Equipments for Physics Laboratory

# Specifications

Notes: Product pictures are only for reference, CEIEC may update them due to technical reasons.

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| **ITEM:** | **CCD YOUNGG'S MODULUS MEASURING INSTRUMENT** |  |
| **PART NUBMER:** | **0201000000** | |
| **BASIC FUNCTION:** | | |
| Demonstration of deformation of a wire under load, which is parallel to the axis of the wire and is applied to one end while the opposite end is held fixed. A microscope and CCD image-forming system is equipped to clearly display the result and you can observe in an easy way. | | |
| **SPECIFICATIONS: (As per one set)** | | |
| Stainless Steel Wire | 90 cm in length, 0.25 mm in diameter | |
| Molybdenum Wire | 90 cm in length, 0.12 mm in diameter | |
| Upright Column | About 100 cm in height | |
| Reading Microscope | Measuring range: 3 mm, min. graduate: 0.05 mm,14× | |
| CCD Video Camera | Effective pixel 752(H) ×582(V) | |
| Video Monitor | Black and white, 35 cm, input impedance 75 Ω | |
| Operating Temperature | -5 ℃ ~ 40 ℃ | |
| Ambient Humidity | 10 ~ 80 % | |
| Total Magnification | 54× | |
| Relative Uncertainty of Measurement | <5% | |

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| **ITEM:** | **MEASURING INSTRUMENT FOR YOUNG'S MODULUS OF ELASTICITY WITH HALL POSITION SENSOR** |  |
| **PART NUMBER:** | **0201000002** | |
| **BASIC FUNCTION:** | | |
| Application of Hall position sensor to the traditional bending method of measuring the Young's modulus of elasticity can make the educational contents richer and the experimental data more stable and reliable. The deviation percentage between the measuring value and the commonly recognized value is less than 3%. | | |
| **SPECIFICATIONS: (As per one set)** | | |
| Measurement accuracy of reading | | |
| Sensitivity of Hall position sensor: | | 250 mV/mm. |
| Microscope: | | 0.01 mm. |

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| **ITEM:** | **EXPERIMENTAL INSTRUMENT FOR SHEAR MODULUS & MOMENT OF INERTIA** | |
| **PART NUMBER:** | **0201000101** | |
| **BASIC FUNCTION:** | | |
| The torsion pendulum experimental instrument has merits as follows:<br>Claw disk at the bottom end of wire has been well designed. The ring-shape rigid body can swing around the same axis either in horizontal state or in perpendicular state and the torsion pendulum can swing stably and reliably.<br>The oscillation period is measured with high accuracy by Hall switch and intelligent time meter with magnetic steel. Experimenters can look into the period of every time and determine optimal periodicity for measurement. And the period can be measured with high accuracy.<br>The instrument can be used to measure moment of inertia about different axis of rigid body (ring). It can help students intensify their comprehension of moment of inertia. | |  |
| **SPECIFICATIONS: (As per one set)** | | |
| DC source | | 5V |
| Digital timer | | 1 set |
| Max timing number | | 80 |
| Digital timer measurement | | 250s |

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| **ITEM:** | **NEW-TYPE EXPERIMENTAL INSTRUMENT OF SINGLE PENDULUM** |  |
| **PART NUMBER:** | **0201000200** | |
| **BASIC FUNCTION:** | | |
| The instrument uses integrated Hall switch sensor to measure oscillation period of single pendulum accurately, thus to measure gravity acceleration more accurately. It can be used to study the influence of non-linear effect when single pendulum undergoes big angle oscillation. | | |
| **SPECIFICATIONS: (As per one set)** | | |
| HTM electrical timer can time automatically with precision of 0.001 s. | | |
| Mirror and scale method is used to measure length of single pendulum. | | |

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| **ITEM:** | **EXPERIMENTAL INSTRUMENT FOR STANDING WAVE ON THE STRING** |  |
| **PART NUMBER:** | **0201000300** | |
| **BASIC FUNCTION:** | | |
| The instrument can be used to observe the standing wave forming on a string and get the relationships on wavelength of standing wave, tension, vibrant frequency, and line density of string. It uses Single Chip Computer to control vibrant frequency，which is digitally displayed. | | |
| **SPECIFICATIONS: (As per one set)** | | |
| Frequency adjustable range: | | 0-200 Hz (continuously adjustable). |
| Frequency step: | | 0.01 Hz. |

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| **ITEM:** | **NEW-TYPE EXPERIMENTAL INSTRUMENT OF JOLY BALANCE** |  |
| **PART NUMBER:** | **0201000400** | |
| **BASIC FUNCTION:** | | |
| The instrument can be used to verify Hooke's Law, measure the period of simple harmonic oscillation and elastic coefficient of spring, help students to learn the character and utilization of integrated Hall switch, and measure the tiny tension with Joly balance. | | |
| **SPECIFICATIONS: (As per one set)** | | |
| Range of Joly balance: | | 0-551 mm, |
| Reading precision: | | 0.02 mm, |
| Precision of millisecond meter: | | 0.001 s. |

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| **ITEM:** | **MEASURING INSTRUMENT FOR LIQUID SURFACE TENSION COEFFICIENT** |  |
| **PART NUMBER:** | **0201000500** | |
| **BASIC FUNCTION:** | | |
| The instrument uses sensor to measure the surface tension at the interface between liquid and solid, with the measuring results displayed by digital voltmeter. This instrument has the feature of small measuring error and fine repeatability.<br>Silicon piezo-resistance force-sensitive sensor: | | |
| **SPECIFICATIONS: (As per one set)** | | |
| Force measuring range： | | 0-0.098 N |
| Sensitivity： | | About 3.00 V/N |

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| **ITEM:** | **SYNTHESIS EXPERIMENTAL INSTRUMENT FOR MEASURING SOUND VELOCITY** | |
| **PART NUMBER:** | **0201000600** | |
| **BASIC FUNCTION:** | | |
| The instrument is multifunctional synthesis experimental instrument. It can be used to measure sound velocity accurately. It can observe not only the phenomenon of standing wave and resonance interface, but also the phenomenon of double-slit interference and single slit diffraction. It can also form wave nodal diagram, if attached to reflector board. | |  |
| **SPECIFICATIONS: (As per one set)** | | |
| Sine wave signal generator: range of frequency: | | 38-42 KHz, |
| Display resolution of frequency: | | 0.001 KHz, |
| Digital display vernier caliper: | | Measuring range: 0-200 mm |
| Precision: | | 0.01 mm, |
| Supersonic generator is fixed. | | |
| Supersonic receiver can rotate around fixed axis. | | |
| Rotating angle: | | -90º-90º |
| Rotating angle division value: | | 1º. |

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| **ITEM:** | **MEASURING INSTRUMENT FOR LIQUID VISCOSITY COEFFICIENT BY THE METHOD OF DROPPING BALL** |  |
| **PART NUMBER:** | **0201000700** | |
| **BASIC FUNCTION:** | | |
| The instrument has two ways of timing: one is timing manually, the other is timing with laser photoelectric sensor. It can be used to measure liquid coefficient of viscosity and help students to learn laser alignment and to time with laser photoelectric sensor. | | |
| **SPECIFICATIONS: (As per one set)** | | |
| Precision of timing meter with laser photo-electric sensor: | | 0.01 s, |
| Measuring error of liquid coefficient of viscosity: | | <3%. |

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| **ITEM:** | **FORCED VIBRATION AND RESONANCE EXPERIMENTAL APPARATUS (COMPUTER ACQUISITION)** |
| **PART NUMBER:** | **0201000800** |

**BASIC FUNCTION:**

Forced vibration and resonance are often used in engineering and science research. For example, in fields of architecture and mechanical engineering, resonance is unfavorable and often needs to be avoided to ensure the quality of construction. However, in some petrochemical processing enterprises, principle of resonance is frequently used to detect fluid density and fluid level. Therefore, forced vibration and resonance are important laws of physics, and are getting more attention in physics and engineering.

The apparatus takes the tuning fork vibration system as the study object, and takes the electromagnetic force of excitation coil as the excitation force, and piezoelectric transducing chip as the amplitude monitoring sensor, to measure relationship between the vibration amplitude and the frequency of the driving force. It is equipped with an additional PC acquisition and analysis system, and it can automatically scan the resonance curve, and measure the mass of weight b linear fitting method.

The apparatus can be used for following experiments:

1.Study the tuning vibrating system in relation of amplitude and forced frequency under the action of external periodic force, measure and draw the resonance curve of vibrating system and find out the resonance frequency and vibration acutance of vibrating system, and then through the computer automatically analyze the curve based on the real time measured curve by computer. Interface software can also be used to automatically collect data of curve and to analyze the hardness of vibration system.

2.Measure the relationship between the vibration of tuning fork and mass of symmetric double arms and find out the relation formula of tuning fork resonance frequency and symmetric mass attached on certain position on the double arms of tuning fork.

3.Measure mass of a pair of mass blocks attached on the fixed position on tuning fork by way of measuring the resonance frequency, and automatically analyze with the data collection software. The apparatus has obvious physics phenomenon and reliable experimental data and is applicable to fundamental physics experiment, design and research experiment as well as lecture experiment.

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**SPECIFICATIONS: (As per one set)**

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| Fork natural frequency: | 250Hz |
| LF signal generator frequency range: | 180-280Hz, resolution 0.01Hz, digital display |
| AC digital voltmeter: | range 0~1.999V, resolution 0.001V |
| Piezoceramic transducer: | Diameter of base plate 27mm, diameter of piezoelectric ceramic 20mm, thickness of chip 0.3mm |

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| **ITEM:** | **COLLISION LABORATORY APPARATUS** |
| **PART NUMBER:** | **0201000900** |

**BASIC FUNCTION:**

Collision between objects is a universal phenomenon in nature. Single pendulum motion and horizontal throw motion are basic content in kinematics. Conservation of energy and conservation of momentum are important concepts in mechanics. This collision laboratory apparatus is aimed at study of collision occurring between two balls, single pendulum motion of the small ball before collision and horizontal throw motion of the bumped ball after, and with a view of solving the actual problem occurred during collision by means of mechanics laws acquired and find out energy loss before and after collision on the basis of difference value between theoretical arithmetic and experimental result, so as to heighten the students' ability of analyzing and solving problems. The apparatus has advantages as followings:

1. Can eliminate the parallax for that its base plate has a guide rail of high strength aluminum alloy, on which the scale is in same plane with that on slider.
2. Can reduce the work to be done by the bumped ball for overcoming the drag friction after being collided due to a small section of the ball-carriage and a conic fat head on its upper end, with weak magnetism, on which the bumped ball can stay at stably with mass center coinciding with the central position site of magnetic feld., the will be reduced.
3. Good repeatability of collision experiment for that the hitch point of pendulum ball and the mass center of the pendulum ball after being attracted by electromagnet and that of the bumped ball are in same plane. This apparatus is suitable for fundamental physics experiment in college and technical secondary school, and also for lecture experiment to be carried out in classroom.

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**SPECIFICATIONS: (As per one set)**

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| Adjustable rack with electromagnet on it: | the rod is graduated 0-20cm |
| Pendulum ball: | steel, 2.0cm in diameter |
| The bumped ball: | Two pieces with diameter respectively is 2.0cm and 1.8cm |
| Guide rail: | high strength aluminum alloy with dovetail groove; 35cm long |
| Ball carriage: | the upper end section is in circle with diameter of 4mm, with weak magnetism |
| Target box: | 30cm long, 12cm wide |
| Standing post: | 45cm long, the cycloid can be changed in its length. |

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| **ITEM:** | **MAGNETIC DAMPING AND COEFFICIENT OF KINETIC FRICTION TESTING LABORATORY APPARATUS** | |
| **PART NUMBER:** | **0201001000** | |
| **BASIC FUNCTION:** | | |
| Magnetic damping is an important conception of electromagnetism and widely applying on every physics feld, but it is seldom to directly be measured. With advanced integrated Hall sensor (hereinafter Hall switch for short), magnetic damping and coefficient of kinetic friction testing laboratory apparatus is capable of measuring downslide velocity of magnetic slider on a no ferromagnetic good conductor inclined plane, and meanwhile finding out magnetic damping and coefficient of kinetic friction after data processing. With Hall switch, the apparatus also can capable of measuring time and converting the nonlinear equation into linear one by means of a clever data processing method.This is a comprehensive physics experiment, with which the students' ability will be trained.<br>The apparatus has following advantages:<br>1. Reliable design and easy angle adjustment of the device;<br>2. Good repeatability and consistency of experimental data and less experimental error;<br>3. Intellectualized timer can save the timing data for 10 times for looking up.<br>The apparatus, with such features as obvious physical phenomenon, reliable experimental data and close to practice application is very suitable for fundamental physics experiment, design study experiment and also for lecture experiment as well. | |  |
| **SPECIFICATIONS: (As per one set)** | | |
| Adjustable angle range of inclined guide rail: | | 0°~45° |
| Length of inclined guide rail: | | 440mm |
| Adjustable support: | | 630mm |
| Intellectualized timer: | | Timing frequency (memory): 10 times (0-9)<br>Timing range: 0.000-9.999s<br>Timing resolution: 0.001s |
| Magnetic slider: | | 18mm in diameter, 6mm in thickness and 11.07mg of mass. |

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| **ITEM:** | **AIR SPECIFIC HEAT CAPACITY RATIO MEASURING APPARATUS (AIR ADIABATIC EXPONENT MEASURING APPARATUS)** |
| **PART NUMBER:** | **0201010002** |
| **BASIC FUNCTION:** | |
| Air specific heat capacity ratio measurement (i.e. air adiabatic exponent measurement) is one of the important teaching experiments of common physics and has been included into the syllabus of physics experimental teaching of universities. In order to cooperate with universities and colleges to realize modernization of teaching appliances, improve the experimental quality, University and our company have jointly developed this new generation of air specific heat capacity ratio measuring apparatus. Air specific heat capacity ratio measurement is introduced in most common physics experimental teaching books.Commonly they use U-shaped mercury gauge or water pressure gauge to measure the pressure of air, and use mercury thermometer to measure temperature. Because the pressure measurement has low accuracy if it is done with mercury thermometer, measuring result is rough and experiment error is high. Air specific heat capacity ratio measuring apparatus is a new generation of experimental instrument based on the original experimental apparatus. It uses silicon pressure sensor to measure pressure of air, and uses integrated temperature sensor to measure temperature, so measurement of air pressure and temperature is accurate and sensitive. Error of measured air specific heat capacity ratio is within 3% comparing with standard value. Meanwhile, students can learn the principle and operating method of advanced silicon pressure sensor and semiconductor integrated temperature sensor, which greatly enriched the teaching contents. Air specific heat capacity ratio measuring apparatus is equipped with an additional stabilized voltage power supply and sampling resistance, so it is not necessary to connect A battery and resistance box outside.<br>The apparatus can be used to do following experiments:<br>1. Measuring the ratio of air specific heat capacity at constant pressure to specific heat capacity at constant volume<br>2. Observing air state changing during thermodynamic process and its basic principle<br>3. Learning the principle and method of accurately measuring air pressure and temperature with sensor |  |
| **SPECIFICATIONS: (As per one set)** | |
| Digital voltmeter: | 2 3-and-half digital voltmeter for measurement of pressure, 4-and-half voltmeter for measurement of temperature |
| Silicon pressure sensor: | range is 0-10KPa larger than environment air pressure, sensitivity 20mV/KPa |

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| Integrated temperature sensor: | sensitivity 1uA/℃ |

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| **ITEM:** | **MEASURING INSTRUMENT FOR SPECIFIC HEAT OF METAL WITH COOLING METHOD** |  |
| **PART NUMBER:** | **0201010100** | |
| **BASIC FUNCTION:** | | |
| The instrument uses the amplifier of high sensibility, high precision and low drift and the three-and-half bit digital voltmeter to construct a second instrument with Copper-Constantan thermocouple as a sensor. It has the feature of fine repeatability and small error. The deviation percentage between the measured specific heat of metal at 100 ℃ and the commonly recognized value is less than 5%. | | |
| **SPECIFICATIONS: (As per one set)** | | |
| Resolution of digital voltmeter: | | 0.01 mV, |
| Measuring range: | | 20 mV. |

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| **ITEM:** | **MEASURING INSTRUMENT FOR LIQUID SPECIFIC HEAT OF VAPORIZATION** |  |
| **PART NUMBER:** | **0201010200** | |
| **BASIC FUNCTION:** | | |
| This meter makes improvement to the heating up and gas transporting units of the traditional ones for liquid specific heat of vaporization. A temperature control circuit is added to the heating up electric stove; polystyrene expanded plastic is filled between the shell and internal cup of the calorimeter for thermal insulation; and integrated temperature sensor is used to measure temperature. | | |
| **SPECIFICATIONS: (As per one set)** | | |
| Resolution of digital voltmeter: | 0.01 mV | |
| Measuring range: | 20 mV. | |

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| **ITEM:** | **MEASURING INSTRUMENT FOR SOLID LINEAR THERMAL EXPANSION COEFFICIENT** |  |
| **PART NUMBER:** | **0201010500** | |
| **BASIC FUNCTION:** | | |
| The instrument uses Single Chip Computer and temperature sensor to control temperature. It can be used to observe solid character of thermal expansion and contraction, and measure linear thermal expansion coefficient of metal accurately. | | |
| **SPECIFICATIONS: (As per one set)** | | |
| Temperature reading accuracy: | 0.1 ℃ | |
| Range of temperature controlling: | Room temperature—80 ℃ | |
| Temperature non-uniformity in stove in equilibrium | <0.3 ℃, | |
| Precision of elongation: | 0.001 mm | |
| Largest measuring range: | 0-1 mm. | |

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| **ITEM:** | **EXPERIMENTAL CONSTANT TEMPERATURE INSTRUMENT FOR TEMPERATURE CONTROLLING WITH TEMPERATURE SENSOR** |  |
| **PART NUMBER:** | **0201010600** | |
| **BASIC FUNCTION:** | | |
| The instrument is high-precision digital constant temperature instrument. It can be used to measure the features of all sorts of temperature sensors, and the relation between resistance and temperature of all kinds of material, and also can be used as constant temperature instrument for some experiments. | | |
| **SPECIFICATIONS: (As per one set)** | | |
| Range of temperature controlling:； | | Room temperature—80 ℃ |
| Precision of temperature controlling: | | ±0.1 ℃, |
| Measuring range of DS18B20 temperature sensor: | | -55 ℃—— +125 ℃, |
| Measuring resolution: | | 0.0625 ℃. |

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| **ITEM:** | **EXPERIMENTAL INSTRUMENT FOR TEMPERATURE SENSOR TEST AND TEMPERATURE CONTROL BY SEMICONDUCTOR REFRIGERATION** | |
| **PART NUMBER:** | **0201010602** | |
| **BASIC FUNCTION:** | | |
| The knowledge about performance and test of temperature sensor is an essential content of college physics experiment. However, most experimental instrument can only be used above ambient temperature. FD-TM experimental instrument for temperature sensor test and temperature control by semiconductor refrigeration can be used for experiments below ambient temperature because it is provided with function of semiconductor refrigeration. The instrument is mainly used to test the performance of temperature sensor AD590 (and other temperature sensor according to user's requests). It can acquaint experimenter with the performance of semiconductor refrigerator stack. | |  |
| **SPECIFICATIONS: (As per one set)** | | |
| Temperature range of heating: | | ambient temperature－120 ℃; |
| Temperature range of cooling: | | 45 ℃ below ambient temperature－ambient temperature (about -10 ℃－15 ℃); |
| Precision of controlling temperature: | | 0.1 ℃; |
| Precision of measuring temperature: | | ± 3%. |

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| **ITEM:** | **THERMAL CONDUCTIVITY MEASURING APPARATUS** |
| **PART NUMBER:** | **0201010702** |

**BASIC FUNCTION:**

Thermal conductivity is a physics quantity representing the heat conducting characteristic of a matter, but change of material structure and different content of impurity have obvious influence on it, therefore, the thermal conductivity of material often needs to be measured on particular requires. Two of steady state method and dynamic method are available for measuring thermal conductivity. By steady state method, the specimen should be preheated in result to make heat conduct from high temperature to the low inside the specimen due to reason of temperature difference, thus the temperature of each point insider the specimen vary with the speeds of heating and conducting, and then give proper control to experiment conditions and parameters to make the process of heating and conducting reach to a balanced state, with which the specimen will have a stable temperature distributed inside. Based on it, the thermal conductivity can be found out. This apparatus is designed adopting the steady state method for measuring the poor conductor (such as rubber), with which we can learn the experimental technique of utilizing the rate of heat release of object to find out conducting speed. The apparatus, with steady state method, is used for measuring the poor conductor. It is the second generation, the heating disc of which is changed to of self-adapting temperature control by monolithic processor with 0.1°C of reading resolution. The heat emission disc is designed with integrated sensor for temperature measurement, the reading resolution of which is 0.1°C. With firm structure, easy measurement and control, the apparatus has been widely applied on heat experiment of general physics in universities and colleges.

The apparatus is capable of doing the following experiments:

1. Measure the thermal conductivity of poor conductor. Rubber specimen is attached with the apparatus for teaching purpose.
2. Learn the experimental technique of utilizing the rate of heat release of object to find out conducting speed.
3. Learn usage of high accuracy integrated temperature sensor.

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| **SPECIFICATIONS: (As per one set)** | |
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| Working temperature: | 0℃~100℃ |
| Thermostatic control range: | ambient temperature-80℃ |
| Display resolution: | 0.1℃ |
| Uncertainty of measured thermal conductivity: | less than 6℃ |

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| Measure the specimen of poor conductor | such as rubber |

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| **ITEM:** | **MEASURING INSTRUMENT FOR SOLID MEDIUM REFRACTION INDEX** |  |
| **PART NUMBER:** | **0201020000** | |
| **BASIC FUNCTION:** | | |
| The instrument can be used to observe and analyze the phenomenon of optical polarization. It can measure the refractive index of solid material, which is transparent based on law of Brewster. By measuring reflection coefficient of polarized light, experimenter can get the diffractive index of solid material. | | |
| **SPECIFICATIONS: (As per one set)** | | |
| Light source: wavelength of semiconductor | | 650 nm, power 1.5-2.0 mW |
| Outer dial can be rotated for 360º. | | |
| Division value: | | 1º |
| Digital optical power meter with photo-electricity receiver: | | |
| Its range has two steps: | | 0.2 mW and 2 mW. |

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| **ITEM:** | **EXPERIMENT INSTALLATION OF ELECTRONIC SPECKLE PATTERN INTERFEROMETRY** | |
| **PART NUMBER:** | **0201020100** | |
| **BASIC FUNCTION:** | | |
| Measuring surface contours and deformation patterns to a high degree of precision and accuracy. The speckles are interference images created when the path lengths of converging rays reflected off the illuminated surface differ by half the wavelength of the coherent light source. Changes in path lengths of one half wavelength of the coherent light illuminating the surface will create a speckle. | |  |
| **SPECIFICATIONS: (As per one set)** | | |
| He-Ne Laser | | 632.8 nm,1.5 mW |
| Variable Voltage Power Supply | | 0V – 110V |
| White black camera | | Effective Pixels 752(H)×582(V),NTSC |
| Video Capture Board | | Resolution higher than 640 × 480 × 16 bit |
| Measurement Error | | 1 / 2 wavelength of laser |

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| **ITEM:** | **EXPERIMENTAL INSTRUMENT FOR SINGLE THREAD & SINGLE SLIT DIFFRACTION** |  |
| **PART NUMBER:** | **0201020200** | |
| **BASIC FUNCTION:** | | |
| The instrument can be used to observe phenomenon of optical diffraction and measure the diameter of single thread and width of single slit by using the method of optical diffraction | | |
| **SPECIFICATIONS: (As per one set)** | | |
| Single thread 、single slit、 mini pore diffraction，etc | | |
| Wavelength of semiconductor laser: | | 650 nm |
| Length of optical bench: | | From 500 mm to 1000 mm |
| Division value: | | 1 mm. |

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| **ITEM:** | **AUTOMATIC DIFFRACTION INTENSITY RECORD SYSTEM** |  |
| **PART NUMBER:** | **0201020300** | |
| **BASIC FUNCTION:** | | |
| This instrument transforms diffraction pattern of single slit, multi-slit, multi-hole, etc., into current, which is then displayed by monitor. Powerful software is used to analysis the result. | | |
| **SPECIFICATIONS: (AS PER ONE SET)** | | |
| Wavelength Range | 200mm | |
| Measurement Accuracy | ±0.01mm | |
| He-Ne Laser | 632.8nm, over 1.5mW | |
| Single Slit | Continuously adjustable from 0 to 2mm | |
| Diffraction Board Group | Slit width: 0.03mm，interval:0.06mm | |
| Grating Scale | Grating Pitch：0.02mm, Accuracy：±0.01mm | |

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| **ITEM:** | **EXPERIMENTAL INSTRUMENT FOR OPTICAL ROTATION OF POLARIZED LIGHT** | |
| **PART NUMBER:** | **0201020400** | |
| **BASIC FUNCTION:** | | |
| Optical rotation effect has a lot of applications in scientific research and technique detection department. For example, pharmaceutical industry, medicine examination department and commodity inspection department often measure the concentration of drug and commodity with the method of optical rotation. The instrument can be used for many experiments of polarized light: optical rotation effect, light polarization experiment, and verification of Malus law and so on. | |  |
| **SPECIFICATIONS: (As per one set)** | | |
| Wavelength of semiconductor laser: | | 650 nm |
| Working voltage | | 3V |

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| **ITEM:** | **CHROMA EXPERIMENTAL DEVICE** |  |
| **PART NUMBER:** | **0201020500** | |
| **BASIC FUNCTION:** | | |
| Automatic detection of dominant wavelength of the sample under experiment, as well as 3 stimulus values of color.<br>2colour metric modes available: transmission-type, and reflection-type.<br>Measurement of any light source. | | |
| **SPECIFICATIONS: (AS PER ONE SET)** | | |
| Wavelength Range | 200-800(380—780nm for chroma experiment) | |
| Wavelength Accuracy | ≤±0.4 nm | |
| Wavelength Repeatability | ≤0.2 nm | |
| Relative Aperture | D/F＝1/7 | |
| Focal Length of Collimation Mirror | 302.5 mm | |
| Stray Light | $\leq 10^{-3}$ | |
| Grating | 1200 L/mm, blazed wavelength at 250nm | |
| Transmittance Accuracy | ≤±1% | |
| Noise | ≤±0.5% | |
| Integral Sphere | Φ=150 mm | |

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| **ITEM:** | **BLACKBODY RADIATION MEASUREMENT INSTALLATION** | |
| **PART NUMBER:** | **0201020600** | |
| **BASIC FUNCTION:** | | |
| This device uses grating monochromator and computer technology to measure radiant energy of light source and clearly display blackbody's radiant energy curve on the terminal. Dual data acquisition format makes laboratory report writing easier for students. Also used for verifying of Plank's blackbody radiant law and Stefan-Boltzmann law. | |  |
| **SPECIFICATIONS: (AS PER ONE SET)** | | |
| Wavelength Range | 800—2500nm | |
| Wavelength Accuracy | ≤±4 nm | |
| Wavelength Repeatability | ≤2 nm | |
| Relative Aperture | D/F＝1/7 | |
| Focal Length of Collimation Mirror | 302 mm | |
| Grating | 300L/mm | |
| Dimension | 360×300×160mm | |

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| **ITEM:** | **FOURIER TRANSFORM SPECTROMETER** |  |
| **PART NUMBER:** | **0201020800** | |
| **BASIC FUNCTION:** | | |
| We design this spectrometer with external optical path and measuring range in the visible spectral range 400-800 nm to capture the geometry and visualize the optics of Fourier transform theory and free students from math calculation. | | |
| **SPECIFICATIONS: (As per one set)** | | |
| WN Range | | 25000-12500 cm-1 (400 -800 nm) |
| Resolution | | 15.6cm-1(1 nm @800nm) |
| Wavelength Accuracy | | 1nm |

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| **ITEM:** | **PLANK'S CONSTANT EXPERIMENT UNIT** | |
| **PART NUMBER:** | **0201020900** | |
| **BASIC FUNCTION:** | | |
| This experiment, using the photoelectric effect, where electrons stimulated by incoming light create an electric current, to experimentally determine the value of Planck's constant (h), allows students to get a fundamental understanding of the quantum character of light and to familiar with experiment skill related to photoelectric effect. | |  |
| **SPECIFICATIONS: (As per one set)** | | |
| Wavelength Range | | 200-800nm |
| Slit Width | | 0.3mm |
| Wavelength Accuracy | | ±3nm |
| Wavelength Repeatability | | ±1nm |
| PMT | | GD31A |
| DC regulated power supply | | ±1.8V digital |
| Light Source | | 12V, 75W bromine tungsten lamp |

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| **ITEM:** | **HENE LASER MODE ANALYZER** |
| **PART NUMBER:** | **0201021000** |
| **BASIC FUNCTION:** | |
| With this device, student may<br>Be familiar with principle and operation of confocal spherical scanning interferometer<br>Observe longitudinal and transverse modes distribution.<br>Observe of several of modes of different lasers.<br>Determine mode structure by calculating modes spacing of the laser |  |
| **SPECIFICATIONS: (As per one set)** | |
| He-Ne Laser | |
| Cavity Length | 246mm |
| Wavelength Accuracy | 1nm |
| Curvature of Resonator | 1m-∞ |
| Center Wavelength | 632.8nm |
| Confocal Spherical Laser Resonator | |
| Cavity Length | 20mm |
| Curvature of Concave Mirror | 20mm |
| Reflectivity of Concave Mirror | 99% |
| Fine Constant | >200 |
| Free Spectral Range | 4GHz |
| Interval Error | ≤20MHz |

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| **ITEM:** | **HENE LASER EXPERIMENT SERIES** |  |
| **PART NUMBE:** | **0201021001** | |
| **BASIC FUNCTION:** | | |
| Adjustment of laser with variable front cavity<br>Measurement of light spots distribution and calculation of angle of divergence.<br>Observation of transverse mode and longitude mode with a confocal spherical laser resonator.<br>Measurement of fine constant of confocal spherical laser resonator. | | |
| **SPECIFICATIONS: (As per one set)** | | |
| He-Ne Laser | | |
| Curvature of Resonator | 1m ∞ | |
| Center Wavelength | 632.8nm | |
| Confocal Spherical Laser Resonator | | |
| Cavity Length | 20mm | |
| Curvature of Concave Mirror | 20mm | |
| Reflectivity of Concave Mirror | 99% | |
| Fine Constant | >100 | |
| Free Spectral Range | 4GHz | |

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| **ITEM:** | **EXPERIMENT DEVICE FOR SEMICONDUCTOR LASER PUMPING** | |
| **PART NUMBRE:** | **0201021003** | |
| **BASIC FUNCTION:** | | |
| With this device, we get 532nm laser with a 808 nm semiconductor pump Nd: YVO4 laser which involve a lot of light path adjustment, allowing students to acquire more familiarity on the principle practically.<br>Many fundamental parameters are measured with this device. | |  |
| **SPECIFICATIONS: (As per one set)** | | |
| 808nm Semiconductor Laser | | ≤500mW |
| Power Supply for Laser | | 0～500mA |
| Nd: YVO 4 crystal | | 3×3×1mm |
| KTP | | 2×2×5mm |
| Output Mirror | | φ6 R=50mm |
| Light power meter | | 2μW～200mW |

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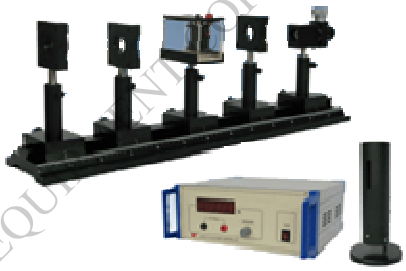
| **ITEM:** | **ULTRASONIC GRATING LABORATORY APPARATUS** |
| **PART NUMBER:** | **0201021201** |
| **BASIC FUNCTION:** | |
| The light wave is diffracted by the ultrasonic wave when it propagates in liquid medium, which is called the optical diffraction caused by ultrasonic sound (also called acousto-optic effect). This phenomenon is the interactional result from light wave and sound wave in medium. The liquid density is modulated by the making the original liquid with even diaphaneity become the "ultrasonic grating" of which refractive ratio changes periodically. The diffraction phenomenon is to be produced when the light beam is passing through, wherefrom the propagation speed of sound wave in liquid can be measured accurately. The acousto-optic effect can be applied widely because the developing laser and ultrasonic techniques.Though ultrasonic grating experiment, the experimenter can get to know the experimental theory of optical effect, to learn to use the optical effect to measure the sound velocity in liquid and the application method of the micrometer ocular.<br>Ultrasonic grating laboratory apparatus manufactured by our company has following features:<br>1.Optical guideway is used to facilitate level and vertical adjustment, and the outdated bulky spectrometer platform is abandoned, so the apparatus is light to be moved.<br>2.Mechanical adjustable slit arrangement is replaced with optical slit, so that the grating spectrograph is fine and obvious.<br>3. The apparatus has a integrated structure and high accuracy, and test data is reliable.<br>This Ultrasonic grating laboratory apparatus mainly consists of mainframe (control box), sodium vapour lamp, optical guideway, liquid tank, collimator and micrometer ocular. |  |
| **SPECIFICATIONS: (As per one set)** | |
| Ultrasonic sound source: | resonance frequency is 10.000MHz approximately; resolution is 0.001MHz. |
| Photolithographic slits: | slit is 0.04mm in width; slit is 6mm in length. |
| Lens: | transmission aperture is φ 28mm; focal length is 157mm. |
| Liquid tank: | 80mm in length; 40mm in width; 59mm in height |
| Micrometer eyepieces: | measured range within 0-8mm; resolution is 0.01mm. |
| Optical guide rail: | 650mm in length; linear measurement resolution is 1mm. |

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| **ITEM:** | **UNIVERSAL INTERFEROMETER OF MICHELSON AND FEBRY-PEROT** |  |
| **PART NUMBER:** | **0201021401** | |
| **BASIC FUNCTION:** | | |
| Demonstration of the structure of Michelson interferometer and Febry-Perot interferometer<br>Observation of Interference fringes of equal inclination, equal thickness fringes, white light fringes.<br>Determination of wavelength of laser<br>Determination of refractive index of transparency slice and of air<br>Observation of fine structure of spectra. | | |
| **SPECIFICATIONS: (As per one set)** | | |
| Flatness of Beam Splitter and Compensator | | $\leq 0.05\,\lambda$ |
| Min Division Value of Movable Mirror | | 0..0005mm |
| Travel of micrometer | | 0.25mm<br>10mm for preset micrometer |
| Barometer | | 0-40kPa |
| Laser Output | | 0.7-1mW |
| Wavelength Measurement Accuracy | | Relative error 2% for 100 fringes |

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| **ITEM:** | **GRATING MONOCHROMATOR** |  |
| **PART NUMBER** | **0201021601** | |
| **BASIC FUNCTION:** | | |
| A monochromator，frequently used as a part of spectrometer, is capable of producing a single spectral line from a broadband (multi-wavelength) source. | | |
| **SPECIFICATIONS: (AS PER ONE SET)** | | |
| Wavelength Range | | 200－800nm |
| Focal Length | | 300nm |
| Wavelength Accuracy | | ≤0.4nm |
| Wavelength Repeatability | | ≤0.2nm |
| Slit | | Continuously adjustable from 0 to 2mm |

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| **ITEM:** | **MODULARIZED MULTIFUNCTIONAL GRATING SPECTROMETER** |  |
| **PART NUMBER:** | **0201021604** | |
| **BASIC FUNCTION:** | | |
| Observe the sodium double lines and spectrum of Mercury lamp.<br>Calibrate the CCD Grating Spectrometer<br>Measure the Rydberg constant<br>Measure isotope shift of Hydrogen and deuterium | | |
| **SPECIFICATIONS: (AS PER ONE SET)** | | |
| Wavelength Range | | PMT: 200-660 nm<br>CCD: 200-660 nm |
| Resolution | | ≤0.06 nm |
| Focal Length | | 500mm |
| Slit | | Continuously adjustable from 0 to 2mm |
| Relative Aperture | | D/F=1/7 |
| Wavelength Accuracy | | ≤±0.4nm |
| Wavelength Repeatability | | 0.2nm |
| Stray Light | | ≤10-3 |
| Dimension | | 560X380X230 mm |
| Weight | | 30Kg |

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| **ITEM:** | **MULTIFUNCTION OPTICAL EXPERIMENTAL INSTRUMENT** |  |
| **PART NUMBER:** | **0201022100** | |
| **BASIC FUNCTION:** | | |
| Five important and basic optical physics experiments (Lens Focus measurement, Optical Polarization experiment, Refraction Index measurement, Characters of Solar Cell measurement and Single Thread & Single Slit Diffraction experiment) can be done on it. It has features of high accuracy, never rustiness, and being capable of using it in bright lab. | | |
| **SPECIFICATIONS: (As per one set)** | | |
| Optical bench length: | | 50.0 cm |
| Division value: | | 1 mm. |
| Wavelength of semiconductor laser: | | 650 nm. |

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| **ITEM:** | **EXPERIMENTAL INSTRUMENT OF LIQUID CRYSTAL (LC) ELECTRO-OPTIC EFFECT** |  |
| **PART NUMBER:** | **0201022200** | |
| **BASIC FUNCTION:** | | |
| The instrument can be used to measure the electro-optical curve and the electro-optical response curve of LC sample. It can help the students to understand the basic principle of LC display and study other LC physical characters. | | |
| **SPECIFICATIONS: (As per one set)** | | |
| Semiconductor laser: | | Wavelength 650.0 nm, power: 2 mW |
| Voltage of square wave: | | 0-10 V, continuously adjustable |
| Frequency: about; | | 500 Hz |
| Power meter of light: | | Its range has two steps of 0.2 mW and 2 mW. |
| Length of optical bench: | | 50.0 cm. |

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| **ITEM:** | **MEASURING INSTRUMENT FOR LENS FOCUS** |  |
| **PART NUMBER:** | **0201022300** | |
| **BASIC FUNCTION:** | | |
| The meter can measure focus of concave lens or convex lens based on the theory of lens imaging, using high luminosity LED as light source. | | |
| **SPECIFICATIONS: (As per one set)** | | |
| Length of optical bench: | | From 500 mm to 1000 mm |
| Division value: | | 1 mm |
| Output power of light source: | | DC 3 V/200 mA |

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| **ITEM:** | **BIPRISM OPTICAL INTERFERENCE LABORATORY APPARATUS** |
| **PART NUMBER:** | **0201022400** |
| **BASIC FUNCTION:** | |
| In 1826, Fresnel, a French scientist, used a biprism to divide wave front of a beam of coherent light into two parts to form component wave interference, with which the interference fringe spacing (in millimeter magnitude) was measured and in consequence to have the light wavelength (in nanometer magnitude) being found out. The physics concepts and experimental technique concerned with this experiment are valuable for teaching. This biprism embodies the following advantages:<br>1. Coherence and without damage your eyes due to a laser source greatly reduced in light intensity by a monochromatic source of semiconductor laser, which is convenient to make the interference fringe image in focus, and also easy to adjust the interference fringe of sodium light.<br>2. Able to stand wear and operating without rustiness due to the application of high strength and quality aluminum alloy to guide rail and turntable, design of dovetail groove structure and agility of the turntable.<br>3. Allowable to carry out optics experiment in white light and ventilating condition due to a black light-shield house equipped with.<br>The apparatus is suitable for foundational physics experiment and design and research in colleges and universities.<br>The apparatus is capable of doing the following experiments:<br>1. Observe the biprism optical interference phenomenon.<br>2. Measure wave length of laser and that of yellow light of sodium lamp<br>3. Observe the interference phenomenon of other light source. |  |
| **SPECIFICATIONS: (As per one set)** | |
| Guide rail: | 80.0cm long; division value: 1mm; slider: 5pieces, in which one with rotary actuator. |
| Slit with turntable: | the width of the slit is 0.03-0.04mm |
| Micrometer eyepiece and bracket: | range 0-8mm; division value: 0.01mm. |
| Light source: | 1) semiconductor laser, optical wave length: 650.0nm; operating voltage: dc 3V |
| Sodium lamp and power supply (optional) | |

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| **ITEM:** | **CURRENT ILLUMINATION CHARACTERISTIC LABORATORY APPARATUS OF PHOTO SENSOR** | |
| **PART NUMBER:** | **0201022500** | |
| **BASIC FUNCTION:** | | |
| In optical experiment, a photo sensor is necessary for measurements such as the illuminance of a position, luminous intensity of light source, light distribution of diffraction and interference, optical fiber optics measuring, extinction position and intensity of polarized light etc. The photo sensor is an element that is capable of converting the physics quantity of light intensity into electricity quantity. It is an important apparatus to be applied on modern optical measurement. Therefore, the experiment of current illumination characteristic of photo sensor is one of essential physical experiment in colleges and universities. The type current illumination characteristic laboratory apparatus of photo sensor is an improved one based on the type A, which embodies the following advantages:<br>1. Free adjustable in luminous intensity of light source by request of experiment; selectable in dc power supply with different voltage for it is equipped with several sets of power supply. It is reliable and easy in adjustment.<br>2. There four kinds photo sensors for selection: silicon photocell, light-sensitive resistor,light-sensitive diode and photistor etc. the apparatus is rich and varied in experimental content and high in availability.<br>The apparatus is capable of doing the following experiments:<br>1. Measure current illumination characteristic of silicon photocell;<br>2.Measure current illumination characteristic of light-sensitive resistor;<br>3. Measure current illumination characteristic of light-sensitive diode;<br>4. Measure current illumination characteristic of photistor | |  |
| **SPECIFICATIONS: (As per one set)** | | |
| Light source (Osram lamp): | | illuminance 0-300Lx. |
| Dc power supply: | | ±2V, ±4V, ±6V, ±8V, ±10V, ±12V, six grades; output current: ≤0.3A adjustable power supply: 0-24V, output current ≤ 1A |
| Dc digital voltmeter: | | range 1.9999V; resolution 0.0001V; Range 19.999V resolution 0.001V |
| Scaled digital voltmeter: | | 0-200mV±0.1%; resolution 0.01mV |

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| **ITEM:** | **MEASURING INSTRUMENT FOR HYSTERESIS LOOP AND MAGNETIZATION CURVE OF MAGNETIC MATERIAL** |  |
| **PART NUMBER:** | **0201030000** | |
| **BASIC FUNCTION:** | | |
| The instrument supplies three different kinds of magnetic material. It uses high precision digital TESLA meter to directly measure magnetic induction intensity *B* in the small inter space of the magnetic circuits, thus getting initial magnetization curve and magnetic hysteresis loop. | | |
| **SPECIFICATIONS: (As per one set)** | | |
| Digital TESLA meter: | | LED display, |
| Range: | | 2.000 T； |
| Resolution: | | 0.1 mT; |
| Constant current source: | | LED |
| Display Range: | | 0-600.0 mA (adjustable); |
| Total turns number of magnetizing coil: | | N=2000. |

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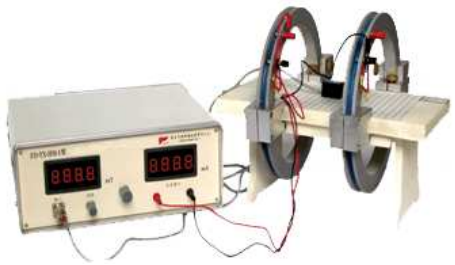
| **ITEM:** | **NEW-TYPE MAGNETIC FIELD MEASURING INSTRUMENT WITH CIRCULAR COIL AND HELMHOLTZ COIL** |  |
| **PART NUMBER:** | **0201030100** | |
| **BASIC FUNCTION:** | | |
| Using this type integrated Hall sensor as detector and including a high sensitive digital-type milli-Tesla meter this instrument can be used to learn how to measure weak magnetic field, verify the superposition principle of magnetic field and measure the magnetic field distribution of HELMHOLTZ coil. | | |
| **SPECIFICATIONS: (As per one set)** | | |
| Range of milli-Tesla meter: | | 0-2.000 mT |
| Resolution: | | 0.001 mT; |
| Turns of coil: | | 500; |
| Measuring error of magnetic induction intensity: | | <3%. |

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| **ITEM:** | **EXPERIMENTAL INSTRUMENT FOR MAGNETORESISTIVE EFFECT** |  |
| **PART NUMBER:** | **0201030200** | |
| **BASIC FUNCTION:** | | |
| The instrument uses two kinds of sensors. It studies resistance magnitude of InSb magnetic resistance sensor in different magnetic field intensity by using GaAs Hall sensor to measure magnetic induction intensity. It can also be used to get the fitting formula of relation between resistance and magnetic induction intensity. | | |
| **SPECIFICATIONS: (As per one set)** | | |
| Range of working current: | 0-500mA (continuously adjustable); | |
| Measuring range of digital milli-Tesla meter: | 0-0.5 T, | |
| Resolution： | 0.0001 T, Accuracy: 1%. | |

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| **ITEM:** | **EXPERIMENTAL INSTRUMENT FOR MEASURING GEOMAGNETIC FIELD WITH MAGNETIC RESISTANCE SENSOR** |  |
| **PART NUMBER:** | **0201030201** | |
| **BASIC FUNCTION:** | | |
| The instrument uses new-type Perm alloy magnetic resistance sensor to measure some important parameters of geomagnetic field (horizontal component, magnetic inclination). The magnetic resistance sensor has the merits of high sensitivity (50V/T), fine resolution ($10^{-7}$-$10^{-8}$ T) and high stability. | | |
| **SPECIFICATIONS: (As per one set)** | | |
| HELMHOLTZ coils: | | Turns number of single coil N= 500 |
| Uncertainty of horizontal component of geomagnetic field: | | <3% |
| Uncertainty of magnetic inclination: | | <3% |
| Radius: | | 10 cm |

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| **ITEM:** | **NMR EXPERIMENTAL SPECTROMETER** |  |
| **PART NUMBER:** | **0201030202** | |
| **BASIC FUNCTION:** | | |
| This instrument is used to prove the existence of magnetic moment of nucleus and measure the magnetic moment of it, thus to derive the g factor of the nucleus. | | |
| **SPECIFICATIONS: (As per one set)** | | |
| Signal to noise ratio: | | 100:1. |
| Measured nucleus: | | $^{1}H$ 、 $^{19}F$ |
| Resonance frequency: | | 17-25 MHz. |
| Oscilloscope and Cymometer should be equipped by user. | | |

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| **ITEM:** | **MEASURING INSTRUMENT FOR CHARACTERS OF SOLAR CELL (SILICON PHOTOELECTRIC CELL)** |  |
| **PART NUMBER** | **0201030300** | |
| **BASIC FUNCTION:** | | |
| The instrument can measure volt-ampere character of solar cell with or without illumination. It can measure the basic parameter of solar cell and measure the relationship between short-circuit current/open-circuit voltage and relative light intensity. It can also measure the basic character of silicon photoelectric cell. | | |
| **SPECIFICATIONS: (As per one set)** | | |
| Light power: | | 40 W, |
| Range of light power meter has two steps: | | 0.2 mW and 2 mW. |

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| **ITEM:** | **EXPERIMENTAL INSTRUMENT FOR HALL EFFECT** |  |
| **PART NUMBER:** | **0201030400** | |
| **BASIC FUNCTION:** | | |
| The instrument can be used to help student grasp the experimental principles of Hall Effect, measure the sensitivity of Hall element, and learn the method of using Hall element (GaAs Hall sensor) to measure intensity of magnetic field. | | |
| **SPECIFICATIONS: (As per one set)** | | |
| Digital TESLA meter: | Range 0-0.35 T | |
| Division value: | 0.0001 T | |
| Electromagnet inter-space: | 3 mm. | |

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| **ITEM:** | **MEASURING INSTRUMENT FOR PN FUNCTION'S PHYSICS FEATURE (MEASURING INSTRUMENT FOR BOLTZMANN CONSTANT)** |  |
| **PART NUMBER:** | **0201030500** | |
| **BASIC FUNCTION:** | | |
| The instrument can be used to measure the physical feature of PN junction and Boltzmann constant and to help students learn a new method for measuring weak current. It is also equipped with thermostat and can be used to study the relation of junction voltage $U_{be}$ and temperature T, thus approximately obtaining the bandwidth of silicon forbidden band at 0 K. | | |
| **SPECIFICATIONS: (As per one set)** | | |
| Range of temperature controlling: | | Room temperature--80 ℃; |
| Precision of temperature controlling: | | ±0.1 ℃. |

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| **ITEM:** | **EXPERIMENTAL INSTRUMENT OF NON-LINEAR ELECTRICAL CIRCUIT CHAOS** |  |
| **PART NUMBER:** | **0201031101** | |
| **BASIC FUNCTION:** | | |
| The circuit board of the instrument is mainly composed of LC oscillator, RC phase shift circuit, non-linear negative resistance element, etc. It can be used to measure voltage-ampere characteristics of non-linear resistance and observe periodic bifurcation of sine wave, the phenomenon of chaos and period variation of phase diagram. | | |
| **SPECIFICATIONS: (As per one set)** | | |
| Range of digital voltmeter: | | 0-20 V |
| Resolution: | | 1 mV. |

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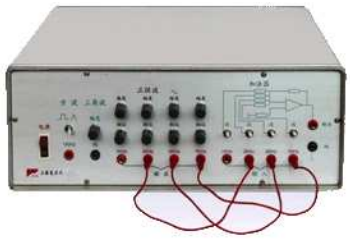
| **ITEM:** | **FOURIER DECOMPOSITION AND SYNTHESIS INSTRUMENT** |  |
| **PART NUMBER:** | **0201031400** | |
| **BASIC FUNCTION:** | | |
| The Instrument is a teaching one for university students to study Fourier analysis method. It can be used to accomplish the experiment of Fourier decomposition and Fourier synthesis. It can help the students to grasp the physical meaning and measuring method of Fourier analysis. | | |
| **SPECIFICATIONS: (As per one set)** | | |
| Frequency of square wave: | 1000 Hz Error < 3%, | |
| Amplitude: | 0.4-1 V (continuously adjustable); | |
| Frequency of triangular wave: | 1000 Hz Error < 3%; | |
| Amplitude: | 0.4-0.9 V (continuously adjustable). | |

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| **ITEM:** | **EXPERIMENTAL INSTRUMENT OF RAMSAUER-TOWNSEND EFFECT** | |
| **PART NUMBER:** | **0201100000** | |
| **BASIC FUNCTION:** | | |
| Experimenters can use the instrument to accomplish the following experimental content:<br>Learning the design principles of electron collision tube, grasping the collision rules between electron and atom and grasping the measuring method of atomic scattering cross section.<br>Measuring the relation between electron velocity and the scattering probability of low energy electron scattering among gas atom.<br>Calculating the effective elastic scattering cross section of gas atom;<br>Measuring the electron energy relevant to the minimum of the scattering probability or scattering cross section.<br>Verifying the Ramsauer-Townsend Effect, and explaining the effect with the theory of quantum mechanics. | |  |
| **SPECIFICATIONS: (As per one set)** | | |
| Source voltage | | 0~5V |
| Accelerating voltage | | 0~15V |
| Compensate voltage | | 0~5V |

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| **ITEM:** | **FRANK-HERTZ EXPERIMENTAL INSTRUMENT** |  |
| **PART NUMBER:** | **0201100101** | |
| **BASIC FUNCTION:** | | |
| The instrument is designed to help the students to understand the Bohr quantum theory. The experiment can prove the quantization of the internal energy of atom by using electron to bombard atom. | | |
| **SPECIFICATIONS: (As per one set)** | | |
| Number of wave peak | | ≧5 |
| Currency measurement | | 0.1nA~10μA |
| Accelerating voltage | | DC 0~15V |

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| **ITEM:** | **A-CLASS ULTRASONIC SOUND LABORATORY APPARATUS** | |
| **PART NUMBER:** | **0201100202** | |
| **BASIC FUNCTION:** | | |
| The ultrasonic wave means that the sound wave of which frequency is higher than the upper limit of hearing of ears. The ultrasonic technique is the modern acoustic one that is used widely. The ultrasonic detection is an important means by which the equipment quality can be guaranteed. The ultra-B instrument has become a favorable helper for human healthy. The ultrasonic inspection is one of main methods by which the non-destructive test is carried out. On base of the propagation rule of ultrasonic wave in media, the material proper and size, shape and distribution of imperfection (crack, inclusion and lack of fusion) on surface of it as well as material properties can be inspected nondestructively by the ultrasonic wave under conditions of the influence of material proper of detected work pieces or acoustic property of internal defect upon the ultrasonic wave propagation. The ultrasonic inspection can detect the heavy forging due to higher sensitivity and stronger penetrability. The detected material is up to much more meter in thickness and the material can be detected on one side so that the on-line inspection and monitoring can be implemented. This apparatus is a nondestructive ultrasonic pulse reflection-type detecting instrument. It is not only used for medicine as ultrasonic diagnostic apparatus but also is used for industry as ultrasonic detector. This apparatus is not only used for the medical physical experiment in medical specialty but also is used for the fundamental physical, modern physical and comprehensive designed experiments in common universities and colleges and technical secondary schools due to the rich, safe and reliable experimentation as well as extensive application.<br>The following experiments can be carried out when this apparatus is used:<br>1. Use A-class ultrasonic laboratory apparatus to measure the sound velocity in water and thickness of water layer;<br>2. Use A-class ultrasonic laboratory apparatus to measure the thickness of viscera of human body;<br>3. Use A-class ultrasonic laboratory apparatus to measure the width of human brain;<br>4. Use A-class ultrasonic laboratory apparatus to measure the thickness of solid and to carry out the ultrasonic nondestructive inspection. | | |
| **SPECIFICATIONS: (As per one set)** | | |
| Pulsed voltage: | 450V | |
| Amplification gain: | >50dB | |
| Triggering mode: | Synchronous triggering | |

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| Output amplitude limiting: | 8V |
| Ultrasonic sound probe: | Integrative send receive, double channel Frequency: 2.5 MHz |

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| **ITEM:** | **MEASURING INSTRUMENT FOR TRANSITION TEMPERATURE OF HIGH-TEMPERATURE SUPERCONDUCTOR** |  |
| **PART NUMBER:** | **0201100400** | |
| **BASIC FUNCTION:** | | |
| The instrument can be used to measure the basic feature of zero resistance of superconductor, thus to determine the basic parameter of superconductor—critical temperature of superconductor (transition temperature). Three manners are supplied to record R-T curve of the sample: using X-Y recorder, recording manually with digital voltmeter and real-time recording by computer (with supporting software). | | |
| **SPECIFICATIONS: (As per one set)** | | |
| Resolution of resistance measuring: | | 0.5 mΩ; |
| Reading error of thermometer： | | < 2 K; |
| Signal to noise ratio of resistance transition: | | > 50:1 |

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| **ITEM:** | **HOLOGRAPHY EXPERIMENT SERIES** |  |
| **PART NUMBER:** | **0201100500** | |
| **BASIC FUNCTION:** | | |
| With this set of components, students can make Fresnel hologram, plane image hologram, one step rainbow hologram and two step rainbow hologram. | | |
| **SPECIFICATIONS: (As per one set)** | | |
| Table Top | | GSZ2 type, 1.2×0.8m or 1.5×1.0m |
| Table Support | | 1.2m or 1.5m |
| He-Ne Laser | | 5mW |
| Exposure Timer | | 0.1~99s |
| White Black Film | | ISO100/21° |
| Lamp | | 100W |
| Beam Splitter | | 7:3,$\varphi$36mm |
| Beam Splitter | | 5:5,70×50mm |

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| **ITEM:** | **LABORATORY APPARATUS FOR OPTICAL FIBER TRANSMISSION WITH SOUND SIGNAL** |
| **PART NUMBER:** | **0201100601** |

**BASIC FUNCTION:**

The optical fiber is a wave-guide used to guide the light wave and is a new transmission media. The light wave is used as the carrier wave of optical fiber communication that is a contact method when the optical fiber is used as the transmission media. The research effort to optical fiber used as the transmission media of light is a hard course. After the Doctor Gao Kun, the Chinese of British Nationality published a paper possessed of the historical significance in 1966, in which the possibility of realization for low-loss transmission information with optical fiber was illuminated theoretically, the development effort to optical fiber was started expeditiously. After 1970 when is reputed as the first year of optical fiber communication, the optical fiber system is developed onto the practical stage with the development of optical fiber communication technique.

With the development of optical fiber communication and optical fiber sensing techniques, the optical fiber technique is promoted to applying in many fields. The optical fiber communication technique that the optical fiber used as the information transmission media not only is an important symbol of new technical revolution but also is a main transmission means in network of future information society.

The students are able to know that how to modulate, transmit and demodulate the light wave through the test for optical fiber transmission with sound signal so that we have had an acquaintance with optical fiber communication primarily. We can know the optical fiber transmission system structure through experimentation and be familiar with the testing method for basic property and main features of semiconductor electrolight/photoelectricity devices as well as have an acquaintance with the commissioning technique of optical fiber transmission system with sound signal.

The following experiments can be carried out when this apparatus is used:

1. Measurement for electro light features of LD transmitted optical fiber components;
2. Measurement for features and responsibility of silicon photoelectric diode (SPD);
3. Measurement for relationship between LD bais current and maximum modulated amplitude of non-discontinued distortion.
4. Measurement for amplitude-frequency features of modulation and amplification circuit of optical signal transmitter;
5. Optical signal reception experimentation;
6. Amplification of optical signal and transmission of speech signal;

**SPECIFICATIONS: (AS PER ONE SET)**

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| Sound signal generator: | Measuring range: 50Hz-20KHz |
| Output amplitude of signal generator: | 0-2V |
| Working current of LD laser diode: | <25mA |

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| **ITEM:** | **PULSED NUCLEAR MAGNETIC RESONANCE APPARATUS** | |
| **PART NUMBER:** | **0201100701** | |
| **BASIC FUNCTION:** | |  |
| 1. FID can be observed, the apparent spin-spin relaxation time can be estimated, and the influence of homogeneity of magnetic field upon the resonance signal can be realized;<br>2. The spin echo signal can be observed and the spin-spin relaxation time of sample can be measured;<br>3. The spin-lattice relaxation time of sample can be measured by the reverse recovery method.<br>4. The chemical shift of dimethyl benzene sample can be measured. | | |
| **SPECIFICATIONS: (As per one set)** | | |
| Resonance frequency:<br>Pulse power: | | 20MHz<br>0.3W |
| Switching amplifier gain:<br>Phase-locked amplifier gain: | | ≥20dB<br>≥40dB |
| Uniformity of magnetic field after the shimming plate is added: | | ≤3ppm |
| power supply (continuous adjustable) | | 0-6.00V |
| magnet gap | | 20mm |
| Corresponding magnetic field | | 0.47T |
| orking temperature | | 36.50°C |

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| **ITEM:** | **FARADAY EFFECT & ZEEMAN EFFECT INTEGRATED EXPERIMENTAL APPARATUS** |
| **PART NUMBER:** | **0201100803** |
| **BASIC FUNCTION:** | |
| In 1945, Faraday found a phenomenon when searching for relationship between electromagnet phenomenon and optical phenomenon. When a plane polarized light beam passes through a media, and if magnetic field is imposed in the direction of the light beam, the plane of polarization of the light rotates for an angle, which means the magnetic field makes the media having the optical rotation. This is now called Faraday Effect. In 1896, P.Zeeman, the Holland physical scientist found that when light source is put in sufficiently strong magnetic field, its original spectral line will split into several ones. The split spectral lines are polarized, and number of split spectral lines varies along with variation of energy level. This phenomenon is now called Zeeman Effect. Faraday and Zeeman Effect is one of the most important achievements of 19 century. It strongly supports the electromagnetic theory of light.<br>Faraday-Zeeman effect integrated experimental apparatus is a new generation that bases on old type. Original 1-dimensional adjustable He-ne laser is replaced by 2-dimensional adjustable semiconductor laser, which makes the adjustment more accurate and the output power of laser is more stable. The central magnetic limit of the electromagnet is also greatly increased. It can reach 1.4T. Angle measuring vernier is replaced with screw micrometer (which transfers angular displacement to linear one). The apparatus can be used for optical and contemporary physics experiment in universities and colleges and it can also be used for study of material characteristics, light spectrum and magneto-optic effect. |  |
| **SPECIFICATIONS: (As per one set)** | |
| Semiconductor laser: | wavelength 650nm power>1.5mW light spot diameter 1mm |
| Electric magnet: | magnetic limit 1.35T(is related to excitation source) |
| Excitation source: | max output power 5A Max output voltage 30V |
| L-voltage mercury lamp | ignition voltage 1500V tube diameter 6.5mm |
| Standard light aperture | 40mm distance 2mm |
| Reading microscope: | resolution 0.01mm measuring range 8mm |
| Faraday Effect | min angle measurement 2 minutes |

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| **ITEM:** | **SURFACE MAGNETO-OPTIC KERR EFFECT EXPERIMENTAL SYSTEM** | |
| **PART NUMBER:** | **0201100902** | |
| **BASIC FUNCTION:** | | |
| The performance and experimental stability of the system are all greatly improved.<br>First, the metal plate experimental platform is replaced with black-anodic oxidized duralumin, so that the removability and optical property of the platform is extensively increased. All optical components are fixed to the platform with M6 screws, which greatly facilitates the experimental operation.<br>Secondly, the test quality level of the apparatus is doubled, so stability in the large of final test signal is greatly improved, which enables the further study of properties of magnetic thin film of monatomic layer. The apparatus plays an important role in the study of magnetic order, magnetic anisotropy, interlayer coupling and phase transition of magnetic ultrathin film.<br>Thirdly, the ring electromagnet is further improved. The size of the magnet is reduced while the central magnetic limit is kept unchanged, which facilitates application of extreme vacuum system to enable in-site measurement of magnetic thin film and ultrathin film. | |  |
| **SPECIFICATIONS: (As per one set)** | | |
| Packed type vibration reduction platform: | | Table top size: 1200×900mm; bolt hole: M6; pitch: 25×25mm |
| High stability semiconductor laser: | | wavelength 650nm<br>Output power 2mW; min light spot diameter: 1mm |
| Polarizing prism: | | clear aperture:8mm<br>Extinction ratio: 10-5; transmittance:90Ċ |
| Ring electromagnet: | | central magnetic limit:2800Gs; gap:40mm |
| Precise constant current source: | | Peak voltage: 38V<br>Max output current: 10A |

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| **ITEM:** | **MICROWAVE-BAND ELECTRON SPIN RESONANCE LABORATORY APPARATUS** |
| **PART NUMBER:** | **0201101000** |

**BASIC FUNCTION:**

Electron spin resonance is named as the electron paramagnetic resonance also, which means that when the electron spin magnetic moment is affected by the electromagnetic wave of response frequency in magnetic field, the resonant transition phenomenon is to occur among the magnetic energy levels of them. This phenomenon can be observed in the paramagnetic substance (i.e. contained uncoupled electronic chemical compound) possessed of uncoupled spin magnetic moment, so the electron paramagnetic resonance is used to detect the uncoupled electron in substance and the mutual effect between electron and atom, with the result that this is an important method by which the microstructure information of related substance can be achieved. This electron paramagnetic resonance is possessed of higher sensitivity and resolution, which is able to go deep into the substance carrying out the fine analysis meanwhile the sample is not destructed and it is not interfered with the chemical reaction. At present, this technique is being applied widely in the following fields such as physics, chemistry, biology, medicine and life sciences.

This microwave-band electron spin resonance laboratory apparatus has been improved on the basis of originality. The microwave frequency counter not only is added to measure the microwave source frequency but also the digital Gauss meter is added to measure the resonant magnetic field accurately besides. Additionally, the exciting current is shown on digital gauge so that the magnetic field can be adjusted easily. This apparatus is possessed of the following features such as easy adjustment, reliable data and rich testing content, which is able to use for the modern physical experimentation and professional researching experimentation.

The following experiments can be carried out when this apparatus is used:

1. Observe the electron spin resonance phenomenon of standard sample DPPH.
2. Use the microwave frequency counter to measure the operating frequency during experimentation and estimate the required stationary magnetic field according to the resonance conditions.
3. Use the Gauss meter to measure the stationary magnetic field and calculate factor g of sample DPPH according to the resonance conditions.
4. Adjust the sample lumen in length, measure position at three resonance points and calculate the wavelength of wave-guide.

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**SPECIFICATIONS: (As per one set)**

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| Short circuiting piston: | measuring range: 0~65mm |
| Outside diameter of sample tube: | 4.8mm |
| Microwave frequency counter: | measuring range:<br>8.2GHz-12.4GHz, resolution: 0.005GHz |
| Digital Gauss meter: | measuring range: 0~2T, resolution: 0.0001T |
| Wave guide specification: | BJ-100 (inside dimension of wave guide: 22.86mm×10.16mm) |

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| **ITEM:** | **CURIE TEMPERATURE MEASUREMENT LABORATORY APPARATUS OF FERROMAGNETIC MATERIAL (COMPUTER ACQUISITION)** |
| **PART NUMBER:** | **0201101100** |
| **BASIC FUNCTION:** | |
| The magnetic material is used widely in the following fields such as electric power, communication, electronic instrument, and automobile and computer as well as information storage. In recent years, it is the nonreplaceable material that the high and new-technology industries are being promoted to developing and the contemporary civilization is making progress. It is very important to research the basic property of magnetic material during physical experimentation. The Curie temperature is the physical quantity used to characterize the basic property of magnetic material, which reflects the transformation temperature of magnetic material from ferromagnetism to paramagnetism.<br>The bridge method is used to measure the temperature of ferromagnetic material when the spontaneous magnetization of it disappears according to the property that the magnetic moment of ferromagnetic material is to change with the changing temperature. The platinum resistance temperature sensor is used to record the temperature; the digital voltmeter is used to take a reading of voltage and then draw up the T~V curve on which the Curie temperature TC is determined. The basic property of this magnetic material can be comprehended deeply through measurement for the Curie temperature of soft magnetic ferrite. Computer can acquire the data and measure out the temperature voltage curve automatically so that the automatic operation combines with the manual operation, i.e. the manual operational ability of students not only can be improved but also an ability by which this classical experimentation is possible to carry out is trained during measurement. This apparatus is possessed of the following features such as firm system structure, steady and reliable property, which is suitable for the modern physical experimentation as well as researching and designing experimentation in universities and colleges. |  |
| **SPECIFICATIONS: (As per one set)** | |

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| Signal generator | Frequency modulation 500Hz-1500Hz<br>Amplitude modulation 2V-10V (peak-peak value) |
| Digital frequency meter | Resolution 1Hz<br>Measuring range 0-9999Hz |
| AC voltmeter | Resolution 0.001V<br>Measuring range 0-1.999V |
| Digital thermometer | Measuring range 0℃-150℃<br>Resolution 1℃ |
| Ferromagnetic sample | Curie temperature 50 ℃ ±2 ℃ and 90 ℃ ±2 ℃, respectively |

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| **ITEM:** | **HUGE MAGNETORESISTANCE EFFECT LABORATORY APPARATUS** |
| **PART NUMBER:** | **0201101300** |
| **BASIC FUNCTION:** | |
| Generally speaking, the magnetic metal and alloy are possessed of the magneto resistance phenomenon. The magneto resistance is a phenomenon that the resistance changes in a certain magnetic field. The huge magneto resistance is a phenomenon that the resistance reduces suddenly in a certain magnetic field. The reductive amplitude is more than magneto resistance value of magnetic metal and alloy material 10 times above. The huge magneto resistance effect is applied extensively to the high-density magnetic reading heads and magnetic store elements. It is often used to measure the displacement and angle also. Compared with the photoelectric sensor, the huge magneto resistance sensor is possessed of the following features such as higher sensitivity, lower power consumption, excellent reliability and compact in volume as well as service under the atrocious conditions.<br>This apparatus is used as the new-type huge magneto resistance sensor so that the students can know the principle and application of the huge magneto resistance effect. It is used for the fundamental physical, modern physical and comprehensive designed experiments in common universities and colleges and technical secondary schools due to the simple operation, rich, safe and reliable experimentation.<br>The following experiments can be carried out when this apparatus is used:<br>1. Know the huge magneto resistance effect principle and study the calibration method of huge magneto resistance sensor. Use the huge<br>Magneto resistance sensor to measure the weak magnetic field;<br>2. Determine the relationship between included angle of sensitive axis on huge magneto resistance sensor to measured magnetic field and sensitivity of sensor;<br>3. Determine the relationship between sensitivity of huge magneto resistance sensor and operating voltage;<br>4. Use the huge magneto resistance sensor to measure the current of electrified wire. |  |
| **SPECIFICATIONS: (As per one set)** | |

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| Huge magnetoresistance sensor: | Linearity range: 1.5Gs-10.5Gs<br>Saturated magnetic field: 15Gs<br>Sensitivity: 3.0mV/V·Gs-4.2 mV/V·Gs |
| Sensor power: | 1.5V~12V continuous adjustable |
| Helmholtz coils: | Turn number of single coil: N=200, 10cm in semi-diameter |
| Constant current for Helmholtz coils: | Output current: 0~0.8A continuous adjustable |
| Measured direct current: | Output current: 0~5A continuous adjustable |

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| **ITEM:** | **OPTICAL EXPERIMENT SYSTEM** |
| **PART NUMBER:** | **0201200000** |
| **BASIC FUNCTION:** | |
| For a better understanding of the false color photography, this device and a brief introduction to Color Composites is given for more advanced students. As it involves many fundamental knowledge of color coding, decoding, memory, reconstruction, chroma, image process, etc., students should be able to explain how colors is " preserved " and many other related techniques. |  |
| **SPECIFICATIONS: (As per one set)** | |
| White Light Source | 30W |
| Diameter of Holes | 0.1mm-2mm |
| Optical Rail | 2m |
| Lens | f=70,190mm |

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| **ITEM:** | **LASER RAMAN SPECTROMETER** | |
| **PART NUMBER:** | **0201400200** | |
| **BASIC FUNCTION:** | | |
| Laser Raman Spectroscopy is a useful instrument for the identification of a wide range of substances in physics and chemistry laboratories of scientific research institutes, universities and colleges. It is a straightforward, non-destructive technique requiring no sample preparation, and it involves illuminating a sample with monochromatic light and using a spectrometer to examine the light scattered by a sample.<br>Features:<br>● Computer-controlled, user friendly interface, capable of automatic record of Raman spectra.<br>● Monochromatic system with high resolution and low stray light.<br>● Single-photon solid state lase used as light source.<br>● External optic path system provided, with good stability and high accuracy.<br>● Various accessories available for analysis of liquid and solid samples.<br>● Trap filter available for cutting stray light. | |  |
| **SPECIFICATIONS: (AS PER ONE SET)** | | |
| Monochromator | | |
| Optical Grating | | 1200 lines/mm, blazed wavelength at 500nm |
| Slit Width | | 0~2mm, continuously adjustable |
| Notch Filter (optional) | | |
| Wavelength | | 532nm |
| Single-photon Counter | | |
| Integration Time | | 0-30min |
| Max Count | | $10^7$ |
| Wavelength Range | | 200-800nm |
| Wavelength Accuracy | | ≤0.4nm |
| Wavelength Repeatability | | ≤0.2nm |
| Stray Light | | $\leq 10^{-3}$ |
| Half-width of Spectral Line | | ≤0.2nm at 586nm |

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