



Advanced yet simple

We are a Taiwan-based company specialized in developing and manufacturing Physics equipment for Educational purposes. We aim to foster the passion for Physics through experiments and demonstrations and help teachers to convey complicated concepts effectively in an engaging way.

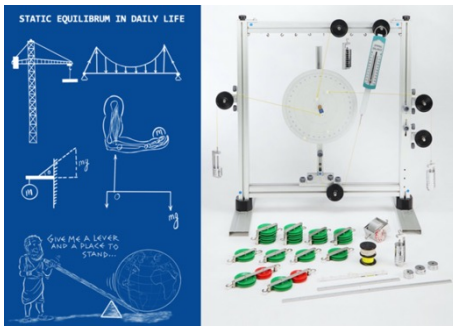
As the beginning of 2021, we launched 28 comprehensive sets divided into 6 major categories. In addition to our signature equipment, we also distribute reliable supplies and instruments for Science for all levels covering the primary school to the research institute.

Besides from the Research center, High school and University, we provided Colombia, Chile, Brazil, Vietnam, Singapore, Thailand, Mongolia and other countries with our products.

Some highlights:

1. Local training for Physics Olympiad in Taiwan
2. Taiba University, Paraguay as an aid from the Ministry of Foreign Affair to establish Physics Laboratory
3. Advanced Physics teaching equipment for the Ocean Research Center, University of Macau
4. Mongolian 200 high schools with comprehensive sets of equipment
5. Physics Laboratory of KMITL University in Thailand
6. Physics equipment for Asian Physics Olympiad
7. Moreover, we donated a batch of Physics equipment and measuring instruments to Mongolia





F26 Static Equilibrium and Its Application

By performing the experiments available in the set, students will learn to apply the equation of equilibrium on a rigid body with torque and force conditions. They will directly verify the results estimated beforehand by measuring the forces afterward. The flexibility is the plus of this set as both the amount and the angle (360°) of the applying forces can be adjusted easily.

To acquire a better understanding of its real-life application, the Mechanical advantage (MA) of the pulley system with plenty of different configurations can be estimated beforehand and, experimentally verified afterward.

F26 Young's Modulus and Stress-Strain Curve

[Force sensor + Datalogger]



A mechanical property that measures the tensile stiffness of the solid material, namely Young's modulus, of the various metal beams are measured precisely.

Moreover, the non-linear relationship of the stress-strain can be seen by using a wire, instead of a bulk beam which is only used for the precise measurement of Young's modulus. Ultimately, this characteristic curve is obtained in order to show the elastic region followed by the permanent deformation region of the metal wire.



F12 Torsion Pendulum and Compound Pendulum

[Light gate + Datalogger] or [Photogate timer]

In the angular version of the linear harmonic oscillator, a mechanical property that measures the elastic stiffness of the solid material can be measured indirectly by using the Moment of inertia and the Period of simple harmonic motion. The wires of three different metals and of three different radii are provided to systematically study the shear modulus.

Moreover, the gravitational acceleration is estimated by altering the position of the center of mass and applying the Parallel axis theorem.



F27 Newton's Laws of Motion and Friction

[Light gate x 2 + Datalogger] or [Photogate timer x 2]



One of the fundamental laws in Dynamics, Newton's Second law, is verified with and without frictional force and even in an inclined configuration. Years of modification resulted in practically negligible friction for the dynamic carts, and it makes the set perfect for only focusing the concepts to be understood instead of baffling with the high experimental errors. Furthermore, the weight of the objects and applying forces can be adjusted easily for different settings.

By using a wooden cart provided in the set, both dynamic and maximum static friction coefficients can be measured. Moreover, in the collision experiments, the Conservation of Momentum can be examined while Kinetic energy distinguishes the inelastic collision from the elastic-type.



F07 Projectile Motion and Ballistic Pendulum

[Light gate + Datalogger] or [Photogate timer]



A special case of the two-dimensional motion, the projectile motion, is a great tool for students to learn to split a complicated motion into simple components and analyze the momentum and speeds with trigonometric functions. As it requires a larger area and to be done on the floor, this set has the biggest area required, thus one of the most energetic and engaging experiments.

For projectile, the launching angle can be adjusted horizontally or non-horizontally. Whereas, for the ballistic pendulum, the angle it reaches can be recorded with high precision (0.2°).

A result estimated from the horizontal displacement can be verified and compared with that of a digital timer's reading.

F08 Mathematical Pendulum, Freefall, and Harmonic Motion

[Light gate $\times 2$ + Datalogger] or [Photogate timer $\times 2$]

One of the lowest experimental error guaranteeing set, it introduces three important topics for motion along a straight line and oscillations. It measures the gravitational acceleration by pendulums with different sized bobs to show that the period only depends on its wire length. Also, different balls are used to show that the gravitation is the sole influence of the free-falling motion. Furthermore, Hooke's law can be verified by obtaining dynamic and kinetic spring constants of different springs. In addition, the Light gate and datalogger enable us to capture and observe the decreasing amplitude of the damping oscillation clearly.



F11 Centripetal Force and Rotational Inertia

[Light gate + Datalogger] or [Photogate timer]

As a uniform circular motion, the relationships between the centripetal force and period of circular motion as well as the tangential speed can be examined systematically. Furthermore, Steiner's theorem is used to determine the Moment of inertia of different bodies, and the result is compared with experimentally measured data.

In addition to the precise experiments, a simple yet practical demonstration can be done with the objects included in order to engage students even more with the topic.



F31 Surface Tension, Viscosity and Capillarity, and Buoyancy

As a result of cohesion attraction between liquid molecules, the surface tension is measured experimentally by a "Ring method". In the case of an incompressible fluid, Poiseuille's law can be used to describe a laminar flow, and whilst applying this law, students will grasp a solid understanding after estimating and comparing the viscosity and the Reynold numbers of the ice-cold, room temperature, and hot waters.

An example of the intermolecular force, one of the most visually appealing liquid-experiment occurs when the water gives a rise between two plates due to capillarity. As the method works with every kind of liquid, the comparison can be made easily. Moreover, the classic method for measuring the density of liquid and solids helps students to utilize the basic yet essential estimation skills.



F14 Bernoulli's Theorem and Venturi Tube



The concept of the Equation of Continuity for incompressible fluid can be explained with this set of equipment and students will learn to put Bernoulli's theorem into applications such as the Venturi tube and Pitot tube for measuring the flow rate and the local velocity, respectively. Add a few drops of food color to the water helps to track the water flow and makes it more fascinating.

Moreover, all the results measured in the tubes and estimated based on the fundamental laws of fluid mechanics can be compared with the reading of a rotameter attached in the end.

F15 Mechanical Waves and Resonance

[Sine wave generator]



The concepts of both a transverse and longitudinal waves are covered in this set. Firstly, two identical sinusoidal waves traveling in opposite directions results in Harmonics or Standing wave patterns, and it can be visualized on the stretched string and characterized whilst altering the frequency and the string tension, systematically. As the nodal points can be seen as standing still and this enables the wave characterization that helps students to comprehend the properties of a wave.

Moreover, the artistic and fascinating resonance patterns can be obtained on a metal plate, which is a standing wave in two-dimensional media, to help to extend the understanding of electromagnetic wave propagation which cannot be directly observed with the naked eye. Furthermore, according to Bohr's Atomic model, the electron is thought of as though its mass and charge are spread out into a standing wave surrounding the atomic nucleus and it well explains the electron as a wave and how it orbits stably around the nucleus.

F04 Resonance tube

The concept of a longitudinal wave is covered in this set. The sound wave, which is invisible, thus hard to imagine properly, is visualized by Styrofoam beads. As can be seen visually, it's a good way to contrast it from the standing wave traveling on the string which is a transverse wave. It clearly shows the features of a standing wave thus allows students to examine the wave property accordingly. The frequency can be adjusted within a range of 0 to 1500 Hz and the speed of sound is estimated precisely by measuring the antinodes while altering this frequency in closed and open tubes.



F05 Ripple Tank

It is a special water tank used to demonstrate and analyze all the basic properties and advanced phenomena of circular and plane waves. With the help of a strobe, the propagating waves appear stationary, moreover, the plate on top enables students to draw and measure the resulting patterns directly for further analysis and the design is also suitable for cellphones to capture the phenomenon clearly. Together with three types of vivid LED lights that project underneath, the resulting waves are absolutely entertaining to grab students' attention throughout the class.

In addition to the precisely controlled frequency controller with 0.1 Hz steps, also the 0°, 90°, 180° phase differences between two waves can be obtained to manifest dipole source, antenna principle, and explain the Frequency beats.



F09 Ideal Gas Law

[Temperature sensor + Pressure sensor + Datalogger]



One of the main subjects in thermodynamics, the physics of gas explains the characteristic of the gas in: volume, pressure and temperature-wise. In this set, all these variables can be adjusted, and their correlations can be verified experimentally to allow students penetrate into the fundamental laws.

Furthermore, the most well-known conversion of thermal energy into mechanical energy, the Carnot cycle can be performed, and each process is displayed on the digital devices in real-time. Moreover, a bit advanced experiment explained by the harmonic oscillation, measurement of the ratio of specific heat is a great practice for students to learn post-experiment data processing.

F016 Linear Thermal Expansion, Specific Heat, and Equivalent of Heat

[Temperature sensor + Pressure sensor + Datalogger]

In this set of equipment, the law of energy conversion can be explained practically. For every experiment, the heating power can be adjusted accordingly while the temperatures of the objects are measured with $0.1\text{ }^{\circ}\text{C}$ precision. The two-dimensional case of the thermal expansion is studied with various metals, whilst the thermal insulator and windshield minimize the experimental errors, and the length increase is recorded with 0.01 mm precision. As both experiments have a relatively big number of data obtained, it is a great way to learn to apply the "Least square method". Moreover, a calorimeter system is used to measure the specific heat of different metals to compare their thermal property..



F25 Thermoelectric Effect

By using this apparatus, one of the most crucial energy conversation examples, temperature difference to electrical voltage and vice versa, is studied to identify the Second law of thermodynamics.

The working principles of the heat engine and heat pumps are explained while showing the Actual efficiency is always lower than that of Carnot, yet both increases as the temperature difference increases.

The energy losses due to the heat dissipation and internal resistance of the apparatus are taken into account to obtain results closer to the reality.



F17 Electricity Field Mapping

After Michael Faraday envisioned the lines at first, the electric field lines helped us visualize the direction and magnitude of electric fields. In addition to teaching about the vectors, this set enables students to map the electric field on conductive plates with printed electrodes and learn the rules to draw it in different settings. Therefore, it helps to visualize the hard-to-imagine concepts by drawing the electric field lines of any given setting. Then students will explain the resulting patterns including where they originate and terminate and what are their spacing represent.

F32 Permittivity of Free Space

It is a great way to teach students how theoretical and fundamental constants are measured, specifically, by using significantly different concepts, namely gravitation and electricity. With this set of equipment, the capability of an electric field to permeate a vacuum is measured by gradually increasing the applied electric force on the aluminum piece until the moment it just balances the force of gravity.

The voltage is applied merely whilst pressing the button and this guarantees safety during the experiment.



F06 Fundamental Electricity and Electronics

By using the parts provided in the set, several types of electrical circuits can be constructed easily by putting the magnetically detachable connectors in where the electrical parts are securely contained.

The basic of the electricity, Ohm's law can be verified by varying the input voltage and altering the resistance of a circuit with a single resistor as well as with multiple resistors which are connected in series or parallel, for a bit advanced level. For more complicated construction, Kirchhoff's law can be applied to analyze the circuit, or on contrary, in the case of the unknown resistor, a Wheatstone bridge is brought in.

Moreover, an emf device, a battery, as well as the I-V characteristic of semiconductor, diode, and transistors, are studied accordingly.

F19 RC and RLC Circuit

[Voltage sensor+ Current sensor + Datalogger + Sine wave generator]

By using the parts provided in the set, several types of electrical circuits can be constructed easily by putting the magnetically detachable connectors in where the electrical parts are securely contained. Firstly, the charging and discharging processes of resistor and capacitor (RC) circuit can be studied. Secondly, the resonant frequency of one of the basic electronic components, a circuit dedicated to produce or accept a particular frequency, made of inductor and capacitor (LC) is studied. Finally, the concept of impedance is introduced while analyzing the resonant frequency and bandwidth of a circuit comprising of a resistor, inductor, and capacitor (RLC).



F18 Magnetism and Electromagnetism

[Magnetic field sensor + Voltage sensor+ Current sensor
+ Datalogger + DC/AC power supply]



In this comprehensive set, electromagnetism, which is a combination of electric and magnetic phenomena, is studied in multiple demonstrations and experiments with relevant calculations. Some of the experiments do seem simple and have relatively easy procedures, nevertheless, their measurements and calculations give solid results that help students to grasp the precise compulsory understanding.

Students can apply Faraday's law and use Lenz's law to predict the direction of produced emf and verify the predicted results afterward. Moreover, the essentials such as a motor, a generator, and transformers, are studied systematically, while the sensor readings are displayed on the digital devices in real-time to explain the mechanism effectively.

Furthermore, this set has several showy demonstrations to bring excitement into the classroom such as wireless transmission, levitating ring, and devices with switching lights.

F20 Microwave Optics

One of the most beneficial yet dangerous applications of the electromagnetic wave, X-Ray diffraction is represented and described by a harmless microwave. Moreover, the refracting property of solid material, a salt specifically, can be examined by simply put into the foam mold provided in the set. In addition to these, the rest of the basic phenomenon of electromagnetic wave, namely, standing wave, reflection, polarization can be studied systematically. In addition, more advanced experiments based on interference, such as two types of interferometers and Lloyd's mirror, can be performed. The smart design and bulky parts are suitable for students and help them to digest the principles that are invisible and take place in a microscopic scale.





F28 Focal Length and Refractive Index

Together with a convenient design suitable for customizing the settings, this set is a user-friendly platform for students to construct the optical instruments by themselves based on the basic law governing the lights. These essentials, such as Snell's law of refraction and working principles of the lens and mirrors, can be individually studied and performed while verifying their experiment results with the estimation made beforehand. Moreover, the items required for performing the classic experiments of determining refractive index are also included.

F29 Basic Wave Optics



In this set considering the wave nature of light, which may be often predicted by Huygens' principle, students must abandon the simplicity of optics in which we describe light as a ray. The wavelength of laser sources can be measured with different types of slits which result in various diffraction and interference patterns which are results of the superposition of waves. The parameters such as slit width and distance are varied and studied systematically, and moreover, those spectacular resulting patterns are examined not only visually but with a photodetector moves with 0.01 mm precision.



F33 Advanced Interference

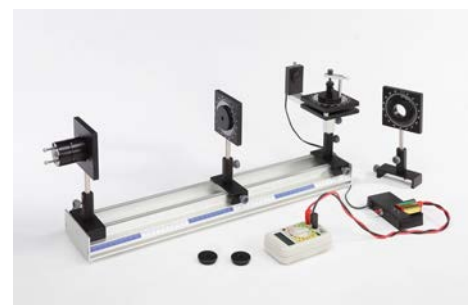
To deepen the understanding further, the interference is studied with most sophisticated and practical experiments such as Newton's ring to measure the radius of curvature (ROC) of the planoconvex lens, Lloyd's mirror to measure the wavelength, and Michelson interferometer for measurement of the refractive index of a glass slide.

In these experiments, those appealing interference patterns are converted into data with photodetector, which moves with 0.01 mm precision, for further analysis. Besides, the optical parts are not fixed, thus students will learn to assemble accordingly for each experiment.



F30 Advanced Polarization

The principle of polarization identified by Malus' law is studied to deepen the understanding further. The comparison of radial graphs of light polarization without retarder and with half plates is a great tool for students to identify the concept. Moreover, the polarization angle or Brewster's angle, at when an unpolarized light is the incident and therefore the reflected light is perfectly polarized, can be measured. All the experiment results are converted into data by a photodetector together with a circular protractor with 0.1° precision.



F22 Determination of Planck's Constant by a Laser Diode



The smallest amount of energy a light wave can have is its frequency times the Planck's constant. In this set of equipment, this constant is determined experimentally, and it gives a solid introduction to the subatomic world, quantum physics.

Foremost, the wavelength of the semiconductor laser is measured by a single slit diffraction experiment based on the principle of Huygens. Secondly, the working principle of a light-emitting diode, the laser specifically, is thoroughly explained and the threshold voltage is measured. Ultimately, the previous two experiments are used to determine the Planck's constant. To differ from a push-button experiment, students will learn how to use a vernier caliper to measure the resulting pattern as well as to do estimations based on relatively advanced equations.

F23 Basic Spectrum

In order to provide the fundamental understanding, three main types of spectrum, namely continuous, absorption and emission, are covered and studied in this set of equipment. A diffraction grating with a particular spacing is used to produce a specific spectrum of different lights within our visible range meaning that it can be observed directly with eyes and thus measured accordingly. Ultimately, to put all these basics into an application, the elements that make up the sun can be observed with a portable spectroscope provided in the set.



F34 Advanced Spectrum

[Infrared sensor + Datalogger + DC/AC power supply]



Broadening the spectrum from a visible range all the way to the several thousands of *nm* which belongs to infrared range, enables the study of thermal radiation of blackbody, which helped establish the foundation of quantum physics.

Foremost, the temperature of the filament is measured indirectly together with applying Ohm's law. After that, to verify the Wein displacement law, which states higher the temperature, the shorter or smaller the wavelength of the thermal radiation, and this practical relationship is widely used in determining the temperature of far radiant objects, a star for instance.

Moreover, students will benefit from using a vernier protractor with 0.02° precision to acquire more hands-on experience as well as the estimation based on relatively advanced equations.