

RE300 Series

Mechanical Science Experiments

A comprehensive range of 37 experiments for students to study basic mechanical science and common mechanisms



- Choice of up to 37 different experiments, available in one large product or several separate smaller products that cover the main subject areas of mechanical science
- Cost-effective - you can buy individual smaller products and gradually build up to the complete range
- Fully illustrated User Guides (supplied with each product) include recommended experiments and theory
- Robust, simple to use experiments and mechanisms that allow students to do clear, practical 'hands-on' experiments to learn and understand basic mechanical principles
- The experiments fit onto a mounting board for easy use

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- An ISO 9001 certified company

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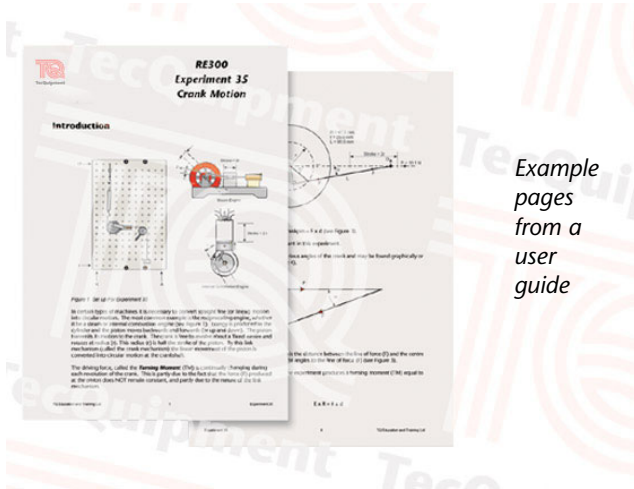
Description - General

The RE300 Mechanical Science Experiments is a comprehensive range of experiments that show some of the most important basic mechanical engineering principles.

There are 37 main experiments (some experiments also have additional procedures). The experiments cover a wide range of topics in mechanical science, from simple equilibrium to centrifugal force. They also contain models of many common mechanisms.

For flexibility, the the RE300 series is structured into products that cover all 37 experiments **or** one or more selected experiments to teach more specific topics.

A fully illustrated User Guide comes with each product. The User Guide includes worksheets with useful information, scientific theory and the suggested experiments. These allow the students to progress with minimal supervision.



Example pages from a user guide

All experiments fit to a precision-engineered Mounting Board with legs that allows students to set up each experiment quickly and efficiently.

The RE300/Board is a single Mounting Board with legs. The RE300/I is the same as the RE300/Board, but includes additional components (weights and hooks), essential for use with some products.

Supplied as standard with the largest product (RE300U) and second largest product (RE300J) is a Mounting Board (RE300/I).

Standard Features

- Supplied with comprehensive user guides
- Two-year warranty
- Made in accordance with the latest European Union directives

Recommended and Essential Ancillaries

- Mounting Board (RE300/Board)

TecEquipment recommends that you buy at least one extra Mounting Board for the Universal Mechanisms (RE300U) and the Junior Mechanisms (RE300J). This will help students do several experiments at the same time.

- Mounting Board and Components (RE300/I)

Essential for selected products, and TecEquipment recommends that you buy at least one extra Mounting Board and Components for the Universal Mechanisms (RE300U) and the Junior Mechanisms (RE300J).

Refer to the selection matrix for details.

To Choose the Right Product

To make your choice, decide which experiments you need, then refer to the selection matrix to choose the product that does your experiments. Also note which Mounting Board is essential or recommended.

If you are unsure about your product selection then contact TecEquipment or your local agent.

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Description – Experiments

1. Centres of Gravity

Includes a set of different shaped plates. Students hang them on the mounting board and find their centre of gravity.

2. Triangle of Forces

Uses strings, weights and pulleys to show that a triangle of forces can represent three non-parallel forces in equilibrium. Shows that you can find two forces of the three if you know the third force and its direction or line of action.

3. Parallelogram of Forces

Uses strings, weights and pulleys to show that when three non-parallel forces in the same plane are in equilibrium, their lines of action meet at a point. This shows that you can use the Parallelogram of Forces to find the resultant of two forces.

4. Polygon of Forces

Uses strings, weights and pulleys to show that when four or more forces are in equilibrium at a point, they can be represented by a Polygon of Forces, from which unknown forces can be found.

5. Principle of Moments

Uses a pivot bar, strings, weights and pulleys to verify the Principle of Moments for parallel and non-parallel forces.

6. Beam Balance

Uses a pivot bar, strings, weights and pulleys to show that the action of weighing with a beam balance or slide balance is based upon the principle of moments.

7. Levers

Uses a pivot bar, strings, weights and pulleys to show the Mechanical Advantage of various types of levers.

8. Beam Reaction Principle

Uses a beam assembly, weights and spring balances to show that:

- a distributed load is like an equivalent concentrated load acting on a beam at the centre of gravity of the distributed load;
- you can apply the Principle of Moments to find the reactions at the supports of a simply supported beam.

9. Simple Pulleys

Uses pulleys, weights and a spring balance to find whether the direction of a cord as it passes over a pulley affects the tension in the cord.

Also finds the mechanical advantage of a simple combination of 'fixed' and 'movable' pulleys.

10. Pulley Blocks

Uses pulleys and weights to investigate the mechanical characteristics of a set of pulley blocks. The set has 3 sheaves in the upper block and two sheaves in the lower block.

11. The Differential Wheel and Axle

Uses weights and a differential wheel and axle to show:

- the Law of the Machine for a simple wheel and axle;
- the variation of mechanical advantage and efficiency with load;
- the Law of the Machine for a Differential Wheel and Axle;
- that the mechanical advantage and efficiency increases with load, up to a limiting maximum.

12. The Weston Differential Chain Block

Uses a Weston Differential Chain Block and weights to show how to find velocity ratio and that:

- Load is directly proportional to effort.
- Mechanical advantage (MA) increases with load up to a limiting value.
- The Efficiency (E) is such that 'overhauling' will not occur.

13. Belt Drive

Uses weights, spring balances and a belt drive with two pulleys. It shows the direction of rotation of open and crossed belt drives, and that the speed of rotation of the two pulleys is inversely proportional to their diameters.

14. Chain Drive

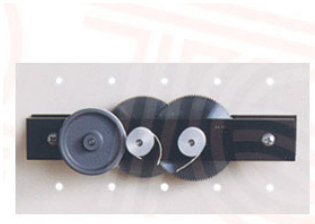
Uses weights and a chain drive to calculate the speed (velocity) ratio of a chain drive and the efficiency of drive transmission.



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15. Simple Gear Chain



Uses weights and a geared winch unit to compare the velocity ratios of a single-stage and double-stage geared winch. It also measures mechanical advantages and efficiencies under varying loads.

16. Bevel Gears

Uses weights and a bevel gear unit to show the efficiency velocity-ratio and mechanical advantage of the Bevel Gear Unit under different loads. It also shows the effects of setting the gear teeth correctly and incorrectly.

17. Worm Gears

Uses weights and a worm-and-wheel unit to show the speed ratio of a simple worm and wheel. It also measures its efficiency under various loads

18. The Screw Jack

Uses weights and a screw jack to measure the effort needed to raise various loads using a simple form of screw jack. It also shows how the Mechanical Advantage and Efficiency varies with load and tests whether the screw jack 'overhauls'.

19. The Spring Balance

Uses tension springs to show that the extension of a coiled spring is proportional to the load applied. It also shows the principle of a spring balance.

20. The Simple Pendulum

Uses weights and a 'plumbob' (a small heavy mass) to show that the time of a simple pendulum depends only on the length of the pendulum. It also shows the value of the force of gravity (g).

21. Potential and Kinetic Energy

Uses a flywheel and weights to investigate Potential energy and Kinetic energy. It shows that energy exists, that it may be transformed and that it may be 'stored' and 'given back'.

22. The Flywheel

Uses weights and a flywheel to find the energy stored in a flywheel by supplying a known quantity of energy. It also shows that the kinetic energy is proportional to the square of the speed of rotation.

23. Sliding Friction

Uses an adjustable plane assembly, a friction block and weights to verify the laws of friction and to measure the Coefficient of Friction for different materials.

24. Inclined Plane

Uses an adjustable plane assembly, a roller and weights to investigate the forces acting on an inclined plane due to a weighted roller supported on the plane.

25. Angle of Friction

Uses an adjustable plane assembly, a friction block and weights to measure the Angle of Friction and from it find the Coefficient of Friction. It also shows that the Coefficient of Friction is equal to Tangent of the Angle of Friction.

26. Friction

Uses an adjustable plane assembly, a friction plate, weights and a wheeled block to show the extent to which the friction is reduced by using wheels and rollers. It also compares the effects of different bearing surfaces.

27. The Principle of the Wedge

Uses weights, a pulley and wedges to find the Mechanical Advantage and Efficiency from the use of two different wedges. Also shows that overhauling may be prevented if the angle of inclination of a wedge is small.

28. Bearings

Uses an assembly with different bearings to compare the resistance to turning due to friction of different materials. It also shows improvements in bearing development.

29. Cam and Roller

Uses a cam and roller assembly with different size cams and a spring balance. It shows the relationship between the angular movement of the cam and its follower. It also shows a constant rise cam with a small and large displacement. It measures the turning force needed for a cam and shows the dangers of 'overhauling' in cams with have a large displacement.

30. The Geneva Mechanism

Includes a Geneva Motion assembly and shows how the circular motion of the drive unit becomes an intermittent motion of the star wheel. It shows how the star wheel accelerates and decelerates and how it locks while the crank pin moves through its free orbit.



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31. The Ratchet Mechanism

Includes a two-pawl ratchet assembly to show the working parts of a ratchet and how it works to allow movement in one direction.

32. The Scotch Yoke

Includes a 'Scotch Yoke' mechanism to show how it works and converts circular motion into reciprocating motion

33. The Universal Coupling

Includes a Universal Coupling and shows how it works to connect two rotating parts together, when the parts are not aligned. It also shows why two couplings on a rod or shaft are better than one single coupling.

34. Centrifugal Force

Uses a centrifugal force machine to show the force produce by a rotating mass. It also shows that the force relates to the weight of the mass, its velocity and the distance from the mass to the centre of rotation.

35. Crank Motion

Uses a crank assembly, a pulley, weights and a spring balance to create a turning moment diagram and find the characteristics of a crank mechanism.

36. The Toggle

Uses a crank assembly, a pulley and weights to show how a toggle mechanism turns circular movement into straight line movement.

37. The Quick Return Mechanism

Includes a Quick Return Mechanism and shows how it converts circular movement into a reciprocating (straight line) movement, but with a quick return.



See the next page for the selection matrix

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Selection Matrix

Expt. No.	Experiment Title	Product																
		RE300U	RE300J	RE300/FRICT	RE300/GEAR	RE300/M1	RE300/M2	RE300/M3	RE300/M4	RE300/M5	RE300/M6	RE300/M7	RE300/M8	RE300/M9	RE300/MECH	RE300/PKE	RE300/PULLEY	RE300/STATIC
1	Centres of Gravity																	
2	Triangle of Forces																	
3	Parallelogram of Forces																	
4	Polygon of Forces																	
5	Principle of Moments																	
6	Beam Balance																	
7	Levers																	
8	Beam Reaction Forces																	
9	Simple Pulleys																	
10	Pulley Blocks																	
11	The Differential Wheel and Axle																	
12	The Weston Differential Chain Block																	
13	Belt Drive																	
14	Chain Drive																	
15	Simple Gear Chain																	
16	Bevel Gears																	
17	Worm Gears																	
18	The Screw Jack																	
19	The Spring Balance																	
20	The Simple Pendulum																	
21	Potential and Kinetic Energy																	
22	The Flywheel																	
23	Sliding Friction																	
24	Inclined Plane																	
25	Angle of Friction																	
26	Friction																	
27	The Principle of the Wedge																	
28	Bearings																	
29	Cam and Roller																	
30	The Geneva Mechanism																	
31	The Ratchet Mechanism																	
32	The Scotch Yoke																	
33	The Universal Coupling																	
34	Centrifugal Force																	
35	Crank Motion																	
36	The Toggle																	
37	The Quick Return Mechanism																	
Essential (E) or Recommended (R) Mounting Boards																		
RE300/BOARD Mounting Board		R	R							E	E	E	E		E			
RE300/I Mounting Board and Components		R	R	E	E	E	E	E						E		E	E	E

Note: The RE300 U and RE300J come with an RE300/I as standard

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Description – Products

- **Universal Experiments and Mechanisms (RE300U)**

Includes all the mechanisms and a mounting board with all components needed to do all the experiments.

- **Junior Experiments (RE300J)**

Includes experiments and a mounting board with all components needed to allow students to do over 15 experiments, to learn about moments, beams, levers, friction and other basic engineering subjects.

- **Friction on an Inclined Plane (RE300/Frict)**

Includes mechanisms that show friction in different engineering applications. You also need the Mounting Board and Components (RE300/I) to complete all the experiments for this product.

- **Belts and Gears (RE300/Gear)**

Includes mechanisms and parts that show how gears, belts and chains work. You also need the Mounting Board and Components (RE300/I) to complete all the experiments for this product.

- **Screw Jack (RE300/M1)**

Includes one mechanism that shows how the screw jack (lifting mechanism) works and the mechanical advantage it gives. You also need the Mounting Board and Components (RE300/I) to complete all the experiments for this product.

- **Wedge (RE300/M2)**

Includes parts that shows how a wedge gives mechanical advantage. You also need the Mounting Board and Components (RE300/I) to complete all the experiments for this product.

- **Cam and Roller (RE300/M3)**

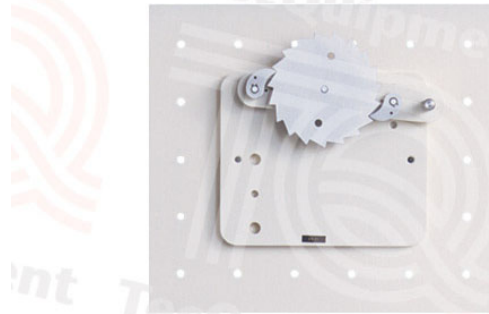
Includes one mechanism that shows how the rotation of a cam displaces a roller. You also need the Mounting Board and Components (RE300/I) to complete all the experiments for this product.

- **Geneva Motion (RE300/M4)**

Includes one mechanism that shows 'Geneva Motion'. You also need the Mounting Board (RE300/Board) to mount this product onto.

- **Ratchet Mechanism (RE300/M5)**

Includes one mechanism that shows how a two-pawl ratchet works. You also need the Mounting Board (RE300/Board) to mount this product onto.



- **Scotch Yoke (RE300/M6)**

Includes a 'Scotch Yoke' mechanism that converts circular motion into reciprocating motion. You also need the Mounting Board (RE300/Board) to mount this product onto.

- **Universal Coupling (RE300/M7)**

Includes one mechanism that shows how a Universal Coupling works. You also need the Mounting Board (RE300/Board) to mount this product onto.

- **Crank Motion/Toggle (RE300/M8)**

Includes one mechanism and parts. It shows how a crank turns straight line movement into circular movement, and how a toggle mechanism turns circular movement into straight line movement. You also need the Mounting Board and Components (RE300/I) to complete all the experiments for this product.

- **Quick Return Mechanism (RE300/M9)**

Includes one mechanism that shows how to convert circular movement into a reciprocating (straight line) movement, but with a quick return. You also need the Mounting Board (RE300/Board) to mount this product onto.

- **Mechanisms Package (RE300/MECH)**

Includes eight common engineering mechanisms and other parts. These include, the Scotch Yoke, the Geneva Mechanism and the Ratchet Mechanism. You also need the Mounting Board and Components (RE300/I) to complete all the experiments for this product.

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• Potential and Kinetic Energy (RE300/PKE)

Includes mechanisms and other parts that introduce students to potential and kinetic energy. You also need the Mounting Board and Components (RE300/I) to complete all the experiments for this product.

• Pulleys and Lifting Devices (RE300/Pulley)

Includes parts that show students how pulleys and chain blocks give mechanical advantage. You also need the Mounting Board and Components (RE300/I) to complete all the experiments for this product.

• Statics Experiments (RE300/Static)

Includes parts that introduce students to forces in static structures. These include forces in levers, beams and other simple structures. You also need the Mounting Board and Components (RE300/I) to complete all the experiments for this product.

Operating Conditions

Operating environment:
Laboratory environment

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

Bench space needed for each mounting board:
900 mm x 500 mm

Packed dimensions and weight (mounting boards):
RE300/Board: 0.07 m³ and 15 kg
RE300/I: 0.07 m³ and 20 kg

Packed dimensions and weights (Products):
RE300U - 0.5 m³ and 150 kg
RE300J - 0.05 m³ and 18 kg
RE300/Frict and RE300/Gear - 0.005 m³ and 5 kg
RE300/M1 - 0.003 m³ and 5 kg
RE300/M2, M3, M4, M5, M7, M8 and M9
- 0.004 m³ and 3 kg
RE300/M6 - 0.003 m³ and 3 kg
RE300/MECH - 0.2 m³ and 30 kg
RE300/PKE - 0.07 m³ and 15 kg
RE300/Pulley - 0.07 m³ and 15 kg
RE300/Static - 0.07 m³ and 15 kg