VIBRATION ISOLATION SYSTEMS

Air Springs
Steel Spring Isolators
Level Control Systems
CFM Schiller looks back on more than 30 years’ experience in the areas of vibration isolation systems and vibration foundations. Since the beginnings, our core business has been to create solutions for problems concerning the safety of people, buildings and plants by employing vibration-isolated bearings. The increasing productive efficiency of machines and test rigs, chiefly in the automotive industry, is leading to a constant increase of disturbances emitted into the environment.

This particularly involves analyses on the operational stability of vehicles and their components as well as flexural fatigue tests on steel and aluminium structures. We offer our customers high-tech, reliable products of the highest quality! The CFM products are manufactured on our premises using state-of-the-art manufacturing technology. Long-term partnerships with carefully selected partners ensure a consistently high standard of quality. Our aim is to entertain long-lasting business relationships based on co-operation with satisfied customers. Our employees guarantee our success. Co-operation is marked by mutual support, open communication and a flat hierarchy.
In the engineering segment we offer complete solutions from one all-in supplier. This particularly includes:

- Calculation of elastic bearings using state-of-the-art computing technology and a large amount of experience
- Calculation and detection of vibration amplitudes
- Calculation of oscillation amplitudes under consideration the free mass forces constituting the exciting forces
- Design and construction of seismic masses made of concrete, cast iron, or a combination of both
- Static and dynamic calculation of seismic masses, with a particular attention to stiffness and natural frequency
- Preparing the construction detail, which includes form work and reinforcement plans, as well as bending instructions iron flexibility table for the concrete foundations
- Force Response Analysis
Vibration isolation systems

THE PRINCIPLE OF VIBRATION ISOLATION

The vibration-isolated installation of a vibrating object, which usually emits sinusoidal or pulsed forces, leads to a significant reduction of interfering forces when dimensioned correctly. It is particularly important that the vibration amplitudes generated as a result of this vibration-isolated set-up are kept within tolerable limits. This is why our isolators are fitted with damping systems. Some even allow an adjustment of the damping effect.

Selecting the appropriate vibration isolation

Selecting the appropriate vibration isolation is fundamental in order to obtain the best possible isolation effectiveness. The crucial factor here is the relationship of exciting frequency and natural frequency of the spring element.

\[ \eta = \frac{f_{\text{excitation}}}{f_{\text{natural}}} = \frac{f_{\text{exc}}}{f_o} \]

Effective isolation starts at a relationship of $\eta = \sqrt{2}$. As a rule, the frequency tuning relationship is adjusted to a value between 3 and 4. In the case of particularly high requirements, it is possible to achieve higher values, which, however, will approach the economical limit.

The isolation efficiency is calculated as follows:

\[ J = \left( \frac{f_{\text{exc}}}{f_o} \right)^2 - 2 \]

In vibration technology you regard active and passive vibration isolation:

- Active vibration isolation
- Passive vibration isolation
SEISMIC MASSES

Concrete foundations and mounting plates on air springs or steel spring isolators are ideally suited for vibration-isolated mounting of machinery or test-rigs. On the one hand, the seismic masses serve as the rigid basis for the machine, and on the other hand they serve as inertial mass. The foundation usually consists of a reinforced concrete structure with a crosssectional shape and mass adapted to suit the individual application. This can realize masses with a weight ranging between 20-2000 t. We carry out the complete design services and on request we also perform the construction work. A cast iron clamping plate can be designed individually for many applications and provided with T-slots or hole grids on the surface (clamping surface) to accommodate machinery or test rigs.

Active vibration isolation
In active vibration isolation, the vibrations emitted from machines or test systems are reduced to such extent that the adjacent parts of the building, machines and those people working on them are not harmed or affected in any way.

Passive vibration isolation
In passive vibration isolation, the vibration isolation protects sensitive machines or measuring equipment such as precision tool machinery, measuring machines and scanning electron microscopes and laser measuring equipment from vibrations which impact the building from the outside, e.g. from underground.

Damping action
The damping action is the physical property of the ability to limit vibrations to a permissible level. Damping always causes the conversion of mechanical energy into heat. With viscous dampers this occurs through fluid friction. With air springs this occurs by a change in volume.
**Vibration isolation systems**

**CFM Schiller** offers clients a broad spectrum of vibration isolation elements for their individual applications. We will find the best vibration isolation system for your application. Whether you want to isolate an air condition, an optical table, a manufacturing line or a complete car test rig, we have the best vibration isolation system for you. With our 30 years of experience we gladly assist you by designing your vibration isolation system. We manufacture all of our vibration isolation elements - air springs, steel springs and dampers - of our own. To complement our range of isolation elements we offer different level control systems for all kinds of air springs. Our technician teams assemble vibration isolation systems world-wide.

**AIR SPRING SYSTEMS**

**CFM Air Spring Systems** are being used for elastic bearing in low frequency mode with frequencies of 0.6 Hz to 2.5 Hz. Hence the air spring is applied at the lower edge of all physical solutions. An air spring system for vibration isolation of machines and/or test systems basically consists of the following main components:

**Seismic mass**
Additional inertial mass of the swinging system. In case of not sufficient available mass of the test system itself an additional mass (i.e. concrete with clamping plate) is added in the function of a base plate.

**Air spring**
The air spring de-couples the machine and/or test system from the laboratory environment. The air spring is precisely selected according to load capacity, natural frequency, amplitude limits and further technical conditions. Through the enlarged volume of an air spring it is possible to lower down the natural frequency until 0.6 Hz. Except in the case of the air spring type **GRB 2480-1200 ZV**, the additional volume is not integrated into the air spring itself. Due to the additional volume the air spring system has two switchable natural frequencies (with and without additional volume). The optimized arrangement of the main components guarantees a vibration isolation of highest efficiency.

**Damper**
The damper is the component to ensure that the vibration amplitude is limited within a permissible level. All dampers are integrated within the air springs and do not require additional space. The air spring type **MAS** offer a wide adjustment range by means of an air regulator. The use of air springs with viscous damping enables us to accommodate customer requirements.
STEEL SPRING ISOLATORS

We offer various types of steel springs for the vibration isolation of machines and plants. The choice of isolators depends on the required load range and the test-frequency employed. Steel spring isolators are able to achieve natural frequencies ranging between 2 and 6 Hz. As opposed to air springs, they are not height adjustable.

The steel spring isolators type P51 are housed in a compact plastic casing, a cast iron casing is used for types P60, P71 and P80. They contain helical springs according to DIN 2098. Types SSI, UbPL and UPM are manufactured as an all steel welded construction. Highly-effective viscous dampers are also available for this type in order to dampen high amplitudes.
LEVEL CONTROL UNITS

We employ level controls for the automatic level control of air spring systems to suit different requirements, from the simple mechanical solution **MC 300-S** to the active position control with microprocessor **μC 300**. All of them are 3-point control systems.

**MC 300-S**
The **MC 300** is a mechanical pneumatic level control unit for applications which do not require external monitoring.
- 3-point control system with maintenance and control unit

**LC 300/302**
Electro-pneumatic level control system offering external equipment monitoring.
- Level position of all 3 systems
- Inlet pressures
- Raising and lowering, using key switches on the control unit
- Switching the natural frequency of the air spring suspension on the control unit (**LC 302** only)

**EC 303**
Electronic-pneumatic level control unit with analogue position encoders and electric control valves. It also offers external equipment monitoring.

**μc 300**
Electronic-pneumatic active position control system with micro-processor and controller. This position control system is used to avoid resonance step-ups and minimize the time for vibration. At the same time this significantly reduces the oscillation damping time.
Using the **μC300** can significantly reduce seismic masses.
MEASURING METHOD

We measure vibrations which occur on buildings or machines using state-of-the-art measuring equipment. The acceleration that occurs is measured with highly sensitive sensors. The results of these measurements form the dimensioning of the required vibration isolation components. This process is carried out according to DIN 4150, which defines this type of measurement and evaluation in buildings. Measuring vibration acceleration / vibration speed is indispensable, particularly when designing the vibration isolation of high-precision and highly sensitive plants and equipment.

We offer high quality produced on our premises!

Examples of air spring systems

Air spring for an industrial diesel generator of a power plant

GRB air springs underneath a foundation

Membrane air springs (MAS) beneath a mounting plate

GRB air springs underneath a foundation
Vibration isolation and damping of structure-borne noise:

- All types of test rigs
- Measuring instruments
- Tool machinery
- Cutting mills
- Presses/Compacters
- Die cutters
- Hammers
- Transformers
- Heavy equipment in general
- BHKW modules
- Diesel generators
- Compressors
- Superchargers
- Refrigerating machines
- Ventilating systems

- Air conditioning systems
- Boiler plants
- Buildings
- Inspection/Measuring rooms
- Measuring stations and control rooms
- Studios
- Spring floors
- Sports halls
- Test rigs for entire cars and HGVs
- Shaft/Axis test rigs cars and HGVs
- Multi-axial shaking tables
- Earthquake simulators
- Railway bogie test rigs
- Component test rigs

Example of steel spring isolators
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