Schiller GmbH

Membrane Air Springs

Principle of Vibration Isolation

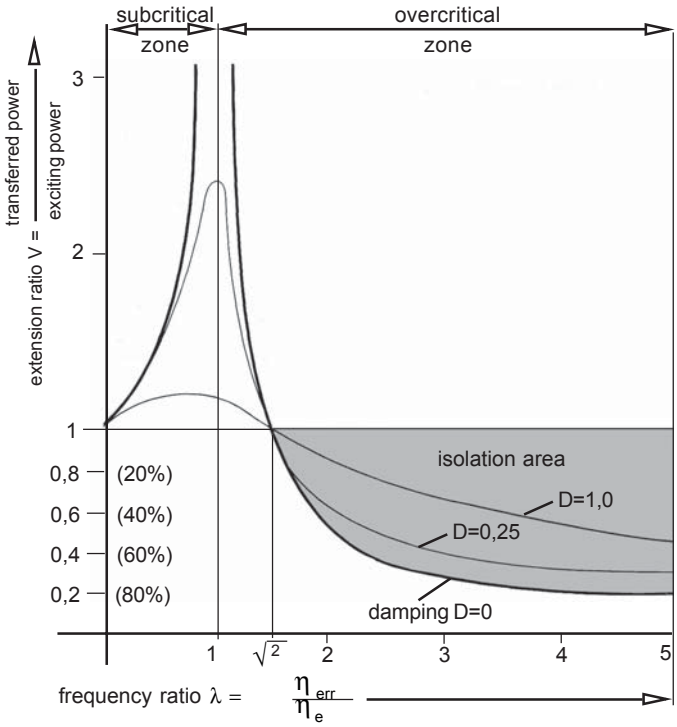
Active Vibration Isolation:
The vibration exciters (such as dynamic test rigs, machines, ...) are arranged on vibration isolation systems. Thus the generated vibration is transferred into the building or surrounding only to an acceptable degree.

Passive Vibration Isolation:
The objects which must be protected are mounted onto vibration isolation systems. Thus we disconnect them from the vibration sources in order to protect them from environmental effects.

These are the specifying properties of a vibration isolator:

- lifting capacity
- natural frequency
- spring stiffness
- damping.

By varying these parameters we can syntonize the vibration isolator to your specific requirements. In most cases the natural frequency must be as low as possible in order to achieve the greatest possible isolation effect.



$\lambda < 1$ no vibration isolation
impact sound insulation possible
$\lambda = 1$ unstable oscillation
max. values within the resonant area
$\lambda > \sqrt{2}$ vibration isolation, efficiency η depending on λ

Range of Application

Employ membrane air springs for vibration isolation:

in the field of passive isolation for

- metrological instruments
- electron microscopes
- equipment in laser technology
- measuring buildups

in the field of active isolation for:

- machines*
- motor test rigs*
- gear test rigs*

* = with little dynamics

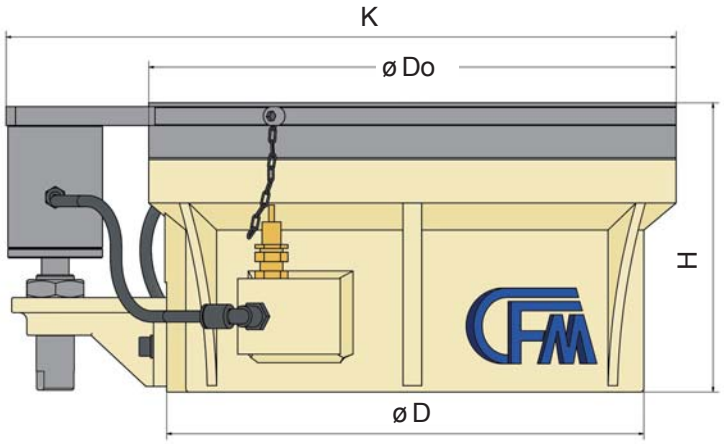
Product Description

Membrane air springs seal air in a reservoir by means of a rubber membrane. The cover plate above the membrane carries the object that must be vibration isolated. Increasing air pressure in this sealed volume increases the force onto the membrane. If this force is greater than the mass force of the load on top, the membrane arches upward and lifts the mass. By means of a level control you prevent that the mass is being lifted too high and thereby the membrane damaged. In comparison to our single convolution air springs of the series BZ the membrane air springs MAS have a higher horizontal stiffness and in addition the air damping can be controlled by a throttle.

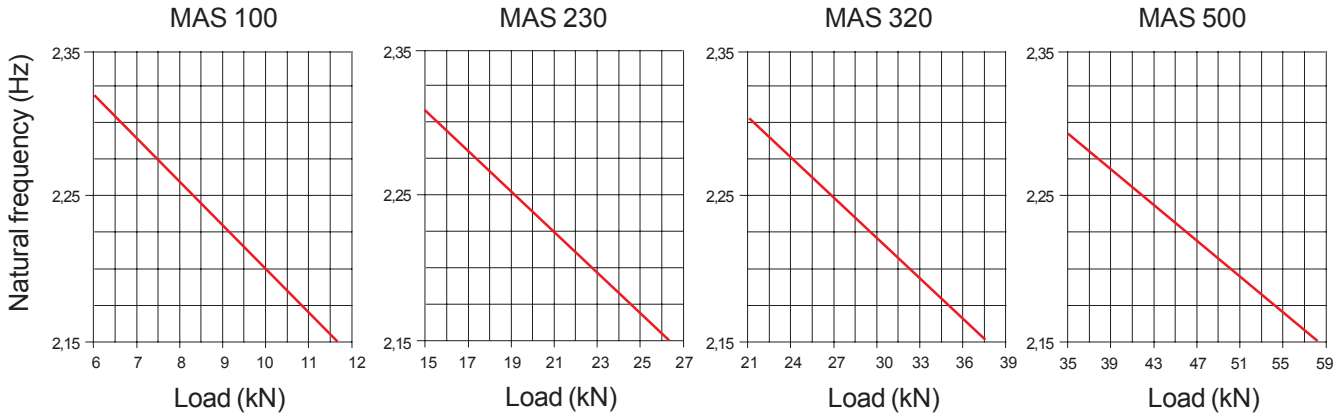
Technical Data

Type of air spring		MAS 100		MAS 230		MAS 320		MAS 500	
		additional volume		additional volume		additional volume		additional volume	
		without	with	without	with	without	with	without	with
Dimensions									
Working height **H** [mm]		157	307	157	307	157	307	157	307
Height when set down [mm]		153	303	153	303	153	303	153	303
Diameter piston **D** [mm]		204		279		319		345	
Diameter top [mm]	**Do** without valve	204		279		319		379	
	K with valve	282		354,5		394,5		454,5	
Diameter footprint [mm]		173	a. A.	245	280	285	a. A.	345	a. A.
Technical data									
Load [kN]	at 4 bar	6,7		15,3		21,4		33,4	
	at 6 bar	10,0		23,0		32,1		50,1	
natural frequency [Hz] at 6 bar, vertical		2,4	1,7	2,4	1,7	2,4	1,7	2,4	1,7
Stiffness [kN/cm]at 6 bar, vertical		2,34	a. A.	5,37	2,43	7,49	a. A.	11,69	a. A.
Stiffness [kN/cm] at 4 bar, vertical		1,67	a. A.	3,14	1,63	5,35	a. A.	8,35	a. A.

a. A. = available on Request



Characteristic curve



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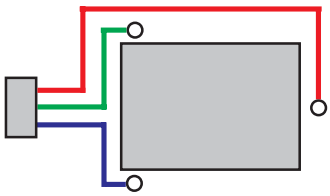
Level Control

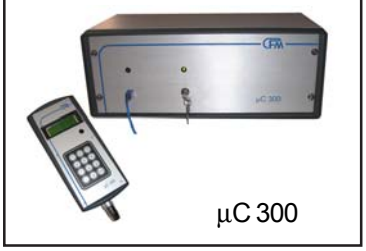
Vibration isolation systems with air springs must be supplemented with a control in order to keep the preset level, even if the load is shifted or changed, to compensate for leakages. A solid system can be realized with a 3-point-bearing. The air springs are divided into three groups, which are controlled by a valve. Each group of air springs has the same air pressure.
We offer two types of level control for membrane air springs:



Control diagram

Electronic Control µC 300

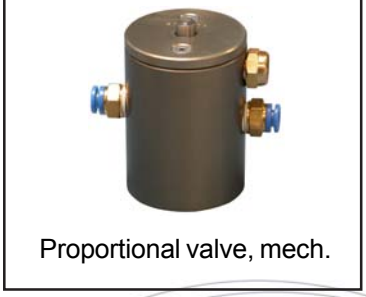
The µC 300 is an electronic position control system with an integrated damping task. A micro-controller prepares the level signals of the contact-free position sensors and gives the input signal to the high dynamic control valves. Via this real-time operation, we can avoid/ reduce step-ups and minimize the time for vibration.
You can handle it by a hand-held control with serial menu navigation.



µC 300

Pneumatic-mechanic Control

The air rate in each air spring is controlled by a mechanic control valve. The niveau-data is transmitted directly to the air spring's piston. If the level is higher than provided the control valve will reduce air from the air spring; if the level is lower than provided, air will be pumped into the air spring.



Proportional valve, mech.

Which control is best for your system, depends on your requirements in terms of the accuracy of automatic reset, the acquisiton and visualisation of system data, convenience and desired control behaviour.

Feel free to contact us!

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