Reinforced Rubber Springs

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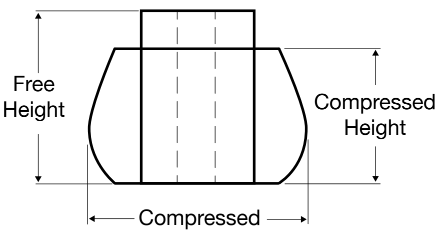
MODELS

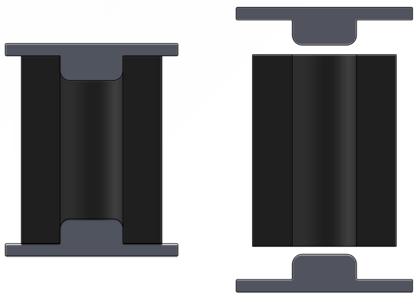
Rubber springs have been used for a long time due to the rubber properties to reduce vibration. The Oria reinforced rubber spring is a vibration isolator made of high-quality materials, combining rubber and fabric, for all industrial applications.

The Oria rubber and fabric spring is composed of a solid rubber core with a hollow in the centre and several plies of fabric reinforced rubber with a final outer cover. The fabric reinforced rubber body provides stability and a consistent cylindrical form, being able to support greater loads while isolating the vibration.

MODEL	UNLOADED SIZE			MINIMUM LOADING			MAXIMUM LOADING		
	Øext [mm]	Øint [mm]	Free Height [mm]	Min. Load [kN]	Compr. Height [mm]	Natural Frecuency [Hz]	Max. Load [kN]	Compr. Height [mm]	Natural Frecuency [Hz]
MM-003	41	16	44	0,6	38	6,9	1,4	32	5,1
MM-006	41	16	89	0,6	76	4,7	1,4	65	4,2
MM-009	83	32	127	1,8	108	4,2	4,0	92	3,1
MM-012	76	25	102	1,8	83	3,3	3,0	74	4,0
MM-018	76	25	76	2,1	65	4,9	4,1	55	3,6
MM-021	102	51	152	2,4	130	3,6	4,9	110	2,7
MM-024	89	25	152	2,5	130	3,7	5,4	110	2,8
MM-027	114	51	152	3,2	130	3,9	7,5	110	2,9
MM-030	114	25	178	5,0	151	3,6	11,3	129	2,6
MM-033	127	25	178	6,2	151	3,5	12,7	129	2,8
MM-036	152	76	152	6,2	130	3,5	13,7	110	3,2
MM-039	165	76	203	6,8	173	3,3	14,9	147	2,4
MM-042	140	51	178	6,8	151	3,0	14,6	129	3,0
MM-045	152	25	152	7,8	130	3,9	18,0	110	2,9
MM-051	165	51	203	8,8	173	3,1	19,6	147	2,7
MM-054	152	25	203	9,7	173	3,2	20,8	147	2,4
MM-057	191	89	203	10,2	173	3,0	22,9	147	2,7
MM-060	191	89	254	10,2	216	2,9	23,6	184	2,4
MM-063	203	89	305	12,0	259	2,6	26,1	221	1,9
MM-066	203	51	203	14,7	173	3,1	35,1	147	3,0
MM-069	229	51	203	23,1	173	3,0	50,7	147	2,5
MM-072	254	51	356	24,4	302	2,5	54,4	258	1,8
MM-075	254	51	203	29,3	173	3,3	66,7	147	2,7
MM-078	279	51	152	36,4	130	3,7	88,9	110	3,4
MM-081	279	51	203	36,9	173	3,3	80,0	147	2,4



The installation of the reinforced rubber springs is made fitting the hollow centre to the mounting pins. The dimensions required for the mounting pins are indicated in each model data sheet.



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ADVANTAGES

The reinforced rubber springs are used as an alternative to steel coil springs, providing a nearly constant natural frequency with changing loads, greater durability in dump and corrosive environments, and a more effective noise reduction with a more compact size of spring.

Low Cost

The high load these springs can bear results on fewer springs requiered for the application, meaning fewer overall costs.

Constant isolation with variable loads

The variable spring rate enables a nearly constant natural frequency with variable loads, resulting on a consistent vibration isolation.

Eliminates downtime

The rubber construction eliminates the spring break possibility (def ect that occurs in steel coil springs), avoiding downtime and potential damage to machinery and environment.

Reduced Noise Level

Reduces the noise transmission caused by vibration compared to the steel coil springs, therefore increasing equipment lifespan and improving working conditions.

Excellent Vibration Isolation

Its low natural frequencies provide excellent isolation of perturbing frequencies in the range of 13 to 20 Hz.

Easy Installation

The rubber fabric spring is a light and compact product, being quick and easy to install and using a minimum space.

Extended Product Life

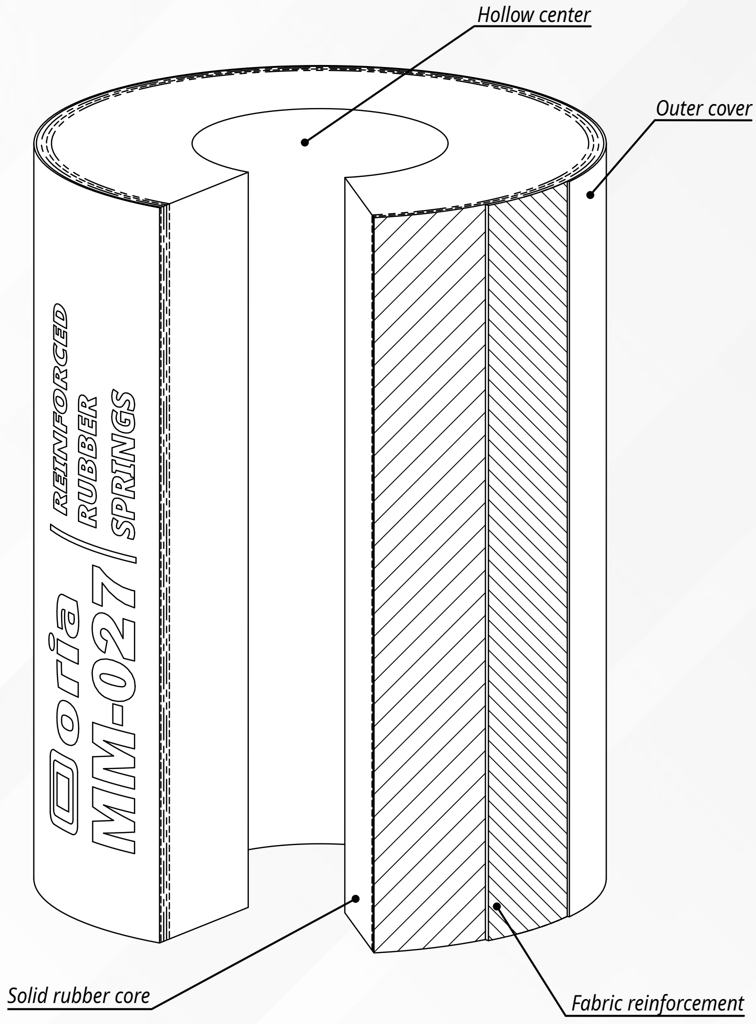
As the spring is made from rubber and fabric it is more effective and lasts longer in damp and corrosive environments.

Temperature range

Recommended working temperature range from -40º C to +75ºC.

Maintenance Free

As there are no moving parts, no maintenance or lubrication is required.



Compact Design

The use of fabric results on being able to bear greater loads maintaining its cylindrical shape. This makes to have lower general dimensions compared to all rubber springs and steel coil springs with similar load capacity.

SELECTION PROCEDURE

1

Determine application load for each spring

The load of the application will be determined by the machine weight and the maximum weight that the machine will operate with. Therefore, considering that the centre of gravity is equidistant (distributing equally the loads), the load range of each reinforced rubber spring can be calculated the next way:

$$\text{Minimum load} = \frac{\text{Unloaded machine weight}}{\text{nº of springs}} \qquad \text{Maximum load} = \frac{\text{Unloaded machine + machine weight}}{\text{nº of springs}}$$

An upward adjustment over calculated force is recommended for unplanned overloads or weight miscalculations.

2

Select the springs that meet the load range

With the obtained load values, it is recommended to select the reinforced rubber spring placed in the middle of the load range.

Oria reinforced rubber springs can operate up to 27,5% of compression of their free height. However, it is recommended to select the spring at 25% deflection or less, thus increasing the life and stability of the product.

If more than one reference meets the load requirements, select the one that has the lowest natural frequency, as the isolation percentage will be higher.

3

Verify design parameters

Verify that the selected reinforced rubber spring meets the stroke required by the application (do not exceed recommended stroke) and that there is enough space for the maximum diameter that the spring is going to take during compression.

4

Verify isolation percentage

Verify that the isolation of the transmission is adequate. For that, use the natural frequency value at the operating height and the next formula:

$$\%\ \text{Isolation} = 100 - \left[\frac{1}{\left(\frac{f_e}{f_n}\right)^2 - 1} \right]$$

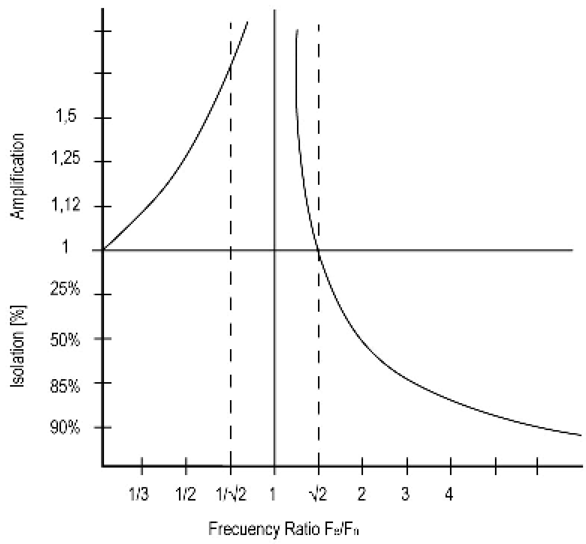
Where:

f_e = Exciting frequency [Hz]
f_n = Natural frequency [Hz]

In the chart beside is plotted the transmissibility or isolation that will be obtained from the frequency ratio.

Isolation will only happen if the exciting frequency is at least 1,4 times greater than the natural frequency.

$$f_e > \sqrt{2} \cdot f_n$$



Amplification and resonance take place when the frequency ratio f_e/f_n lies between 1/√2 and √2.

The natural frequency is indicated in each individual data sheet in different compression values. Its value for an undamped system is calculated using the following formula:

$$f_n = 0,5 \cdot \sqrt{\frac{K}{L}}$$

Where:

K=Spring Rate [kN/m]
L=Load [kN]

The spring rate, defined as the amount of weight required to compress a spring by one inch, is equal to the slope of the load-deflection curve at the corresponding load. As the reinforced rubber spring load-deflection curve is not linear (in contrast to steel spring linearity), the spring rate varies with deflection. It is calculated as follows:

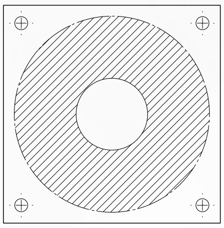
$$K = \frac{L}{x}$$

Where:

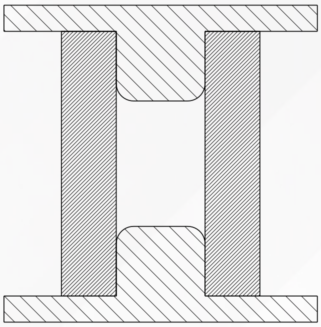
x=Deflection [m]

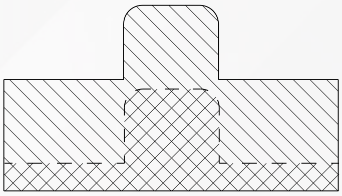
INSTALLATION INSTRUCTIONS

The reinforced rubber springs use supports with pins fixed to the structure of the machine to place and maintain their position during operation. For a vibration isolation installation, next steps must be followed:



Clear area = maximum spring Ø
Locate mounting holes outside clear area.





Adaptable height to maintain previous system dimension.

SUPPORT DIMENSIONING

The upper and lower supports must be manufactured according to the dimensions indicated for each reference in their respective technical data sheet. The outer diameter of the pin shall be equal to the inner diameter of the spring, and the minimum diameter of the support shall be at least equal to the maximum diameter of the spring.

If a steel coil spring system is being replaced, and it is mandatory to maintain the height, the supports heights can be adapted to achieve the same dimensions on the reinforced rubber spring assembly. Consider the reinforced rubber spring loaded height and add the remaining height to the supports.

ASSEMBLY READINESS

Before inserting the assemblies (the springs + the supports), it is necessary to properly clean the surfaces of the supports and the pins their self, otherwise the inside diameter of the spring could be damaged. For such cleaning, it is recommended to use water or silicone, as this will also help to position the spring correctly without damaging it.

ALIGNMENT

The machine must be raised high enough to be able to install the assembly of the supports and the spring. Place the assemblies and carefully lower the frame, ensuring that the springs are correctly aligned.

DIMENSIONAL CHECK

With the structure correctly aligned and supported on the reinforced rubber springs, the spring heights must be checked. The height of the springs must be within the working range indicated on the data sheet. If this is not the case, it means that the calculation of the loads is wrong and this will cause a malfunction. If the height is higher than the recommended, it can increase resonance, and if it is too compressed, it will shorten the life of the product and cause premature failure.

ASSEMBLY FIXATION

Proceed to drill the supports and the structure, in order to fasten them with screws (always outside the area of the maximum diameter of the spring) and thus to have correctly completed the installation of the Oria reinforced elastomeric springs to the machine.

OPERATION VERIFICATION

Even if the installation has been carried out following the rigorous steps, it is advisable to observe that the springs work correctly during the first start-ups and shut-downs of the machine, making sure that there are no strange functions.

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MANUFACTURAS UNE, S.A.U.

Paseo Egiburuberri 19 C
20100 Renteria
Guipuzcoa, Spain
T. 34 943 46 88 35
eganasl@eganasl.com
www.eganagroup.com

Cr. GI-2632 Km 7,8
20709 Ezkio
Guipuzcoa, Spain
T. 34 943 72 07 65
comercial@grupooria.com
www.eganagroup.com