

# Sensor & Inspection Technology Trainers

**SI-CG2003**

**EDU-LABS**



## **Introduction:**

SI-CG2003 sensor & inspection technology training equipment is the most updated modular product developed specifically for professional requirements on basis of several years sensor technology teaching equipment production. Including 17 kinds sensor experiments, it makes management & teaching much more convenient after complete reform on main control board structure and modules as following:

- (1) Adjust to requirements of different specialties, we also provide custom-made modules according to special requirements.
- (2) Adjust to continuously rapid development of sensors as a tool for information pickup, can continuously supplement new sensor experimental modules.
- (3) Instruct teachers & students to develop and organize new experiments by their selves, we can cooperate with schools to accomplish the work.
- (4) Make use of the common power supply for curriculum design, graduation design, and self-making of equipments.
- (5) Benefit management.

SI-CG2003 sensor & inspection technology training equipment is mainly used in teaching of Sensor principle & technology, Automatic inspection technology, Electronic measurement technology of non-electric quantity, Industrial automatic meter & control, Electronic measurement technology of mechanical quantity in all kinds of universities & colleges, secondary technical & vocational schools.

Although the main sensors adopted in SI-CG2003 sensor & inspection technology training equipment are teaching sensors (transparent for teaching), its structure & circuit of is the basis of industrial Application, we hope the equipment will help the students understand the knowledge in books more deeply and master the basic operation skill & practical ability for a Science & Technology worker through signal pickup, transformation & analysis in experiments.

### **Configuration:**

The equipment is composed of table, console and 15 modules. Console has all kinds of AC & DC power supplies, temperature control instruments, 1-20Hz excitation signals generator, 500Hz to 10KHz low frequency signal generator, 0-100KC frequency meter, a data processor composed of 4-digit data display, sampling, and communication.

### **Functions:**

#### 1. Table:

Has all of kinds of sensors such as strained, differential S-alternation, differential solenoid induction (differential transformer), electric eddy-current, semiconductor Hall, piezoelectric, piezoresistive, electromagnetic, thermocouple, thermoresistive, optical fiber, temperature, pyroelectric sensors etc. On table displacement can be fulfilled by vibration of exciter driving girder (dynamic) and spiral micro-measuring head (static).

#### 2. Excitation source and display part:

Including 0.4 ~ 10kHz audio signal generator, 1 ~ 30 Hz low-frequency signal generators, DC constant-voltage power supply and digital V/F meter. Signal generators adopt large-scale integrated circuit, and potentiometer to regulate frequency, has adjustable amplitude, little distortion, wide frequency band, is stable and reliable, in addition, it has digital display for precision.

#### 3. Processing circuit part:

Including bridge, voltage amplifier, differential amplifier, capacitance converter, low-pass filter, eddy-current converter, phase-sensitive detector, phase shifter, temperature inspection & regulation, pressure inspection & regulation, and pyroelectric infrared sensor amplifier control circuit.

#### 4. Data sampling, processing & communication software:

To make students understand the inspection system more deeply, this equipment has data sampling, processing, and communication software circuit, A/D conversion circuit, standard RS232 serial interface and computer. Students can sample data, get the average value and list, draw graph, analyze, save, and print date. Different schools can select different modules to organize experiments according to teaching outline.

Most sensors are transparent, wires have iterative plugs with little contact resistance for connection. This equipment has a dual-trace oscillograph, 49 experiments can be carried out on this equipment.

## Experiments:

1. Experiment on metal foil strained chip single arm bridge capability
2. Experiment on metal foil strained chip half bridge capability
3. Experiment on Metal foil strained chip full bridge capability
4. Comparison of metal foil strained chip single arm, half bridge & full bridge capability
5. Temperature effect on metal foil strained chip
6. Application of metal foil strained chip DC full bridge-electronic scale experiment
7. Application of metal foil strained chip AC full bridge-electronic scale experiment
8. Pressure measurement experiment on diffused silicon piezoresistive pressure sensor
9. Differential pressure measurement experiment of diffused silicon pressure resistor sensor
10. Vibration measurement experiment on electric eddy current sensor
11. Vibration measurement experiment on electromagnetic sensor
12. Vibration measurement experiment on Hall sensor
13. Vibration measurement experiment on differential variable voltage sensor
14. Vibration measurement experiment on optical fiber sensor
15. Experiment on displacement characteristics of capacitance sensor
16. Experiment on dynamic characteristics of capacitance sensor
17. Experiment on displacement characteristics of DC excitation Hall sensor
18. Experiment on displacement characteristics of AC excitation Hall sensor
19. Vibration test experiment on differential variable voltage sensor
20. Capability test experiment of differential transformer
21. Zero-point remain voltage dispensation experiment of differential transformer
22. Application of differential transformer: microcalliper
23. Experiment on displacement characteristics of electric eddy current sensor
24. Effect of materials on characteristics of electric eddy current sensor
25. Application of electric eddy current sensor-electronic scale experiment
26. Speed measurement experiment of optical & electronic sensor
27. Speed measurement experiment of electric eddy current sensor
28. Speed measurement experiment of electromagnetic sensor
29. Speed measurement circuit experiment of Hall sensor
30. Speed measurement circuit experiment of optical-fiber sensor
31. Experiment on displacement characteristics of optical-fiber sensor
32. Experiment on temperature characteristics of PN junction temperature sensor
33. Experiment on temperature characteristics of positive thermistors
34. Experiment on temperature characteristics of negative thermistor
35. Experiment on temperature characteristics of integrated temperature sensors
36. Temperature measurement experiment on integrated temperature sensors
37. Experiment on temperature characteristics of Pt resistor
38. Experiment on temperature characteristics of Cu resistor
39. Temperature measurement experiment on K thermocouple

40. Temperature measurement experiment on E thermocouple
41. Temperature compensation experiment of thermocouple
42. Experiment on characteristics of gas sensitive sensor
43. Experiment on characteristics of humidity sensor
44. Experiment on characteristics of thermal releasing electric infrared sensor
45. Vibration test experiment on piezoelectric sensor
46. Experiment on phase shifter
47. Experiment on phase sensitive wave detector
48. Experiment on low-pass filter
49. Experiment on amplification measurement

### Technical Parameters:

#### 1. Audio signal generator:

Output frequency range: 0.4kHz ~ 10kHz (stepless adjustable)

Output voltage range: 0VP-P ~ 10VP-P (stepless adjustable) (1kHz)

Maximum output current: 0.1A (effective value) (1kHz)

#### 2. Low-frequency signal generator:

Output frequency range: 1Hz ~ 30Hz (stepless adjustable)

Output voltage range: 0VP-p ~ 15VP-P (stepless adjustable)

Maximum output current: 0.2A (effective value) (1KHz)

#### 3. Temperature controller:

Room temperature ~ +100 °C

Power of heating source ≤ 100W

#### 4. Measurement range of frequency meter : 0kHz ~ 10kHz Input signal amplitude > 3Vp-p

#### 5. DC high-accuracy constant-voltage power supply

Output voltage range: ±2V ~ ±10V ( 4 stages)

Output constant-voltage accuracy:

4V/6V/8V/10V positive voltage ±0.5%

-4V/-6V/-8V/-10V negative voltage ±0.5%

#### 6. Constant-current output range: 0.5mA ~ 10mA (stepless adjustable)

#### 7. Constant-voltage output accuracy:

+15V ±2%

-15V ±2%

#### 8. Sampling display:

Display range: 0V ~ 2V

Display accuracy: ±0.5%

Software interface:

Data sampling & processing interface

**Configuration:**

| NO. | Name                      | Spec (cm)   | Qty |
|-----|---------------------------|---|-----|
| 1   | Console                   | 139x23x30   | 1   |
| 2   | Training table (Optional) | 150x70x80   | 1   |
| 3   | Console                   | Computer interface cable  | 1   |
|     |                           | 3-core wire   | 300 |
| 4   | 15 modules                | NO.1 Metal foil strained chip module  | 1   |
|     |                           | NO.2 Diffusion silicon piezoresistive sensor module                                   | 1   |
|     |                           | NO.3 Vibration measurement module   | 1   |
|     |                           | NO.4 Capacitance sensor module  | 1   |
|     |                           | NO.5 Hall sensor module   | 1   |
|     |                           | NO.6 Differential transformer module  | 1   |
|     |                           | NO.7 Electric eddy sensor module  | 1   |
|     |                           | NO.8 Rotation speed module  | 1   |
|     |                           | NO.9 Temperature sensor module  | 1   |
|     |                           | NO.10 Gas sensitive sensor module   | 1   |
|     |                           | NO.11 Humidity sensor module  | 1   |
|     |                           | NO.12 Heat releasing electric infrared sensor module                                  | 1   |
|     |                           | NO.13 Piezoelectric sensor vibration measurement module                               | 1   |
|     |                           | NO.14 Phase-shift, phase-sensitive, low-pass filtering, differential amplifier module | 1   |
|     |                           | NO.15 AC & DC, full bridge, measurement, differential amplifier module                | 1   |
| 5   | Wires                     |   | 20  |
| 6   | Conversion connector      |   | 10  |
| 7   | User's manual             |   | 1   |
| 8   | User's software manual    |   | 1   |