

PT 501

Roller bearing faults



Description

- **assessment of bearing condition by vibration analysis**
- **comparison of bearings with different faults**

Vibration analysis is a key tool in estimating the condition of a roller bearing. The slow change in the vibration spectrum provides indications of the remaining life of a bearing and can be used as a criterion for its replacement. The spectral distribution can deliver accurate information on the type and location of the damage.

PT 501 contains six interchangeable roller bearings on which different faults can be detected and explained. The radial load on the bearing is set within broad limits using the loading device.

An electric motor with variable speed via frequency converter is used as drive. An acceleration sensor with measuring amplifier serves to measure the vibrations at the bearing housing. The speed is measured with an optical sensor.

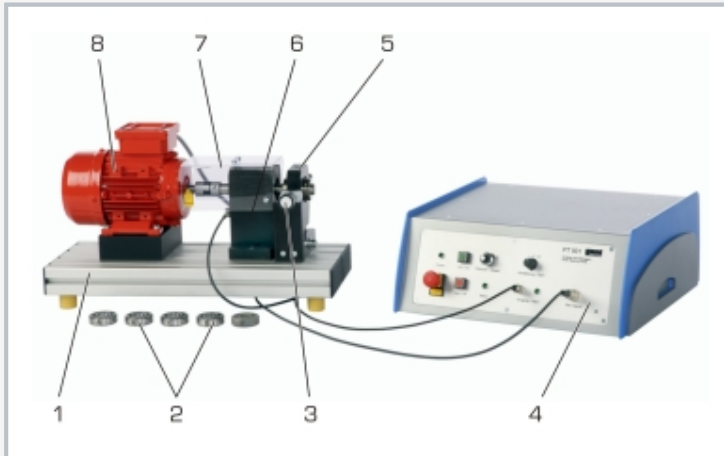
The measured values are transmitted directly to a PC via USB. The software for vibration analysis is included. The analysis software offers the following features: two-channel oscilloscope for investigations in the time range; two-channel spectrum analyser for investigations in the frequency range; vibration measuring unit; envelope analysis for bump effects and roller bearing damage.

Learning objectives/experiments

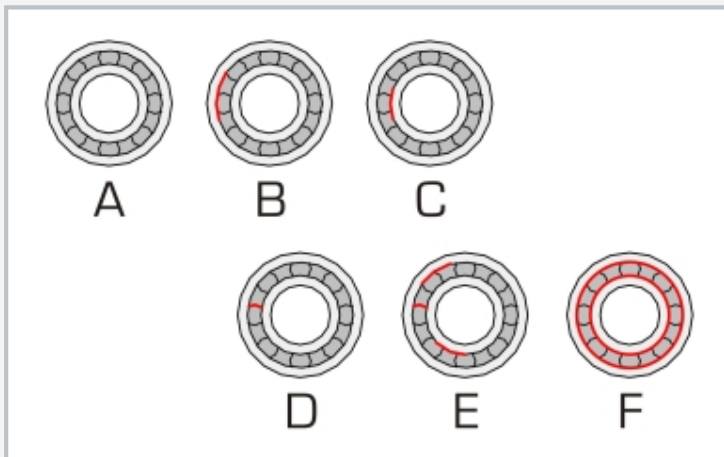
- vibrational spectrum of the running noise of roller bearings
- familiarisation with the envelope analysis
- influence of damage to outer race, inner race or roller body, on the spectrum
- estimating service lives of roller bearings
- influence of the lubricant on the vibration spectrum
- detection of faulty roller bearings
- use of a computerised vibration analyser

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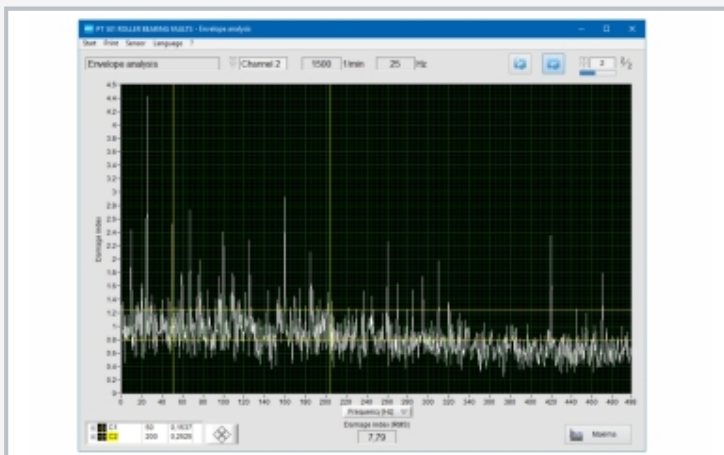
Roller bearing faults



1 foundation plate, 2 roller bearing, 3 loading device, 4 control unit, 5 mounting for roller bearing to be studied, 6 bearing of the shaft, 7 transparent cover, 8 motor



A) undamaged bearing, B) bearing with damage to outer race, C) bearing with damage to inner race, D) bearing with damage to a roller body, E) bearing with damage to roller body, outer and inner race, F) heavily worn bearing



Envelope analysis of the heavily worn bearing (F) at $f=1500\text{min}^{-1}$

Specification

- [1] investigation of the vibrations of roller bearings
- [2] roller bearing with damage to outer race
- [3] roller bearing with damage to inner race
- [4] roller bearing with damage to a roller body
- [5] roller bearings with combined damage
- [6] long-running roller bearings
- [7] new and undamaged roller bearing
- [8] drive motor with variable speed via frequency converter
- [9] radial loading of bearings via adjustable loading device
- [10] vibration isolation of the foundation plate using rubber elements
- [11] instruments: optical speed sensor, acceleration sensor to record vibration
- [12] software features: 2-channel oscilloscope; 2-channel FFT analyser; envelope analysis; run-up curve and order analysis
- [13] GUNT software for data acquisition via USB under Windows 10

Technical data

Pendulum ball bearing of type NU204-E-TVP2

- inside diameter: $\varnothing=20\text{mm}$
- outside diameter: $\varnothing=47\text{mm}$
- width: 14mm
- number of rollers: 12

Drive motor

- speed: $100\text{...}3000\text{min}^{-1}$
- power: 370W

Acceleration sensor

- frequency range: $1\text{...}10000\text{Hz}$
- sensitivity: 100mV/g
- resonance frequency: 32kHz

Optical speed sensor

- sampling width: $3\text{...}150\text{mm}$
- laser class II, 675nm

230V, 50Hz, 1 phase

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

LxWxH: 510x200x330mm (experimental unit)

LxWxH: 420x400x180mm (control unit)

Weight: approx. 25kg (total)

Required for operation

PC with Windows

Scope of delivery

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