



TM1001

WHIRLING OF SHAFTS AND CRITICAL SPEED

Bench-mounted apparatus that demonstrates 'whirling' in different horizontal shafts with a variety of fixings (end conditions), loaded and unloaded.



KEY FEATURES

- Self-contained bench mounting unit for experiments that predict and show 'whirling' in different length and diameter shafts with different end conditions
- Very visual apparatus - ideal for demonstrations to groups of students
- Demonstrates first and second mode whirl speeds and how to predict them
- Extra bearings and weights (included) give a choice of free-free, fixed-free and fixed-fixed end conditions and experiments with loaded shafts and eccentric loading
- Includes all tools needed for easy experiment setup
- Supplied with different shafts to study how length and diameter affects whirling
- Fully guarded and interlocked for safety
- Optional stroboscope to 'freeze' the image of the shaft to see its shape clearly

WHIRLING OF SHAFTS AND CRITICAL SPEED

DESCRIPTION

TecEquipment's Whirling of Shafts apparatus (TM1001) shows how shafts vibrate transversely and 'whirl' at a certain rotation frequency.

This helps engineers understand possible problems with long shafts and allow for them in their designs.

The equipment is in two parts and fits on a bench or desktop.

The main part is a solid alloy frame that holds a variable speed motor which turns the horizontal test shaft. Two bearings hold the shaft, one bearing at the 'driven end' and the other bearing at the 'tail end' of the shaft. The tail end bearing slides in its housing to allow the shaft length to change as it 'whirls'. Similar to a beam on two simple knife-edge supports, both bearings allow free angular shaft movement (free ends condition). Also supplied with the equipment are extra bearings that restrict angular movement when fitted, to give 'fixed ends'.

Two movable nylon bushes help to prevent the shaft whirling amplitude from reaching excessive levels. A movable cord plate allows students to control the shaft in some experiments, to help reach the second mode whirl speed. A sensor at the driven end measures the shaft speed and sends its signal to the control and instrumentation unit display. A removable safety guard with magnetic interlock surrounds the shaft and only allows the motor to work when fitted.

The separate control and instrumentation unit contains the drive for the variable speed motor and a display to show the shaft speed. It also includes a trigger output for the optional stroboscope.

When used in a darkened classroom, the optional stroboscope gives an impressive demonstration of how the shaft shape changes as it reaches its whirling speeds.

Supplied with the apparatus is a set of test shafts of different length and diameter to show how these properties affect whirling and its 'critical speed'. Also supplied is a set of weights to show how concentrated loads affect whirling. One weight has an extra hole to make it an eccentric load. This helps to show the phase difference between the load and the deflection (you need the optional stroboscope to see this clearly).

STANDARD FEATURES

- Supplied with comprehensive user guide
- Five-year warranty
- Manufactured in accordance with the latest European Union directives
- ISO9001 certified manufacturer

RECOMMENDED ANCILLARY

- Stroboscope (ST1)

LEARNING OUTCOMES

- Basic whirling demonstration
- The effect of shaft length and diameter
- The effect of end conditions (fixings)
- Loaded shaft (one and two masses)
- Eccentric loading

ESSENTIAL SERVICES

ELECTRICAL SUPPLY:

220 VAC to 240 VAC phase to neutral or phase to phase
50 Hz to 60 Hz at 1 A

NOTE: Please state your electrical supply type on order.

BENCH OR DESKTOP SPACE NEEDED:

1500 mm x 800 mm

NOTE: This equipment can create large vibrations, so you must use it on a strong, good-quality laboratory bench.

OPERATING CONDITIONS

OPERATING ENVIRONMENT:

Laboratory or classroom

STORAGE TEMPERATURE RANGE:

-25°C to +55°C (when packed for transport)

OPERATING TEMPERATURE RANGE:

+5°C to +40°C

OPERATING RELATIVE HUMIDITY RANGE:

80% at temperatures < 31°C decreasing linearly to 50% at 40°C

SPECIFICATIONS

TecEquipment is committed to a programme of continuous improvement; hence we reserve the right to alter the design and product specification without prior notice.

NETT DIMENSIONS AND WEIGHT:

Main unit: 1460 mm long x 270 mm high x 400 mm front to back and 35 kg

Control and instrumentation unit: 400 mm wide x 180 mm high x 360 mm front to back and 8 kg

PACKED VOLUME AND WEIGHT:

Approximately 0.35 m³ and 50 kg

MILD STEEL SHAFTS:

1 x 3 mm diameter x 750 mm

1 x 3 mm diameter x 900 mm

1 x 6 mm diameter x 900 mm

1 x 7 mm diameter x 900 mm (for use with the weights)

WEIGHTS:

2 x 300 g

1 x 400 g

1 x 300 g with hole (eccentric weight)