

TM 182

Vibrations on machine foundations



Description

■ vibrations generated via imbalance

An indispensable part of machine design is the reduction of vibrations. For example, an elastic, vibration-isolating setup of the machine avoids disruptive vibrations being transferred to the surroundings.

The TM 182 unit can be used to study the issue of machine foundations and isolation from vibrations using a practical example. To do this, vibrations are deliberately produced on an elastically mounted machine. The transfer of these vibrations to the foundation is measured. It is then possible to test different adjustments using different springs and to study absorbing effects using vibration absorbers.

The experimental setup consists of a machine, a foundation and a frame. A vibration generator serves as the machine, consisting of two independently driven imbalance sets. The imbalance sets are driven by servomotors so that any excitation forces and force directions can be generated. Alternatively, a piston compressor (TM 182.01) can be used to generate vibrations.

The machine is mounted on a foundation by means of springs and dampers. The surroundings are represented by the foundation, on which the effectiveness of the vibration isolation is measured.

The foundation is connected to the actual frame of the trainer via additional coil springs. This dual vibration isolation, together with the large weight of the foundation itself, guarantees a vibration-free operation in the laboratory even under unfavourable experimental conditions. A switch cabinet is attached to the frame, housing the control system, power supply and data acquisition.

Acceleration sensors are used to measure deflection, velocity and acceleration of the vibrations at different points. Using these measured values, it is possible to calculate and display the operational vibration modes.

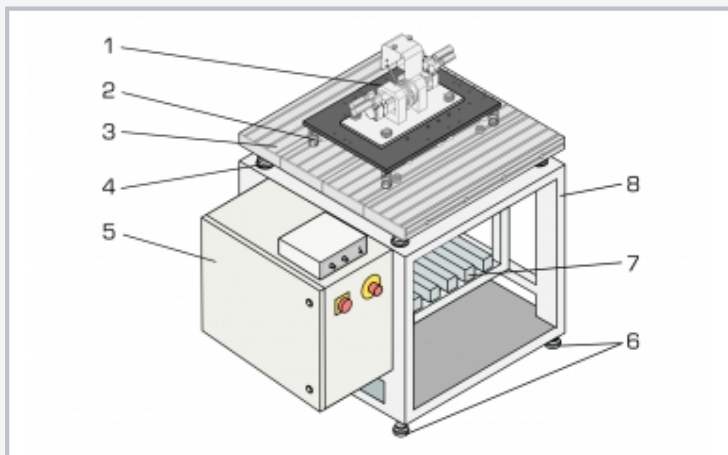
A comprehensive software program is provided to control the operating conditions and to capture and analyse the data. The unit is connected to the PC via USB.

Learning objectives/experiments

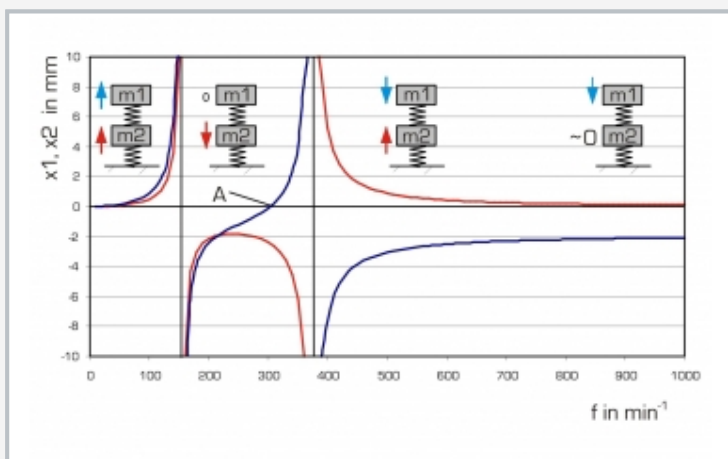
- familiarisation with vibration phenomena on machine foundations
- adjust the foundation for different excitation forces
- investigate vibration absorbers
- investigate the effect of additional damping
- compare metal springs and rubber springs
- measure and analyse vibrations
- determine operational vibration modes

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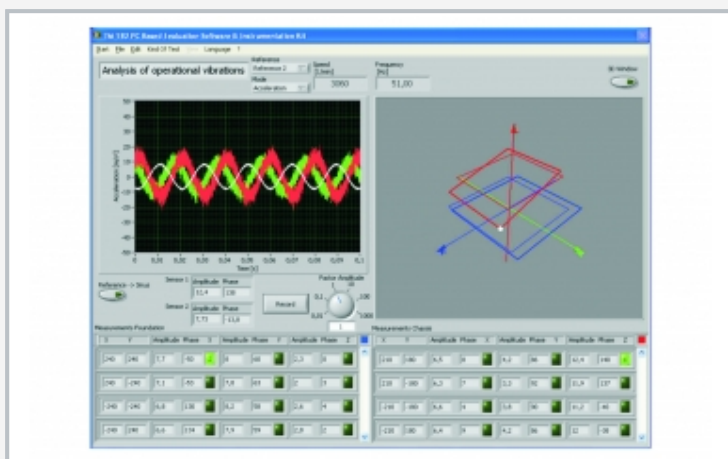
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1 vibration generator as machine, 2 coil spring, 3 foundation, 4 coil spring, 5 switch cabinet, 6 elastic support, 7 extra masses for the foundation, 8 frame



Amplitude-frequency response at unbalance excitation and effect of vibration absorbers m: mass, blue amplitude x1: mass 1, red amplitude x2: mass 2, A: absorption point



Software screenshot: measurement and representation of operational vibration mode

Specification

- [1] display and study vibrations on machine foundations
- [2] vibration generator excites vibrations by imbalance
- [3] vibration-free laboratory operation thanks to additional vibration isolation of the foundation
- [4] 2 brushless high-performance servomotors to drive the vibration generator
- [5] eccentricity, rotational frequency, direction of rotation, adjustable phase position and frequency ratio
- [6] variable arrangement of vibration absorbers
- [7] vibration measurement via acceleration sensors
- [8] inductive displacement sensor records the eccentricity of the imbalance masses
- [9] GUNT software with control functions and data acquisition via USB under Windows 7, 8.1, 10
- [10] TM 182.01 piston compressor can be used as alternative "real" vibration generator

Technical data

Drive motors

- max. speed: 6000min⁻¹
- max. torque: approx. 3,40Nm

"Machine" mounted on a plate

- mass: max. 26kg (incl. extra weights 4x 2kg)
- max. imbalance: 2x 500cmg
- max. imbalance force: 2x 500N (up to 3000min⁻¹)

Foundation

- mass: max. 73kg (incl. extra weights 5x 9,4kg)
- min. natural frequency: 2,66Hz

Compression springs

- spring stiffness C: 2,44N/mm...139,53N/mm
- transverse stiffness Cq: 0,30N/mm...90,0N/mm

Measuring ranges

- acceleration: 490m/s²

230V, 50Hz, 1 phase

230V, 60Hz, 1 phase; 230V, 60Hz, 3 phases

UL/CSA optional

LxWxH: 1140x800x1170mm

Weight: approx. 311kg

Required for operation

PC with Windows

Scope of delivery

- 1 trainer
- 1 vibration generator
- 1 GUNT software CD + USB cable
- 1 set of instructional material

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Optional accessories

040.18201 TM 182.01 Piston compressor for TM 182