broneske GmbH.

<table>
<thead>
<tr>
<th>Rubber Hardness</th>
<th>Compare</th>
<th>Dynamic Resonance</th>
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<tr>
<td>Shore (A) Factor</td>
<td>Dynamic/static</td>
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<td>45°</td>
<td>1.05 - 1.50</td>
<td>22</td>
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<td>50°</td>
<td>1.20 - 1.30</td>
<td>20</td>
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<td>55°</td>
<td>1.30 - 1.45</td>
<td>18</td>
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<td>60°</td>
<td>1.40 - 1.55</td>
<td>16</td>
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<tr>
<td>70°</td>
<td>1.70 - 1.90</td>
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</table>
3. Installation

3.1. Installation of Vibration Mount SB72 without Height Adjustment

(1) Remove the four bolts M20 (position 9) on the top cover of mount SB72.

(2) The series SB72 mounts are pre-loaded by Schwingungstechnik-Broneske GmbH, to prevent the centre bolt from touching the foundation, when the engine is lowered onto the mount. But the centre bolt position must still be checked before the installation. The distance casting leg (position 1) – bolt end (position 10) must be 10 mm.

(3) Raise the generator set or engine and fasten the SB72 mounts under the unit. The M20 bolts (position 9) in the top cover should be fastened.

(4) When all SB72 mounts are fastened to the base of the unit, the engine can be lowered slowly on to the mounts. Fasten the base of all SB72 mounts to the foundation.

(5) After the unit has been lowered, the play of the centre bolt in each mount has to be checked and adjusted, if necessary. The distance of the centre bolt to the foundation must be 5 mm. To ascertain this distance is correct, the feeler gage provided with Mount SB72 is inserted into the control slot (position 10). If the gage can be inserted under the centre bolt with only little play, the mount is adjusted to specifications.

(6) The centre bolt adjustment is too high and has to be lowered, if the feeler gage has too much play. To lower the bolt, loosen the securing nut (position 7) and turn the hexagon adjusting bolt (position 8) clockwise, until the 5 mm distance between foundation and base of the bolt is correct. Now tighten the securing nut (position 7) again.

(7) The centre bolt adjustment is too low, if the feeler gage can not be pushed under the bolt base. To raise the centre bolt, loosen the securing nut (position 7) and turn the hexagon adjusting bolt (position 8) anti-clockwise. Tighten the securing nut, when the correct foundation to base of bolt distance of 5 mm is reached. Tighten the securing nut (position 7) again.

(8) The centre bolt sits on the foundations when the elastic spring is made with soft rubber composition. In this case the load has to be taken off the mount first, before an adjustment, as in (paragraph 7), can be performed.

(9) The resilient support system with SB72 mounts settles a few millimetres during the first 48 hours after the initial installation (see creep curve page 15).

(10) After 48 hours a final adjustment of all centre bolts should take place, as in (paragraph 6), (paragraph 7) or (paragraph 8).

(11) It is therefore advisable to adjust propulsion, supply and exhaust lines only after 48 hours.
3.2. Installation of Vibration Mount SB72 with Height Adjustment

1. Remove the securing nut (position 7) and upper fastening plate (position 10) from the centre bolt of the mount SB72.

2. The series SB72 mounts are pre-loaded by Schwingungstechnik-Broneske GmbH, to prevent the centre bolt from touching the foundation, when the engine is lowered on to the mount. But the centre bolt position must still be checked before the installation. The distance, casting leg (position 1) – bolt end (position 11), must be more than 10 mm.

3. Raise the generator set/engine and fasten the SB72 mounts to the base of the unit. The base of the unit is fixed between the lower fastening base and the upper fastening plate of the mount (position 9 and 10). The upper fastening plate (position 7) is screwed down with the securing nut.

4. When all SB72 mounts are fastened to the base of the unit, it can be slowly lowered on to the mounts. Fasten the base of all SB72 mounts to the foundation.

5. After the unit has been lowered, the play of the centre bolt in each mount has to be checked and must be adjusted, if necessary. The distance of the base of the centre bolt to the foundation must be 5 mm. To ascertain this distance is correct, the feeler gage provided with the Mount SB72 is inserted into inspection slot (position 11). If the gage can be inserted under the base of the centre bolt with only little play, the mount is adjusted to specifications.

6. The centre bolt adjustment is too high and has to be lowered, if the feeler gage has too much play. To lower the bolt, the securing nut (position 7) has to be loosened. Turn the hexagon bolt (position 8) clockwise, until the distance between bolt base and foundation is 5 mm. Now tighten the securing nut (position 7) again.

7. The centre bolt adjustment is too low, if the feeler gage can not be pushed under the base of the centre bolt. To raise the centre bolt, loosen the securing nut (position 7) and turn the hexagon bolt (position 8) anti-clockwise. Tighten the securing nut, when the 5 mm distance of bolt base to foundation is reached. Tighten the securing nut (position 7) again.

8. The centre bolt sits on the foundations; in case the elastic spring is made with a soft rubber composition, the centre bolt can come to rest on the foundation. In this case the load must be taken off the mount first, before an adjustment, as in (paragraph 7), can be made.

9. Resilient support systems with SB72 mounts settle a few mm during the first 48 hours after the initial installation (see creep curve page 14).

10. After 48 hours a final adjustment of all centre bolts should take place, as in (paragraph 6), (paragraph 7) or (paragraph 8).

11. It is therefore advisable to adjust propulsion, supply and exhaust lines only after 48 hours.

12. SB72 H mounts can be height adjusted +/- 10 mm by lowering or raising the height adjustable fastening base (position 9 and 10) with the aid of the thorn provided with the mount SB72.
4. Maintenance

Your generator set is mounted on resilient mounts, which were manufactured with great precision and their "Made in Germany" workmanship should provide long-term reliable service.

The Vibration Mount SB72 requires very little maintenance.

4.1. Service Life

The service life of the elastomer (rubber) of the Vibration Mount SB72 series is approx. 10 to 15 years. Should the rubber cone show signs of ageing after this time, the rubber insert has to be replaced.

A sure sign of fatigue are cracking or swelling of the rubber. Also the amplitudes of the mount get larger over time. While natural rubber is an excellent isolator for noise and vibration abatement, rubber is vulnerable to oil and oil derivatives and should be protected from these materials.

4.2. Monthly Maintenance

For reasons of safety, all bolts and fasteners of the SB72 mounts should be inspected on a monthly basis. As part of the monthly check, the nuts should be checked and the inner bolt play should also be routinely checked and adjusted, where necessary, using the supplied feeler gage. When the gage (5 mm high) is inserted under the base of the centre bolt with only little play, the mount adjustment is correct.

The exposed rubber parts should also be wiped with a rag and freed from any oil or fuel deposits.

4.3. Spare Parts

Schwingungstechnik-Broneske GmbH stocks spare parts for its Vibration Mount SB72 in Europe, North America and Asia and can typically ship spare parts within 24 hours to any destination in the world.

4.4. Guarantee

The Vibration Mount SB72 is guaranteed by Schwingungstechnik Broneske GmbH for a period of one year from the time the equipment is operated.
5. Required Information for Calculations

To provide our clients with a complete and expeditious proposal for a resilient mount system, Schwingungstechnik-Broneske GmbH requires the information listed in the following table, as it applies to your specific installation.

To submit the necessary data, may we suggest you use the questionnaire designed for this purpose, which is enclosed with this brochure.

Please, use the data sheets, which are attached in the appendix.

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### 5.1. Questionnaire for Vibration Calculation

#### 5.1.1. Vibration Calculation – Part 1 (Engine)

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<th><strong>Tab</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine builder</td>
</tr>
<tr>
<td>Engine Type–Designation</td>
</tr>
<tr>
<td>Output [kW]</td>
</tr>
<tr>
<td>Speed [rpm]</td>
</tr>
<tr>
<td>No. of Cylinder</td>
</tr>
<tr>
<td>Angel of Cylinder [°]</td>
</tr>
<tr>
<td>Speed gange [rpm]</td>
</tr>
<tr>
<td>Nuber of Cycles: [4 stroke or 2 stroke]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Specific Engine Data</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Poston Capacity [cm³]</td>
</tr>
<tr>
<td>Oscillating Mass [kg]</td>
</tr>
<tr>
<td>Connection–Rod Ratio</td>
</tr>
<tr>
<td>Lift of Strike [cm]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Specific Engine Data</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Length [mm]</td>
</tr>
<tr>
<td>Width [mm]</td>
</tr>
<tr>
<td>Height [mm]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Individual Masses</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Designation</td>
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</tbody>
</table>
### Supporting Springs

<table>
<thead>
<tr>
<th>Designation</th>
<th>Static Stiffness [N/mm]</th>
<th>Distance in Direction [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>x-axis</td>
<td>y-axis</td>
</tr>
<tr>
<td></td>
<td>x-axis</td>
<td>y-axis</td>
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<tr>
<td></td>
<td>x-axis</td>
<td>y-axis</td>
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</tbody>
</table>

### Additional Spring and Calculation Points

<table>
<thead>
<tr>
<th>Designation</th>
<th>Static Stiffness [N/mm]</th>
<th>Distance in Direction [mm]</th>
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