

PT 502

Field balancing



Description

- measurement of imbalance vibrations
- single and two-plane balancing

In rotating machines such as turbines or pumps, vibrations due to imbalance lead to comfort problems or even damage related to overloading. The imbalance of a rotating machine part may cause harmful vibrations in the entire machine. A familiar example is unbalanced tyres on a car. These cause annoying and unpleasant vibrations in the steering. This is why almost all rotating parts are balanced. If this balancing is done not on a particular machine but directly on the machine in operation located on-site, it is known as field balancing. Field balancing is done in four steps. In the first step, the vibrations are used to measure the initial imbalance. In the second step, additional known test imbalances are applied and the system is measured again. In the third step, the balancing is calculated from these two measurements and is applied. The fourth step is a control run to check whether the balancing has been successful.

The core of the PT 502 unit comprises two flywheels that are driven by an electric motor. Defined imbalances can be attached to the flywheels. At the foot of the motor are two acceleration sensors that measure the imbalance vibrations. The speed is measured by an optical sensor. The motor is mounted on the base plate with vibration-damping rubber elements. The unit is driven at variable speed by a frequency converter.

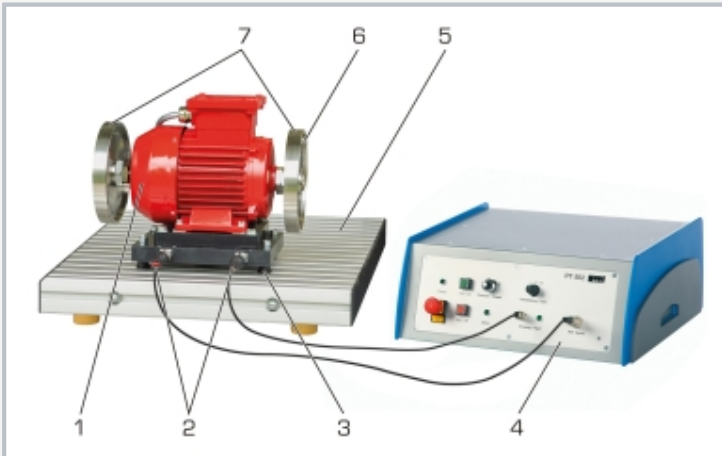
The measured values are transmitted directly to a PC via USB, where they can be analysed using the vibration analysis software that comes included. This analysis software has the following features: dual-channel oscilloscope for investigations in the time range, dual-channel spectrum analyser for investigations in the frequency range, vibration amplifier and balancing module for single and two-plane balancing.

Learning objectives/experiments

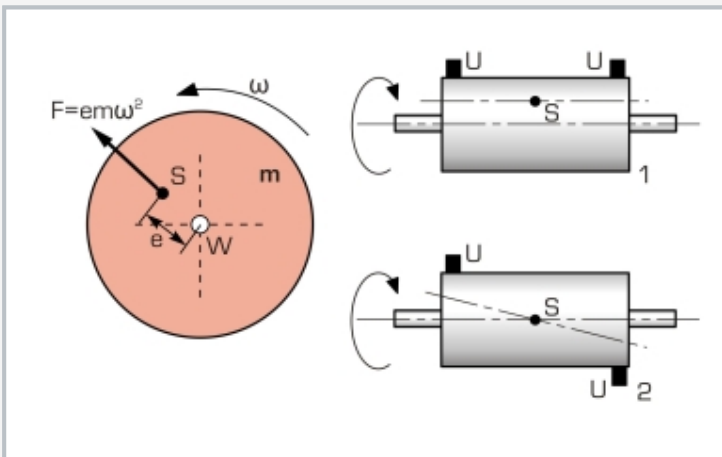
- measure and assess machine vibrations
- occurrence of imbalance vibrations
- static, dynamic or general imbalance
- dependence of imbalance vibration on position and magnitude of the imbalance
- basic principles of balancing
- field balancing in one plane
- field balancing in two planes
- assessment of balancing quality
- using a computerised vibration analyser

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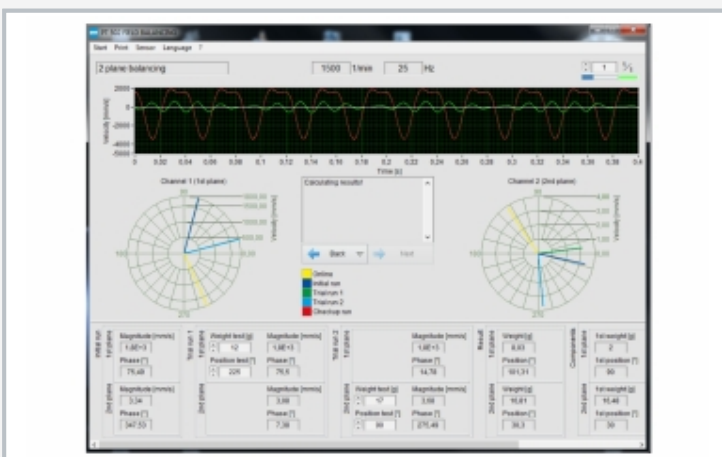
Field balancing



1 motor, 2 acceleration sensor, 3 elastic bearing, 4 control unit, 5 base plate, 6 balance mass, 7 flywheel



Left: imbalance force F due to eccentricity e of the centre of gravity S ; 1 static imbalance with eccentric centre of gravity, 2 dynamic imbalance with inclined inertial axis; m mass, W axis of rotation, ω angular velocity



Two-plane balancing using the GUNT software for vibration analysis

Specification

- [1] field balancing in one or two planes
- [2] 2 flywheels with mounting holes for imbalance or balance masses and angular division
- [3] imbalance or balance masses in different sizes
- [4] drive motor with variable speed via a frequency converter
- [5] elastic bearing of the drive motor
- [6] vibration isolation of the base plate using rubber feet
- [7] control unit with integrated measuring amplifier
- [8] instrumentation: optical speed sensor, 2 acceleration sensors for vibration measurement
- [9] software functions: dual-channel oscilloscope, dual-channel FFT analyser, ramp-up curve, order analysis and balancing
- [10] GUNT software for data acquisition via USB under Windows 10

Technical data

Flywheels

- 2x mass: 1,675kg
- radius for balance masses: 60mm
- angular division: 15°

Drive motor

- speed: 300...3000min⁻¹
- power: 370W

Imbalance or balance masses

- 2...10g
- max. total imbalance: 2x 42cmg

Acceleration sensors

- frequency range: 1...10000Hz
- sensitivity: 100mV/g
- resonant frequency: 32kHz

Optical speed sensor

- scan range: 3...150mm
- laser class II: 675nm

230V, 50Hz, 1 phase

230V, 60Hz, 1 phase; 120V, 60Hz, 1 phase

UL/CSA optional

LxWxH: 510x450x380mm (experimental unit)

LxWxH: 370x360x160mm (control unit)

Weight: approx. 39kg (total)

Required for operation

PC with Windows

Scope of delivery

- 1 experimental unit
- 1 control unit
- 1 set of accessories
- 1 GUNT software + USB cable
- 1 set of instructional material

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Optional accessories

WP 300.09 Laboratory trolley