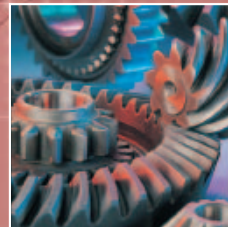


Theory of Machines



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An awareness of the way machines operate is fundamental to nearly all engineering courses. Students need to understand the principles of gears, cams, vibration and so on to give them a solid foundation of knowledge about mechanical system behaviour. This knowledge will serve them throughout their academic and future engineering careers.

TQ offers an outstanding selection of quality products to teach the principles and theory of machines. The strong designs clearly demonstrate a comprehensive range of basic and advanced principles used throughout engineering.

For maximum teaching efficiency, you'll find the equipment is equally effective whether it's used for classroom demonstrations, by students on their own or in groups. This versatility is a great benefit when teaching different academic levels. It's easy to show basic principles to groups of students, while, for more advanced investigations, the straightforward controls, instrumentation and built-in safety allow students to progress through experiments with the minimum of supervision.

With all products in this range, the designs focus on student learning and understanding. Operation is kept simple and all equipment needs only minimal installation and maintenance. This keeps running costs low and makes efficient use of staff and student time.

All TQ equipment is built to exceptionally high safety standards. Even though some of this range includes fast moving parts, our designers have developed ingenious ways to make the equipment completely safe to use without compromising its educational value. This all adds to the world-class status of TQ designs.

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- TQ is an ISO 9001 certified company and an Investor in People
- **Integrated Learning Solutions**



Universal Vibration Apparatus

For a complete range of vibration experiments. The equipment quickly and easily assembles on a mobile frame, which includes a storage cupboard and worktop. Ideal for group work, projects or classroom demonstrations. The equipment is available as a comprehensive system (Universal Vibration Apparatus TM16) including all modules (TM16a to TM16p), or alternatively TQ can supply the basic frame (TM16a) and modules individually.

Vibration experiments include:

Pendulum Experiments

For simple and compound pendulums, centre of percussion and bifilar suspension experiments.

Mass-Spring

Three varying open helical springs, loaded by various masses, which vibrate vertically. Measurements include periodic time and deflection.

Free and Forced Vibrations

A beam pivots at one end, a spring supports it at the other. A pen at the free end traces vibrations so students can measure amplitude and frequency. The Exciter Motor and Speed Control unit (TM16f) allows forced vibration investigations. Students can also vary the degree of damping.

Lateral Vibrations

A beam pivots at one end, a bracket supports it at the other. This gives free lateral movement of the beam. For use with the Exciter Motor and Speed Control unit (TM16f) for lateral vibration experiments.

Undamped Vibration Absorber

A central block carrying two spring steel cantilevers with steel masses. Students adjust the masses along the cantilevers during vibration to tune the system, transmitting all vibrations to the absorber.

Free Torsional Vibrations

For experiments on undamped torsional vibration of shafts. A heavy steel flywheel provides adjustable vibrating inertia.

Damped Torsional Vibrations

For experiments on damped torsional vibration of various shafts using a heavy steel flywheel. Lets students record a permanent amplitude against time chart of vibration.

Geared Systems

Robust, bench-mounting apparatus which allows students to safely perform a comprehensive range of experiments on geared systems. Students can practically investigate a variety of simple and compound gear trains. They can fully analyse each system, including the dynamic mechanical efficiency and comparison of theoretical and experimentally determined mass moments of inertia.

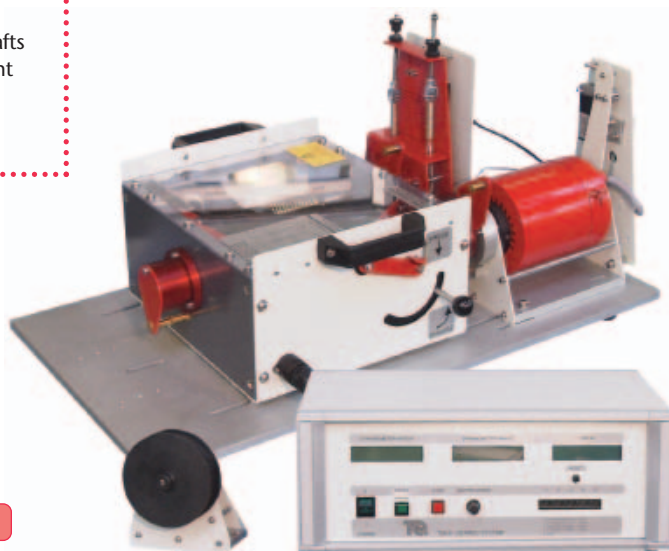


TM16a frame with TM16d mounted

Universal Vibration Apparatus
(includes frame and all modules)

TM16

Basic Frame	TM16a
Pendulum Experiments	TM16b
Mass Spring System	TM16c
Free and Forced Vibrations	TM16d
Lateral Vibrations	TM16e
Exciter Motor and Speed Control	TM16f
Undamped Vibration Absorber	TM16g
Free Torsional Oscillation	TM16h/i
Damped Torsional Oscillation	TM16k



Geared Systems

TM18



Gyroscope Apparatus

An educational gyroscope to demonstrate the relationship between gyroscopic torque, rotor speed and the rate of precession. Students can find out experimentally the moment of inertia of the gyroscope rotor and motor armature. Fully guarded and interlocked for safety.

Gyroscope Apparatus

TM104

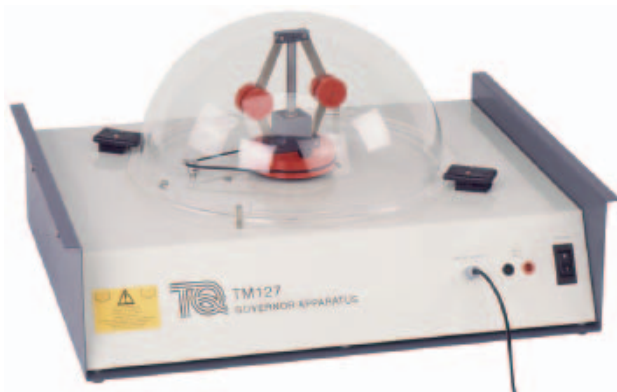


Centrifugal Force Apparatus

Displays the relationship between centrifugal force, mass of a rotating body, distance from the axis and its angular velocity. Fully guarded and interlocked for safety.

Centrifugal Force Apparatus

TM105

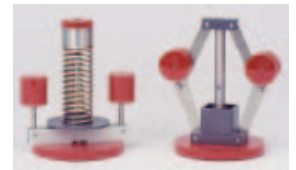


Governors Apparatus

Three interchangeable governors (Hartnell, Porter and Proell) which show the effects of speed, mass and geometry on governor behaviour. Fully guarded and interlocked for safety.

Governors Apparatus

TM127

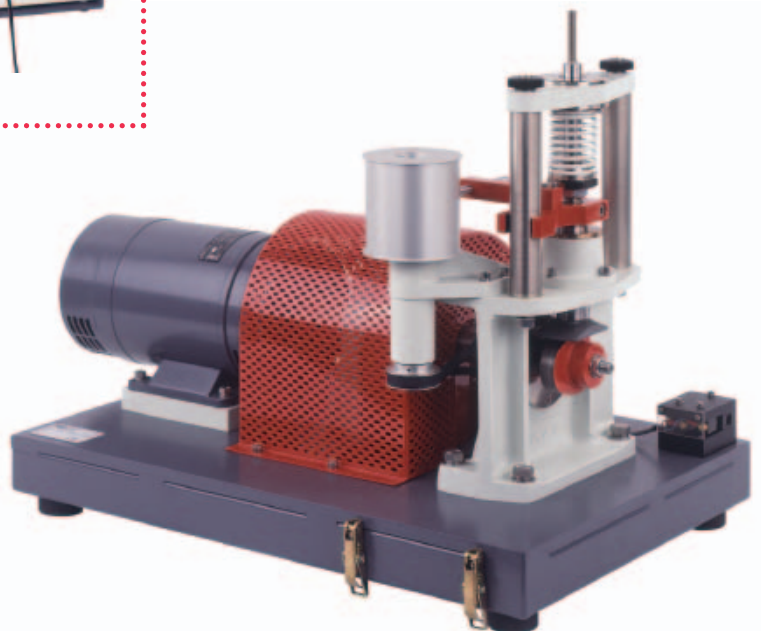


Cam Analysis Machine

For practical study of the dynamic behaviour of various cams and followers. Students can predict lift by analysing pen recorder traces and derive velocities and accelerations for the follower. Clearly shows 'follower bounce', and is fully guarded and interlocked for safety.

Cam Analysis Machine

TM21





Whirling of Shafts

Consists of a shaft which takes up the natural whirling phenomenon predicted by simple elastic theory. Students can investigate various modes of whirl for loaded and unloaded shafts of varying dimensions and with fixed or free ends. Guarded and interlocked for safety.

Whirling of Shafts

TM1



Journal Bearing Demonstration

Visually effective apparatus allowing students to examine journal bearing performance in various test conditions. Shows oil film thickness, provides an amplified pressure profile and demonstrates critical bearing whirl.

Journal Bearing Demonstration

TM25

Balancing of Reciprocating Masses

A model engine on a spring showing primary or secondary forces and couples. An oscilloscope (available separately) allows students to look at waveforms and perform Fourier analysis. Students can also vary weights on one or more of the pistons and crank handle.



Balancing of Reciprocating Masses

TM22



Static and Dynamic Balancing

For balancing a rotating mass system and verifying methods of calculation, including independent analysis of static and dynamic balancing. Guarded and interlocked for safety.

Static and Dynamic Balancing

TM102

Power Supply

Supplies a 12 volt d.c. 10 ampere output from a mains input. For use with the Static and Dynamic Balancing apparatus (TM102). Also for use with equipment from TQ's Electrical Engineering Principles range.

Power Supply

E66



Electronic Tachometer

For rotational speed measurement on the Whirling of Shafts (TM1), Gyroscope (TM104), Centrifugal Force (TM105) and Governors Apparatus (TM127). Powered from a low voltage supply or a mains supply.

Electronic Tachometer

E64

Speed Control Unit

For use with the Gyroscope (TM104), Centrifugal Force (TM105) and Governors Apparatus (TM127) to control the speed of their d.c. motors.

Speed Control Unit

E67



Stroboscope

Accurate stroboscope for use with TQ's Whirling of Shafts (TM1), Universal Vibration Apparatus (TM16), Balancing of Reciprocating Masses (TM22) and Journal Bearing Demonstration (TM25). Also for general laboratory use. Displays flash rate in flashes per minute, Hertz, or milliseconds.

Stroboscope

ST1

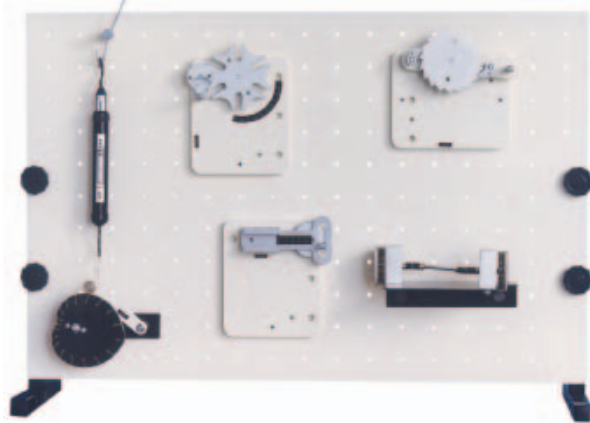
Universal Mechanisms Kit

High-quality, robust apparatus for clear, practical and cost-effective teaching of a full range of fundamental mechanical principles. Applies to many introductory to intermediate engineering courses, including design and technology, engineering and mechanical science, and manufacturing. The Universal Mechanisms Kit consists of the whole range of experiments possible with this equipment and includes comprehensive instructions for a wide selection of experiments. The experiments are also available individually, or as packages (such as the Junior Mechanisms Kit or Statics Kit), for specific topic areas.

Universal Mechanisms Kit

RE300U

See also mechanisms products in the TASK range.



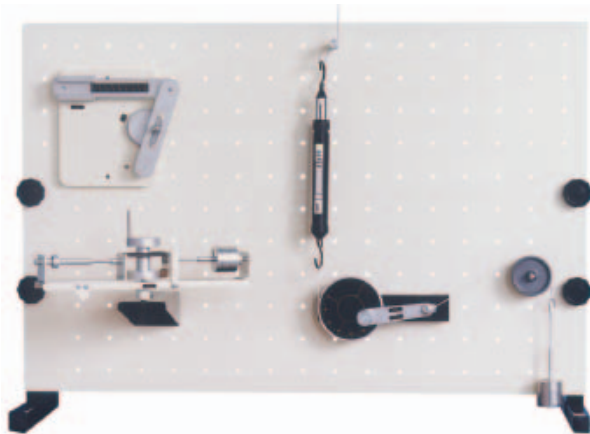
Geneva, ratchet and other mechanisms

Junior Mechanisms Kit

High-quality, robust apparatus for clear, practical and cost-effective teaching of fundamental mechanical principles. For use with many introductory engineering courses, such as design and technology, engineering and mechanical science. Includes comprehensive experiment instructions.

Junior Mechanisms Kit

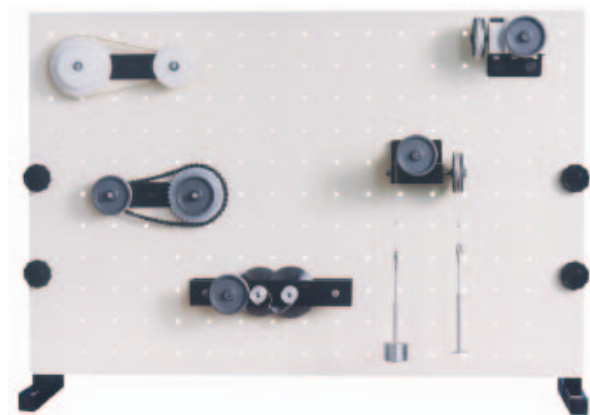
RE300J



Centrifugal force, crank/slider



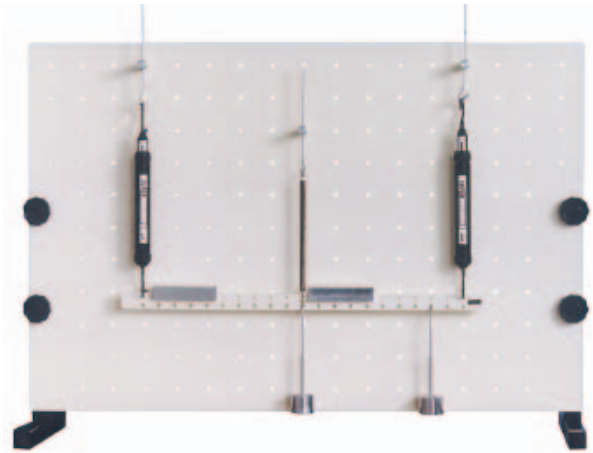
Pulleys and chain block



Belts, chains and gears



Friction on inclined plane



Beam forces



Triangle of forces

Mounting Board and Brackets

Supports experiments in the Universal Mechanisms Kit (RE300U) and the Junior Mechanisms Kit (RE300J).

Mounting Panel

For mounting the experiments from TQ's RE300 range.

Friction on an Inclined Plane Kit

For a variety of experiments to introduce students to the concept and principles of friction.

Belts and Gears

Allow investigations of the working principles of both belt and gear drives.

Screw Jack

An apparatus to allow investigation of the working principles of a simple screw jack lifting device.

Wedge

For practical illustration of the working principles of a wedge.

Cam and Roller

Simple hand-operated apparatus to demonstrate the action of cams and followers.

Geneva Motion

Demonstrates how the Geneva mechanism converts uniform circular motion into intermittent indexed motion with accurately locked location of the driven member.

Ratchet Mechanism

Allows students to investigate the principles, operation and applications of a ratchet mechanism.

Scotch Yoke

Demonstrates the conversion of circular to straight line reciprocating motion in a Scotch yoke mechanism.

Universal Coupling

Demonstrates power transmission through shafts at an angle.

Quick Return Mechanism

Clearly illustrates a quick return mechanism.

Crank Motion/Toggle

Link mechanism to clearly illustrate crank motion and toggle action.

Mechanisms Package

High-quality, robust apparatus for clear, practical and cost-effective teaching of the working principles of the screw jack, wedge, cam and roller, Geneva mechanism, ratchet, Scotch yoke, universal coupling, toggle, quick return mechanism and centrifugal force.

Potential and Kinetic Energy Kit

Introduces the concepts of potential and kinetic energy using a spring balance, simple pendulum, the interchange of potential and kinetic energy, the flywheel and a simple crank.

Pulleys and Lifting Devices

Shows the working principles of simple pulleys, pulley blocks, differential wheel and axle, and the Weston differential chain block.

Statics Kit

For introducing students to fundamental mechanical science principles, including centres of gravity, triangle of forces, parallelogram of forces, polygon of forces, principle of moments, beam balance, levers and beam reaction forces.

Mounting Board and Brackets	RE300/BOARD
Mounting Panel	RE300/I
Friction on an Inclined Plane Kit	RE300/FRICT
Belts and Gears Kit	RE300/GEAR
Screw Jack	RE300/M1
Wedge	RE300/M2
Cam and Roller	RE300/M3
Geneva Motion	RE300/M4
Ratchet Mechanism	RE300/M5
Scotch Yoke	RE300/M6
Universal Coupling	RE300/M7
Quick Return Mechanism	RE300/M9
Crank Motion/Toggle	RE300/M8
Mechanisms Package	RE300/MECH
Potential and Kinetic Energy Kit	RE300/PKE
Pulleys and Lifting Devices	RE300/PULLEY
Statics Kit	RE300/STATIC