TM 182 TRAINER FOR DEMONSTRATION OF VIBRATIONS ON MACHINE FOUNDATIONS

Vibration insulation as an important task in machine dynamics

Machines often generate disturbing vibrations, caused by free inertia force or impacts inside the machine. With a rigid connection between the machine and its installation location, the vibrations are transmitted to the surroundings with no damping and can result in disturbances (noise emissions) or damage.

A vibration insulating machine installation can prevent vibrations. In this case, the machine foundation is not bolted rigidly to the installation location but connected using elastic spring elements.

The flexibility of these spring elements prevents the full magnitude of the excitation forces from acting on the location and causing vibrations.

Systems consisting of a mass (machine) and spring elements are vibratory. If a natural frequency of this spring/mass system randomly coincides with the excitation frequency of the machine, a resonance vibration with far greater amplitudes occurs. The vibration insulation becomes vibration amplification. Therefore, the spring/mass system must be carefully designed in terms of the issue of changing speeds.

However, the vibration insulation can also be used to keep vibrations in the surroundings away from the machine. This is used for high precision measuring systems or as protection against earthquakes.

Vibration insulation with helical springs
Source: www.gerb.com

VIBRATION INSULATION PRINCIPLE

In vibration insulation, we use the property that vibrations (e.g. structure-borne sound) are not completely transmitted from one component to a second component if a spring element is fitted between these components.

The effect of the vibration insulation depends on the natural frequency of the elastically supported component. The natural frequency is determined by the mass of the elastically supported component and the spring constant of the spring element.

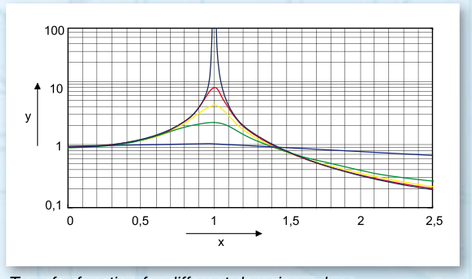
Undamped vibration systems can reverberate for a relatively long time. Damping extracts energy from the vibration system and the vibrations subside more quickly. Disadvantage: The dampers transmit vibrations to the surroundings. This reduces the insulation effect.

Vibration insulation with elastomer spring elements
Source: www.ruheschutz.ch, www.gerb.com

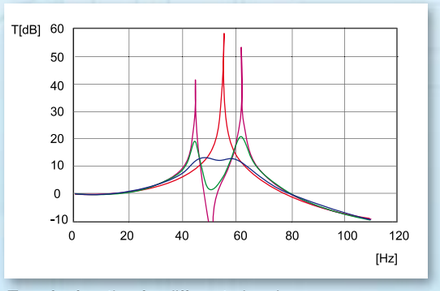
Our trainer demonstrates clearly and practically the occurrence and prevention of vibrations.

As a machine model, we use a vibration generator or, alternatively, a piston compressor.

A foundation represents the surroundings of the machine and is elastically connected to both the machine model and to a frame. This enables the vibration occurring on the foundation to be measured without impairing laboratory operation by vibrations.



Transfer function for different damping values



Transfer function for different absorbers

The insulating effect on the foundation can be tuned using springs. The scope of delivery includes compression springs with different characteristic values for this purpose.

To further reduce the vibrations generated, vibration absorbers and additional dampers can be used and their effect investigated.

Analysis software for TM 182
Frequency analysis of vibrations

A PC is used to control the vibration generator and record the vibrations.

LabVIEW based software is used to analyse and clearly represent these vibrations.

Alternatively, a piston compressor can be used as the machine model instead of the vibration generator. The compressor is available as an accessory.

Piston compressor TM 182.01