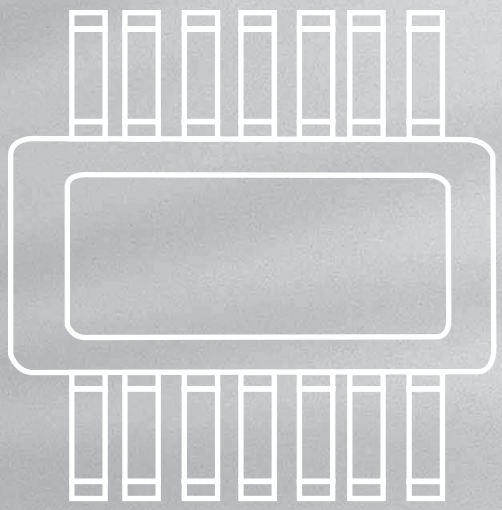
Summarized
Catalogue

two(2)



2. **Electronics**

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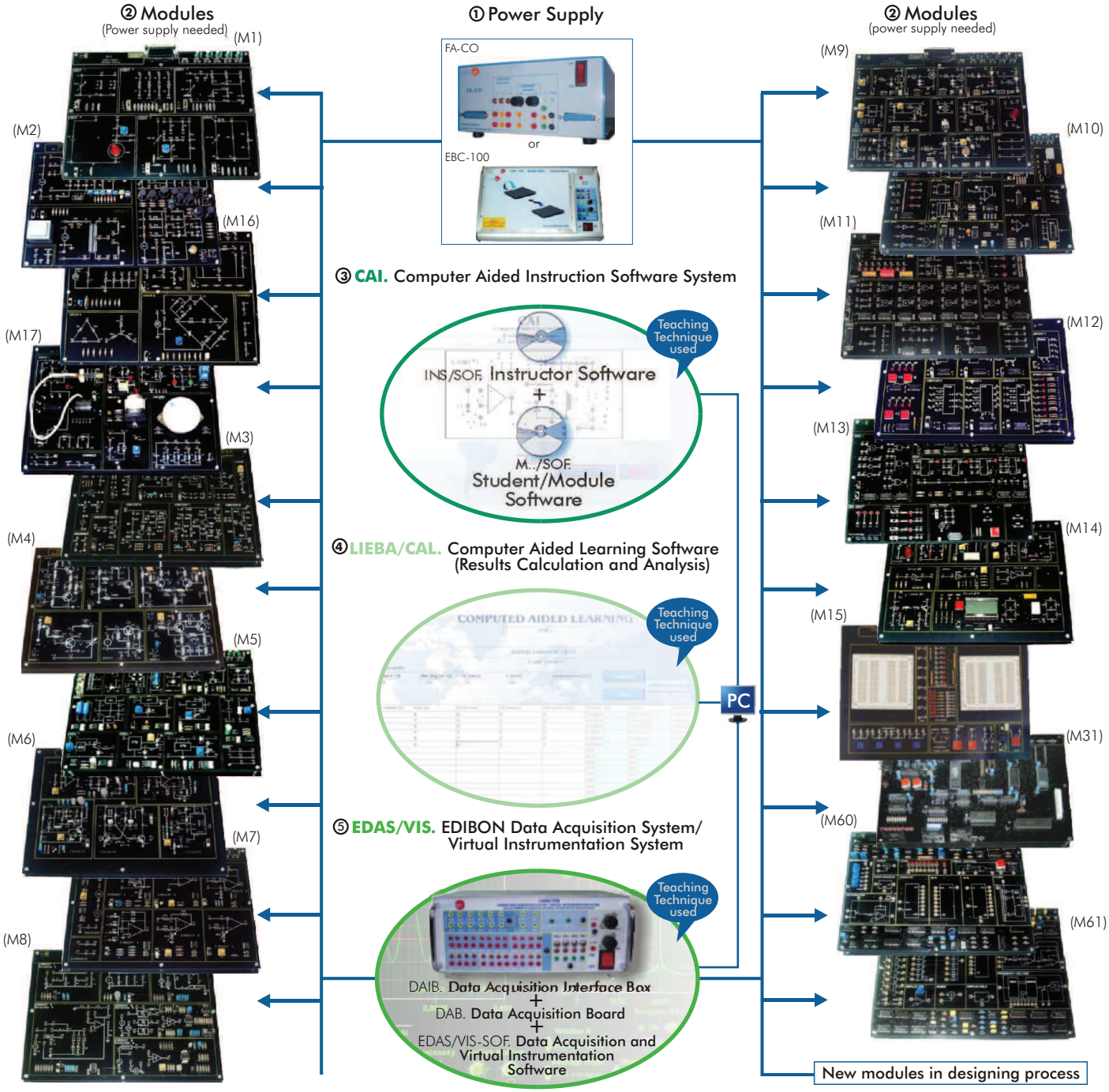
LIEBA. **Basic Electronics and Electricity Integrated Laboratory:**

Laboratory structure



The complete laboratory includes parts 1 to 5 and any part can be supplied individually or additionally. (Power supply + Module/s is the minimum supply).

Available Modules:

➤Basic Electronics concepts
- .M3. Semiconductors I.
- .M4. Semiconductors II.
- .M6. Oscillators.
- .M7. Operational Amplifiers.
- .M8. Filters.
- .M9. Power Electronics.
- .M60. Analog/Digital Converters.
- .M61. Digital/Analog Converters.
- .M99. Expansion Unit:

  Modules included:
  - .M99-1. Analog Multiplexer module.
  - .M99-2. Analog Multiplier module.
  - .M99-3. Function Generator module.
  - .M99-4. AM Modulator module.
  - .M99-5. AM Demodulator module.
  - .M99-6. Motors, Generators and Controls Unit.

➤Digital Electronics
- .M10. Digital Systems & Converters.
- .M11. Digital Electronics Fundamentals.
- .M12. Basic Combinational Circuits.
- .M13. Basic Sequential Circuits.
- .M14. Optoelectronics.
- .M41. Resistance Transducers.

➤Basic Electricity concepts
- .M5. Power Supplies.
- .M1. Direct Current (D.C.) Circuits.
- .M2. Alternating Current (A.C.) Circuits.
- .M16. Electric Networks.
- .M17. Electromagnetism.
- .M18. Three-phase Circuits.

➤Electronics Applications
- .M43. Applications of Temperature.
- .M49. Applications of Temperature and Pressure.
- .M44. Applications of Light.
- .M45. Linear Position and Force.
- .M46. Environmental Measurements.
- .M15. Development Module.
- .M48. Sounds Measurements.

➤Control
- .RYC/B. Basic Teaching Unit for the Study of Regulation and Control.
- .M47. Rotational Speed & Position Control.

More information in: www.edibon.com/products/catalogues/en/units/electronics/basic/LIEBA.pdf

LIEBA. **Basic Electronics and Electricity Integrated Laboratory:**

① Power Supply

There are two choices for suppling the modules:

FA-CO. **Power Supply**

or

SPECIFICATIONS SUMMARY

Fixed outputs: + 5 V, ± 12 V, 1 A. Variable outputs: ± 12 V, 0.5 A. AC output: 12V. or 24 V. Outputs through either 2mm. contact terminals, or through 25 pin CENTRONICS connectors (2 outputs). LED's voltage indicators. Robust construction. Supply: 110/220V A.C. Frequency: 50/60 Hz.

FA-CO includes all the requirements for full working with any module from M1 to M99.

Dimensions (approx.): 225 x 205 x 100 mm. Weight: 2 Kg.

EBC-100. **Base Unit,** with built-in power supply

SPECIFICATIONS SUMMARY

Hardware support and power supply. Modules supporting unit.

Fixed outputs + 5V, + 12V, -12V. Variable outputs ± 12 V. AC output: 12 V. or 24 V. Outputs through either 2mm. contact terminals, or through 25 pin CENTRONICS connector. LED's voltage indicators. Robust construction. Supply: 110/220 V. A.C. Frequency: 50/60 Hz.

EBC-100 includes all the requirements for full working with any module from M1 to M99.

Dimensions: 410 x 298 x 107 mm. approx. Weight: 2 Kg. approx.

② Modules

They consist on electronic boards or modules which allow the student to do the exercises/practices corresponding to the target subject.
On these modules the circuits to be designed are serigraphed. Real components are displayed to familiarize the student with them. There are many points where measures can be taken (voltage, current intensity, resistance, etc.).
Moreover, circuit and electronic component faults can be simulated too.
Every Module has its own manuals, that gives the theoretical knowledge and explains everything the student needs to carry out the exercise/practice. We provide eight manuals per module.
Connectors and cables for completing the exercises and practices are included.

➤Basic Electronics concepts

M3. **Semiconductors I**

SPECIFICATIONS SUMMARY

Circuit blocks:
- Diode. (Circuit#1).
- Signal filtration. (Circuit#2).
- Diodes bridge. (Circuit#3).
- Zener diode. (Circuit#4).
- BJT transistor. (Circuit#5).
- NPN and PNP as switch. (Circuit#6).
- NPN amplification. (Circuit#7).
- PNP amplification. (Circuit#8).
- Sources.
- Load.
- Channels.

Dimensions (approx.)= 300 x 210 x 45 mm.
Weight: 300 gr.

More information in: www.edibon.com/products/catalogues/en/units/electronics/basic/LIEBA.pdf

PRACTICAL POSSIBILITIES

Characteristics of the PN junction:
1.- Study of the diode.
2.- Fault Study in Diodes.
3.- Exercises.

The diode as a rectifier element:
4.- Half wave rectifier.
5.- Study of faults in Rectifier circuit.
6.- Bridge rectifier.
7.- Study of faults in bridge rectifier.
8.- Exercises.

The Zener diode:
9.- Voltage regulator with a Zener diode.
10.- Study of faults in Zener circuit.
11.- Exercises.

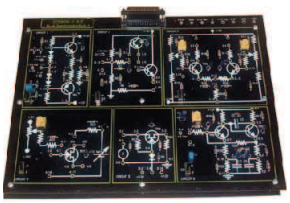
Study and characteristics of the transistor:
12.- Study of the transistor.
13.- Study of the fault in the transistor.
14.- Exercises.

Transistor characteristics operating as a switch:
15.- Study of the transistor as a switch.
16.- Exercises.

Common emitter amplifier:
17.- Study of the common emitter NPN amplifier.
18.- Fault Study in Amplifier circuit.
19.- Study of the common emitter PNP amplifier.
20.- Exercises.

Additional Possibilities:
Voltage Doubler.
Power Supply filtering.

M4. **Semiconductors II**



SPECIFICATIONS SUMMARY

Circuit blocks:
- Complementary transistors. (Circuit#1).
- Darlington configuration. (Circuit#2).
- Differential configuration. (Circuit#3).
- JFET field-effect transistors. (Circuit#4).
- Analog switch. (Circuit#5).
- Direct coupling. (Circuit#6).

Dimensions (approx.)= 300 x 210 x 45 mm.
Weight: 300 gr.

More information in: www.edibon.com/products/catalogues/en/units/electronics/basic/LIEBA.pdf

PRACTICAL POSSIBILITIES

Complementary transistors pair:
1.- Complementary transistors pair.
2.- Transistors pair with alternating signal.
3.- Fault study of the complementary Transistor pair.
4.- Exercises.

Darlington configuration:
5.- Darlington configuration.
6.- Fault study of the Darlington configuration.
7.- Exercises.

Differential amplifier:
8.- Differential amplifier.
9.- Fault study in the differential amplifier.
10.- Exercises.

Study and characteristics of the JFET transistor:
11.- JFET characteristics.
12.- Fault study with the JFET transistor.
13.- Exercises.

Analog switch:
14.- Analog switch.
15.- Exercises.

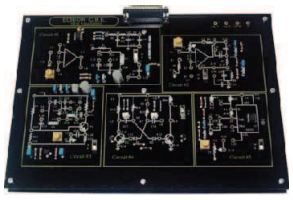
Multistage Amplifier. Direct coupling:
16.- Amplifier coupled directly.
17.- Fault study of an amplifier coupled directly.
18.- Exercises.

LIEBA. **Basic Electronics and Electricity Integrated Laboratory:**

② Modules

➤ **Basic Electronics concepts**

M6. **Oscillators**



SPECIFICATIONS SUMMARY

Circuit blocks:
- RC and LC oscillators. (Circuit#1).
- Wien bridge. (Circuit#2).
- Colpitts, Hartley oscillators. (Circuit#3).
- Astable multivibrator. (Circuit#4).
- 555 Timer. (Circuit#5).

Dimensions (approx.)= 300 x 210 x 45 mm.
Weight: 300 gr.

More information in: www.edibon.com/products/catalogues/en/units/electronics/basic/LIEBA.pdf

PRACTICAL POSSIBILITIES

Oscillators. RC and LC Nets:
1.- RC net oscillator.
2.- LC net oscillator.
3.- Faults study with RC and LC Net oscillators.
4.- Exercises.

Wien bridge oscillator:
5.- Wien Bridge.
6.- Fault study in the Wien bridge oscillator.
7.- Exercises.

Colpitts oscillator. Hartley oscillator:
8.- Colpitts oscillator.
9.- Hartley oscillator.
10.- Faults study with the Colpitts oscillator.
11.- Exercises.

Astable multivibrator:
12.- Astable multivibrator.
13.- Fault study with an Astable mulltivibrator.
14.- Exercises.

555 TIMER:
15.- 555 timer.
16.- 555 timer fault study.
17.- Exercises.

M7. **Operational Amplifiers**

SPECIFICATIONS SUMMARY

Circuit blocks:
- Non-inverting amplifier. (Circuit#1).
- Amplifier. (Circuit#2).
- Voltage follower. (Circuit#3).
- Adder. (Circuit#4).
- Differential amplifier. (Circuit#5).
- Comparator. (Circuit#6).
- Channels.
- Sources.

Dimensions (approx.)= 300 x 210 x 45 mm.
Weight: 300 gr.

More information in: www.edibon.com/products/catalogues/en/units/electronics/basic/LIEBA.pdf

PRACTICAL POSSIBILITIES

Operational amplifier characteristics:
1.- Operational amplifier study.
2.- Closed-loop output compensation voltage.
3.- Operational amplifier fault study.
4.- Exercises.

The inverting amplifier:
5.- Inverting amplifier study.
6.- Inverting amplifier fault study.
7.- Exercises.

The non-inverting amplifier:
8.- Study of the non-inverting amplifier.
9.- Voltage follower.
10.- Fault study in the non-inverting amplifier.
11.- Exercises.

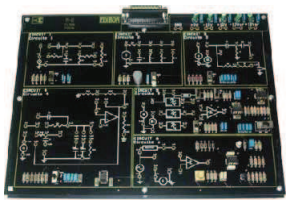
The adder amplifier:
12.- Adding amplifier study.
13.- Fault study in the adding amplifier.
14.- Exercises.

The differential amplifier:
15.- Differential amplifier study.
16.- Differential amplifier fault study.
17.- Exercises.

Comparators:
18.- Comparator study.
19.- Comparators fault study.
20.- Exercises.

Additional Possibilities:
Attenuator.
Voltage Divider.
Open-loop operation.

M8. **Filters**



SPECIFICATIONS SUMMARY

Circuit blocks:
- RC filters. (Circuit#1).
- LC filter. (Circuit#2).
- T-shaped filter. (Circuit#3).
- Active filters. (Circuit#4).
- Association of filters. Distorted signal filters. (Circuit#5 and Circuit#6).

Dimensions (approx.)= 300 x 210 x 45 mm.
Weight: 300 gr.

More information in: www.edibon.com/products/catalogues/en/units/electronics/basic/LIEBA.pdf

PRACTICAL POSSIBILITIES

RC and LC filter responses:
1.- Frequency response.
2.- Low-pass filter.
3.- High-pass filter.
4.- LC Circuit.
5.- Study of Error in Low-pass filter.
6.- Study of Error in High-pass filter.
7.- Exercises theoretical/practical.

T-shaped Filter:
8.- Filter with double T link.
9.- Generator circuit of the signal S1.
10.- Study of Error in RC filter with double T.
11.- Exercises theoretical/practical.

Active filters:
12.- Low-pass filter.
13.- Low-pass filter with load and operational amplifier.
14.- High-pass filter.
15.- High-pass filter with load and operational amplifier.
16.- The attenuation is cumulative.
17.- Use of Operational Amplifier.
18.- Study of Faults in filters.
19.- Exercises theoretical/practical.

Association of filters:
20.- Behaviour of the filter.
21.- Filter of distorted signal.
22.- Filter in cascade; low pass filter and high pass filter.
23.- Filter in parallel.
24.- Study of Error in filters.
25.- Exercises theoretical/practical.

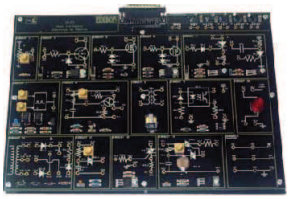
Additional Possibilities:
Band-Pass and Band-Stop Filters.

LIEBA. **Basic Electronics and Electricity Integrated Laboratory:**

② Modules

➤**Basic Electronics concepts**

M9. **Power Electronics**



SPECIFICATIONS SUMMARY

Circuit blocks:
- Variable source. (Circuit#1).
- Power transistors. (Circuit#2).
- MOSFET N. (Circuit#3).
- MOSFET P. (Circuit#4).
- Thyristores. (Circuit#5).
- Pulse generator. (Circuit#6).
- UJT. (Circuit#7).
- Transformer. (Circuit#8).
- Photodiode. (Circuit#9).
- Lamp. (Circuit#10).
- Rectification. (Circuit#11).
- DIAC. (Circuit#12).
- TRIAC. (Circuit#13).
- DIAC tripping TRIAC. (Circuit#14).
- Channels.

Dimensions (approx.) = 300 x 210 x 45 mm.
Weight: 300 gr.

More information in: www.edibon.com/products/catalogues/en/units/electronics/basic/LIEBA.pdf

PRACTICAL POSSIBILITIES

The bipolar power transistor:

1.- Study of the power transistor.

2.- Study of faults in the power transistor.

3.- Exercises.

The MOSFET transistor:

4.- Study of the MOSFET transistor.

5.- Study of faults in the MOSFET transistor.

6.- Exercises.

The thyristor:

7.- Study of the thyristor.

8.- Study of the error of the thyristor.

9.- Exercises.

The UJT transistor and trigger circuits of the thyristor:

10.- Study of the trigger circuits of the thyristor.

11.- Study of insulation circuits.

12.- Exercises.

The TRIAC:

13.- Study of the TRIAC.

14.- Practical assembly of the TRIAC.

15.- Exercises.

Additional Possibilities:

Half/Full wave control.

M60. **Analog/Digital Converters**

SPECIFICATIONS SUMMARY

Circuit blocks:
- Generators.
- D/A converter.
- A/D converter.
- Adder.
- Sample & Hold.
- Leds.
- Logic control.
- Integrator.
- Counter.
- Flash converter.

Dimensions (approx.) = 300 x 210 x 45 mm.
Weight: 300 gr.

More information in: www.edibon.com/products/catalogues/en/units/electronics/basic/LIEBA.pdf

PRACTICAL POSSIBILITIES

1.- Sampling theorem.

2.- Monopolar simple ramp converter.

3.- Monopolar double ramp converter.

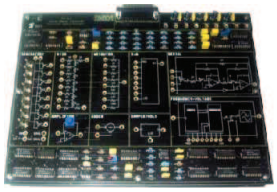
4.- Monopolar binary ramp converter.

5.- A/D integrated converter. Monopolar assembly.

6.- A/D integrated converter. Bipolar assembly.

7.- Flash converter.

M61. **Digital/Analog Converters**



SPECIFICATIONS SUMMARY

Circuit blocks:
- Generators.
- R/2R converter.
- Weighled converter.
- D/A converter.
- Serial converter.
- Amplifier.
- Adder.
- Sample/Hold.
- Frequency-voltage converter.

Dimensions (approx.) = 300 x 210 x 45 mm.
Weight: 300 gr.

More information in: www.edibon.com/products/catalogues/en/units/electronics/basic/LIEBA.pdf

PRACTICAL POSSIBILITIES

1.- D/A converter of weighted divider resistors.

2.- Analog switches errors.

3.- D/A converter of R/2R ladder.

4.- Current division in R/2R ladder converter.

5.- D/A converter of inverted ladder.

6.- D/A integrated converter.

7.- Serial data input D/A converter.

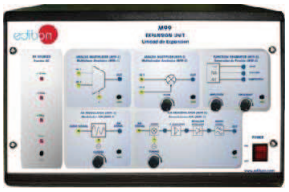
8.- D/A converter of pulse width modulation.

LIEBA. **Basic Electronics and Electricity Integrated Laboratory:**

② Modules

➤**Basic Electronics concepts**

M99. **Expansion Unit**



SPECIFICATIONS SUMMARY

M99 unit enables to carry out different practices related with basic electronics.

Modules included in M99 unit:

M99-1. Analog Multiplexer module:

This module allows us to select between two analog signals IN1 and IN2. There is a digital control signal S for selecting the input signal.

M99-2. Analog Multiplier module:

This module is an analog multiplier. There is also a potentiometer to control the gain of the multiplier.

M99-3. Function Generator module:

This module allows us to generate three different types: sinusoidal, square and sawtooth signals. The frequency and amplitude of the signals can be adjusted using the potentiometers (amplitude potentiometer and frequency potentiometer).

M99-4. AM modulator module:

This module allows us to generate an AM signal. The frequency of the carrier signal can be selected by using a potentiometer. The carrier signal can be observed using the outout terminal. AM-DSB modulator.

M99-5. AM demodulator module:

This module allows us to demodulate an AM signal. The demodulator is divided in different blocks: mixer, IF amplifier, envelope detector and audio filter. The frequency of the local oscillator generated for the tuning can be selected by using a potentiometer.

DC source module.

Dimensions (approx.) = 490 x 330 x 310 mm.

Weight: 6 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electronics/basic/LIEBA.pdf

PRACTICAL POSSIBILITIES

1.- TDM (Time Division Multiplexing).

2.- Analog Multiplication.

3.- AM modulation/demodulation.

4.- FM modulation/demodulation.

5.- PWM modulation/demodulation.

M99-6. **Motors, Generators and Controls Unit**

SPECIFICATIONS SUMMARY

M99-6 unit enables to carry out different practices related with motors and generators.

The unit is divided in three different modules: DC motor, AC motor and Stepper Motor.

DC Motor:

This module contains a DC motor. There is a potentiometer to control the speed of the motor. There is a switch to enable the motor to run. The voltage internally applied to the motor or generated can be observe using the "M+" and "M-" terminals.

AC Motor:

This module contains an AC synchronous motor. There is a switch to enable the motor to run. The voltage internally applied to the motor or generated can be observe using the "AC1" and "AC2" terminals.

Stepper motor:

This module contains a stepper motor. There are two switches to control the rotation of the motor.

Dimensions (approx.) = 490 x 330 x 310 mm.

Weight: 6 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electronics/basic/LIEBA.pdf

PRACTICAL POSSIBILITIES

1.- DC motor.

2.- AC Motor.

3.- DC Generator.

4.- AC Generator.

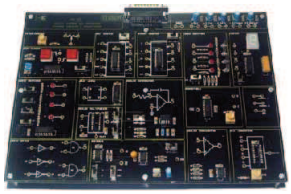
5.- Stepper Motor.

LIEBA. **Basic Electronics and Electricity Integrated Laboratory:**

➤ **Digital Electronics**

② **Modules**

M10. **Digital Systems & Converters**



SPECIFICATIONS SUMMARY

Circuit blocks:
- Potentiometer.
- BCD counter.
- Binary counter.
- Logic monitors.
- Display.
- Shot Clocks.
- Logic switches.
- Flip Flop RS.
- Analog multiplexer.
- Analog integrator.
- Monostable.
- Logic gates.
- Astable.
- Analog comparator.
- D/A converter.
- Channels.

Dimensions (approx.)= 300 x 210 x 45 mm.
Weight: 300 gr.

More information in: www.edibon.com/products/catalogues/en/units/electronics/basic/LIEBA.pdf

PRACTICAL POSSIBILITIES

Analog switching. The bistable, astable and monostable family:
1.- Characteristics of an analog switch chip.
2.- Study of the error F1 in the Analog Multiplexer.
3.- Study of the errors in the Analog Multiplexer.
4.- Characteristics of an S-R type Latch Integrated circuit.
5.- Error Study in the bistable.
6.- Characteristics of an integrated astable circuit.
7.- Error Study in the astable.
8.- Characteristics of an integrated Monostable circuit.
9.- Theoretical/practical exercises.

Behaviour of Binary/BCD Counters & 7-segments Displays:
10.- Characteristics of Binary UP/DOWN Counter 74LS193 and 7-Segment Display.
11.- Error Study in the binary counter.
12.- Characteristics of the BCD UP/DOWN counter and 7-Segment Display.
13.- Error Study in the BCD counter.
14.- Theoretical/practical exercises.

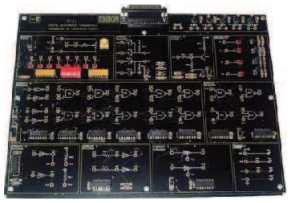
Comparators and analog integrators:
15.- Characteristics of an analog comparator.
16.- Analog integrator.
17.- Error Study in the analog integrator.
18.- Triangular wave generation.
19.- Theoretical/practical exercises.

A/D and D/A conversion:
20.- D/A Converter.
21.- A/D Converter.
22.- Theoretical/practical exercises.

Applications:
23.- Random number generator.
24.- Measuring the time between two events.
25.- Theoretical/practical exercises.

Additional Possibilities:
Synchronous/Asynchronous Counter.

M11. **Digital Electronics Fundamentals**



SPECIFICATIONS SUMMARY

Circuit blocks:
- Logical source. (Circuit#1).
- Sources. (Circuit#2).
- TTL logical gates. (Circuit#3).
- CMOS logical gates. (Circuit#4).
- Open collector gates. (Circuit#5).
- Schmitt trigger. (Circuit#6).
- Three-states. (Circuit#7).
- Channels.
- Sources.
- Indicators.

Dimensions (approx.)= 300 x 210 x 45 mm.
Weight: 300 gr.

More information in: www.edibon.com/products/catalogues/en/units/electronics/basic/LIEBA.pdf

PRACTICAL POSSIBILITIES

Numbers systems:
1.- Voltage measurement in a circuit of sources.
2.- Fault study in the source circuit.
3.- Exercises.

Logical circuits:
4.- Logical Diode.
5.- Fault study in Sources.
6.- Logic with transistor and diodes.
7.- Fault study in transistor/diode circuit.
8.- Exercises.

TTL gates:
9.- Basic function gates.
10.- Fault study in TTL circuit.
11.- Fault study in Logic Gates.
12.- Exercises.

CMOS gates:
13.- Basic function gates.
14.- Fault study in CMOS circuit.
15.- Exercises.

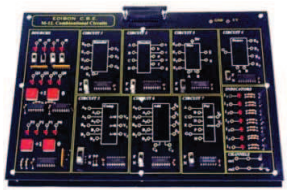
Boolean Algebra and logical functions:
16.- Study of use of Circuit #3.
17.- Exercises.

Open collector gates:
18.- Study of the use of Circuit #5.
19.- Exercises.

Others types of integrated gates:
20.- Study of simple operations with a Schmitt Trigger inverter.
21.- Operation study of a three-state buffer.
22.- Study of the fault in the Circuit #7.
23.- Exercises.

Additional Possibilities:
JK Flip-Flop.
Control of Data Bus.

M12. **Basic Combinational Circuits**



SPECIFICATIONS SUMMARY

Circuit blocks:
- Encoder. (Circuit#1).
- Decoder. (Circuit#2).
- Multiplexer. (Circuit#3).
- Demultiplexer. (Circuit#4).
- Comparator. (Circuit#5).
- Adder. (Circuit#6).
- Parity. (Circuit#7).
- Indicators.
- Channels.
- Sources.

Dimensions (approx.)= 300 x 210 x 45 mm.
Weight: 300 gr.

More information in: www.edibon.com/products/catalogues/en/units/electronics/basic/LIEBA.pdf

PRACTICAL POSSIBILITIES

Encoders:
1.- Study of an encoder.
2.- Fault study in the encoder.
3.- Exercises.

Decoders:
4.- Study of a decoder.
5.- Fault study in the decoder.
6.- Exercises.

Multiplexers:
7.- Study of a multiplexer.
8.- Study of the errors in the multiplexers.
9.- Exercises.

Demultiplexers:
10.- Study of a demultiplexer.
11.- Study of the errors in demultiplexers.
12.- Exercises.

Digital Comparators:
13.- Study of a comparator.
14.- Study of the errors in a comparator.
15.- Exercises.

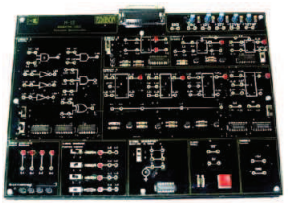
Arithmetic and logic operations:
16.- Study of an adder.
17.- Study of the error in the arithmetic and logic operations.
18.- Study of a parity generator.
19.- Study of the error in the Parity generator.
20.- Exercises.

LIEBA. **Basic Electronics and Electricity Integrated Laboratory:**

② Modules

➤**Digital Electronics**

M13. Basic Sequential Circuits



SPECIFICATIONS SUMMARY

Circuit blocks:
- Logic gates. (Circuit#1).
- RS Bistable. (Circuit#2).
- Shift registers. (Circuit#3).
- Counters. (Circuit#4).
- Logic displays.
- Sources.
- Signal generator.
- Clock.

Dimensions (approx.)= 300 x 210 x 45 mm.

Weight: 300 gr.

More information in: www.edibon.com/products/catalogues/en/units/electronics/basic/LIEBA.pdf

PRACTICAL POSSIBILITIES

Bistables:
1.- Bistables.
2.- Bistable S-R using NAND gates.
3.- Practical performance.
4.- Study of error in the Bistables.
5.- Exercises.

Shift registers:
6.- Shift registers.
7.- Study of faults of the Shift registers.
8.- Exercises.

Counters:
9.- Practice of the Counters.
10.- Study of faults of the Counters.
11.- Exercises.

Synchronised sequential circuits:
12.- Practice of the Synchronised.
13.- Study of errors of the Synchronised sequential circuits.
14.- Exercises.

Memories:
15.- Exercises.

M14. Optoelectronics

SPECIFICATIONS SUMMARY

Circuit blocks:
- Lamp. (Circuit#1).
- Sources. (Circuit#2).
- Bar graph. (Circuit#3).
- LDR. (Circuit#4).
- Photodiodes, optic fibre. (Circuit#5).
- Converter. (Circuit#6).
- Amplifier. (Circuit#7).
- Differential amplifier. (Circuit#8).
- Infrared Photodiodes. (Circuit#9).
- LCD Display, 7 segment BCD. (Circuit#10).
- Buzzer.

Dimensions (approx.)= 300 x 210 x 45 mm.

Weight: 300 gr.

More information in: www.edibon.com/products/catalogues/en/units/electronics/basic/LIEBA.pdf

PRACTICAL POSSIBILITIES

Light transmitters and liquid crystal display (LCD):
1.- Light transmitters.
2.- Bar graph.
3.- LCD display and 7-segment display.
4.- Fault Study in light transmitters and liquid crystal display.
5.- Exercises.

Photo-conducting cells:
6.- Light dependent resistors.
7.- Alarm.
8.- Fault study on the photo-conducting cell.
9.- Exercises.

Fibre optics:
10.- Fibre optics practice.
11.- Fault study using fibre optics.
12.- Exercises.

Infrared:
13.- Circuit with infrared diodes.
14.- Fault study of the infrared diodes.
15.- Exercises.

M41. Resistance Transducers

SPECIFICATIONS SUMMARY

This module enables to carry out different practices related with variable resistance transducers.

On the chassis there are two holders with a lamp, heater and the sensors. The lamp is used to control the illumination incident. The module also include a dark cover box whose aim is to avoid the environmental light noise. The heater is used to control the temperature.

Elements included:
- Lamp.
- Heater resistor.
- PTC.
- NTC.
- RTD.
- LDR.
- Extensiometric gauge.

Dimensions (approx.)= 405 x 300 x 350 mm.

Weight: 6 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electronics/basic/LIEBA.pdf

PRACTICAL POSSIBILITIES

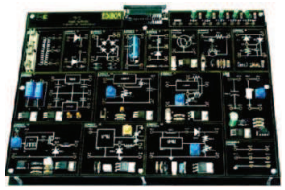
1.- Study of the properties of NTC for the measurement of temperature.
2.- Study of the properties of PTC for the measurement of temperature.
3.- Study of the properties of LDR for the measurement of light intensity.
4.- Study of the properties of RTD for the measurement of temperature.
5.- Study of the properties of Extensiometric Gauge for the measurement of deformation.

LIEBA. **Basic Electronics and Electricity Integrated Laboratory:**

② Modules

➤ **Basic Electricity concepts**

M5. **Power Supplies**



SPECIFICATIONS SUMMARY

Circuit blocks:
- Transformer. (Circuit#1).
- Half wave rectifier. Full wave rectifier, center tap. (Circuit#2).
- Full wave rectifier. (Circuit#3).
- Filtering. (Circuit#4).
- Zener limiting.(Circuit#5).
- Regulation. (Circuit#6).
- Overcurrent protection. (Circuit#7).
- Overvoltage protection. (Circuit#8).
- Voltage regulators. (Circuit#9).
- LM317 adjustable Regulators. (Circuit#10).
- L200 adjustable Regulator. (Circuit#11).
- Switched source. (Circuit#12).
- PWM switched source. (Circuit#13).
- Boost switched source. (Circuit#14).
- Load.
- Channels.

Dimensions (approx.)= 300 x 210 x 45 mm.
Weight: 300 gr.

More information in: www.edibon.com/products/catalogues/en/units/electronics/basic/LIEBA.pdf

PRACTICAL POSSIBILITIES

Rectification:
1.- Rectification.
2.- Bridge rectifier.
3.- Theoretical/practical exercises.

Fixed voltage sources:
4.- Power supply with the Zener diode.
5.- Stabilization through Zener and Transistor.
6.- Fault study in "Stabilization through Zener and Transistor".
7.- Protection against overcurrents.
8.- Protection against overvoltages.
9.- Study of the fault "Protection against overcurrents".
10.- Theoretical/practical exercises.

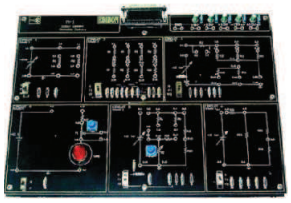
Symmetrical voltage power sources:
11.- Symmetrical source; 78XX regulator.
12.- Symmetrical source; 79XX regulator.
13.- Theoretical/practical exercises.

Voltage regulators with integrated circuits:
14.- Adjustable regulator; LM317.
15.- Study of the fault in adjustable LM317 regulator.
16.- Adjustable L200 regulator.
17.- Fault Study in adjustable L200 Regulator.
18.- Theoretical/practical exercises.

Introduction to switched power supplies:
19.- Switching technique.
20.- Switching technique. PWM.
21.- Switching technique. Boost.
22.- Theoretical/practical exercises.

Additional Possibilities:
Voltage Feedback.
DC-DC converter.

M1. **Direct Current (D.C.) Circuits**



SPECIFICATIONS SUMMARY

Circuit blocks:
- Resistance Circuit.(Circuit #1).
- Series/Parallel Resistors. (Circuit #2).
- Series/Parallel Resistors Circuit with source. (Circuit #3).
- Intensity regulation. (Circuit #4).
- Wheatstone bridge. (Circuit #5).
- Faults study. (Circuit #6).

Dimensions (approx.)= 300 x 210 x 45 mm.
Weight: 300 gr.

More information in: www.edibon.com/products/catalogues/en/units/electronics/basic/LIEBA.pdf

PRACTICAL POSSIBILITIES

Measurement managing and checking instruments:
1.- Electronic instrumentation operation. Use of multimeter.
2.- Study of fault F1 in Resistance circuit.
3.- Study of fault F2 in Resistance circuit.
4.- Theoretical/practical exercises.

Ohm's Law:
5.- Ohm's Law verification.
6.- Power calculation.
7.- Theoretical/practical exercises.

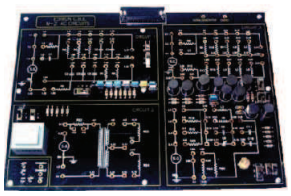
Resistors: characteristics and types:
8.- Resistor measurements. Color code. Ohmmeter.
9.- Study of Fault F1 in Resistors circuit.
10.- Study of Fault F2 in Resistors circuit.
11.- Theoretical/practical exercises.

Resistors association and the Wheatstone Bridge:
12.- Voltage and current measurement in a circuit with resistors connected in series.
13.- Series/Parallel configuration study.
14.- The Wheatstone Bridge.
15.- Study of Fault in Series Resistors circuit.
16.- Study of Fault in Parallel Resistors circuit.
17.- Study of Fault F1 in Wheatstone Bridge circuit.
18.- Study of Fault F2 in Wheatstone Bridge circuit.
19.- Theoretical/practical exercises.

Kirchoff's laws:
20.- Kirchoff's first law
21.- Kirchoff's second law.
22.- Fault study using Kirchoff's law.
23.- Theoretical/practical exercises.

Additional Possibilities:
Voltage/Current dividers.
Batteries and Switches.
Power source in series and parallel.
The Rheostat and Potentiometer.

M2. **Alternating Current (A.C.) Circuits**



SPECIFICATIONS SUMMARY

Circuit blocks:
- Wave forms. (Circuit #1).
- Transformers. (Circuit #2).
- Reactive mixed circuits. (Circuit #3).
- Channels.

Dimensions (approx.)= 300 x 210 x 45 mm.
Weight: 300 gr.

More information in: www.edibon.com/products/catalogues/en/units/electronics/basic/LIEBA.pdf

PRACTICAL POSSIBILITIES

Alternating signal characteristics. Instruments:
1.- Waveforms study in A.C.
2.- Introduction of anomalies in the Wave form circuit.
3.- Study of Faults in the Waveform circuit.
4.- Relation between peak values and RMS for sinusoidal waves.
5.- Resistance in a sinusoidal alternating current.
6.- Measurements using the oscilloscope.
7.- Voltage and current phase angles for resistors in sinusoidal alternating current.
8.- Sinusoidal A.C. resistors in series.
9.- Sinusoidal A.C. resistors in parallel.
10.- Exercises.

Behaviour of A.C. capacitors and inductors:
11.- Capacitance with square waveform and sinusoidal input current.
12.- Inductance with square waveform and a sinusoidal input voltage.
13.- Reactive reactance, Xc, variations with the frequency.
14.- Study of faults in capacitors.
15.- Reactive capacitance variations with the capacitance.
16.- A.C. capacitors in parallel.
17.- A.C. capacitors in series.
18.- A.C. capacitors as voltage dividers.
19.- Inductance in an A.C circuit.
20.- Inductive reactance variations with the inductance.
21.- Inductors in series in an A.C. circuit.
22.- Exercises.

Basic theorems and capacitance and inductance circuits:
23.- A.C. Resistor-Capacitor circuits in series.
24.- A.C. Resistor-Capacitor circuits in parallel.
25.- A.C. Resistor-Inductor circuits in series.
26.- Study of Fault 1 in the Circuit #3.
27.- Study of Fault 2 in the Circuit #3.
28.- A.C. Resistor-Inductor circuits in parallel.
29.- Exercises.

RLC Circuits:
30.- Resistance-Capacitance Filters.
31.- Filters inductive resistance. Low-Pass and High- Pass filters.
32.- Exercises.

Resonance:
33.- A.C. L-C Circuits in parallel with low impedance source.
34.- Study of Fault 1 in the resonance circuit.
35.- Study of Fault 2 in the resonance circuit.
36.- A.C. L-C Circuits in parallel with high impedance source.
37.- Circuit frequency response and bandwidth.
38.- A.C. R-L-C Circuits in series.
39.- Study of Fault 1 in the resonance circuit.
40.- Exercises.

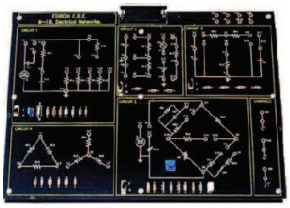
The transformer:
41.- The transformer.
42.- The transformer with load.
43.- Current measurement in the secondary Transformer with charge.
44.- Exercises.

LIEBA. **Basic Electronics and Electricity Integrated Laboratory:**

② Modules

➤**Basic Electricity concepts**

M16. **Electric Networks**



SPECIFICATIONS SUMMARY

Circuit blocks:
- Series/Parallel Connections. (Circuit#1).
- AC/DC. (Circuit#2).
- Superposition. (Circuit#3).
- Triangle .Star. (Delta | Y)(Circuit#4).
- Bridges. (Circuit#5).
- Channels.

Dimensions (approx.)= 300 x 210 x 45 mm.
Weight: 300 gr.

More information in: www.edibon.com/products/catalogues/en/units/electronics/basic/LIEBA.pdf

PRACTICAL POSSIBILITIES

Ohm's law:
1.- Calculation of the internal resistance of a continuous source.
2.- Error study in an internal resistance.
3.- Internal resistance calculation of an alternating source.
4.- Theoretical/practical exercises.

Electrical power:
5.- Power transferred by a DC source to load.
6.- Power transferred to a load by an AC source.
7.- Theoretical/practical exercises.

Power supplies combination:
8.- DC+DC assembly.
9.- Error study in the circuit, DC assembly.
10.- DC+AC assembly.
11.- Theoretical/practical exercises.

Thévenin's and Norton's theorems:
12.- Thévenin and Norton equivalent circuits. Conversion. Kirchoff's laws.
13.- Theoretical/practical exercises.

Superposition theorem:
14.- Application of the Superposition theorem.
15.- Error study in the Superposition circuit. Component values modifications.
16.- Theoretical/practical exercises.

Star-triangle transformation:
17.- Resistance measurement between terminals. Delta | Y configurations.
18.- Theoretical/practical exercises.

Wheatstone bridge:
19.- Calibration of a Wheatstone bridge fed by a DC source.
20.- Error study in the Wheatstone bridge circuit.
21.- Wheatstone bridge calibration fed by an AC source.
22.- Theoretical/practical exercises.

Additional Possibilities:
Millman's Theorem.

M17. **Electromagnetism**

SPECIFICATIONS SUMMARY

Circuit blocks:
- Coils. Hall effect probe. Materials. (Circuit#1).
- Solenoid. (Circuit#2).
- Excitation. Relays. (Circuit#3).
- Hall effect probe. DC Motor. (Circuit#4).
- Stepper motor. (Circuit#5).
- Channels.

Dimensions (approx.)= 300 x 210 x 45 mm.
Weight: 300 gr.

More information in: www.edibon.com/products/catalogues/en/units/electronics/basic/LIEBA.pdf

PRACTICAL POSSIBILITIES

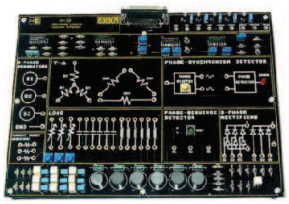
Magnetic fields:
1.- Magnetic fields measurement.
2.- Induced electromotive force. Coil Reactance calculation.
3.- Exercises.

Electromagnetic applications:
4.- Mutual Inductance.
5.- Basic operation of the transformer.
6.- Core effect in a transformer response.
7.- Fault study in the Transformer.
8.- Basic operation of the solenoid.
9.- Fault study in the Solenoid circuit.
10.- Basic operation of a relay.
11.- Self-holding of the position of the contacts.
12.- Fault study in the Relay circuit.
13.- Exercises.

Direct current motor:
14.- Characteristic Speed/Voltage of a continuous current motor.
15.- Motor used as DC generator.
16.- Cemf.
17.- Exercises.

Stepper Motor:
18.- Stepper motor working.
19.- Fault study in Stepping motor circuit.
20.- Exercises.

M18. **Three-phase Circuits**



SPECIFICATIONS SUMMARY

Circuit blocks:
- Three-phase generator.
- Star-Delta (Y-Δ).
- Phase-synchronism detector.
- Current resistors.
- Loads.
- Phase-sequence detector.
- Three-phase rectifiers:
  - -Full wave three-phase rectifier.
  - -Half wave three-phase rectifier.

Dimensions (approx.)= 300 x 210 x 45 mm.
Weight: 300 gr.

More information in: www.edibon.com/products/catalogues/en/units/electronics/basic/LIEBA.pdf

PRACTICAL POSSIBILITIES

Generation of a three-phase system:
1.- Checking of the three-phase system.
2.- Calculation of the voltage values.

Three-phase loads in star and delta:
3.- Star-delta equivalence.
4.- Decompensation of the star.
5.- Out-phase between voltage and current (reactance).
6.- Measurement of the power factor.
7.- Correction of the power factor.

Synchronism detector:
8.- Out-phase generation between waves.
9.- Detection of out-phase between waves.

Phase-sequence detector:
10.- Waves in direct sequence.
11.- Waves in inverse sequence.

Three-phase rectifier:
12.- Half-wave three-phase rectifier.
13.- Full-wave three-phase rectifier.

LIEBA. **Basic Electronics and Electricity Integrated Laboratory:**

② Modules

➤**Electronics Applications**

M43. **Applications of Temperature**

SPECIFICATIONS SUMMARY

Circuit blocks:
- Counter/Timer.
- Thermometric probes (Type 'K', IC, Thermistor, Platinum RTD).
- Wheatstone bridge.
- Carbon track.
- Buzzer.
- Electronic switch.
- Voltage to frequency converter.
- Differentiator.
- AC Amplifier.
- Amplifier (Adjust offset. Gain).
- Comparator. Hyteresis.
- Instrumental amplifier.
- Buffer.
- x100 amplifier.

Dimensions (approx.) = 300 x 210 x 45 mm.
Weight: 300 gr.

More information in: www.edibon.com/products/catalogues/en/units/electronics/basic/LIEBA.pdf

PRACTICAL POSSIBILITIES

The integrated circuit temperature transducer:

1.- Characteristics of an integrated temperature circuit.

2.- Construction of a digital thermometer.

The (T.D.R.) Platinum transducer:

3.- Characteristics of a platinum Temperature Dependent Resistance (T.D.R) transducer.

The N.T.C (Negative Temperature Coefficient) thermistor:

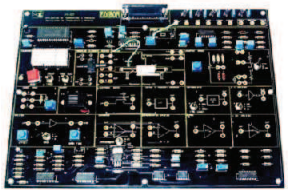
4.- Characteristics of an N.T.C thermistor.

5.- N.T.C Characteristics. Thermistor used in an alarm circuit (double thermistor).

The "K" type thermocouple temperature thermistor:

6.- Characteristics of a 'K' type thermocouple.

M49. **Applications of Temperature and Pressure**



SPECIFICATIONS SUMMARY

Circuit blocks:
- Counter/Timer.
- Thermometric probes (Type 'K', IC, Thermistor, Platinum RTD).
- Wheatstone bridge.
- Carbon track.
- Buzzer.
- Pressure transducer.
- Electronic switch.
- Voltage to frequency converter.
- Differentiator.
- AC Amplifier.
- Amplifier (Adjust offset. Gain).
- Comparator. Hyteresis.
- Instrumental amplifier.
- Buffer.
- x100 amplifier.

Dimensions (approx.) = 300 x 210 x 45 mm.
Weight: 300 gr.

More information in: www.edibon.com/products/catalogues/en/units/electronics/basic/LIEBA.pdf

PRACTICAL POSSIBILITIES

The integrated circuit temperature transducer:

1.- Characteristics of an integrated temperature circuit.

2.- Construction of a digital thermometer.

The (T.D.R.) Platinum transducer:

3.- Characteristics of a platinum Temperature Dependent Resistance (T.D.R) transducer.

The N.T.C (Negative Temperature Coefficient) thermistor:

4.- Characteristics of an N.T.C thermistor.

5.- N.T.C Characteristics. Thermistor used in an alarm circuit (double thermistor).

The "K" type thermocouple temperature thermistor:

6.- Characteristics of a 'K' type thermocouple.

The Pressure transducer:

7.- Characteristic of a pressure transducer.

M44. **Applications of Light**

SPECIFICATIONS SUMMARY

This module enables to carry out different practices related with the light intensity measurement.

The module has five different types of light sensors.

On the chassis there are two holders with a lamp and the sensors. The lamp is used to control the illumination incident. The module also includes a dark cover box whose aim is to avoid the environmental light noise.

Elements included:
- Lamp.
- Photodiode.
- Phototransistor.
- LDR.
- Photovoltaic cell.
- IR Emitter.
- IR Receiver.

Dimensions (approx.) = 405 x 300 x 350 mm.
Weight: 3 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electronics/basic/LIEBA.pdf

PRACTICAL POSSIBILITIES

1.- Study of the equivalent electrical circuit of a photodiode.

2.- Study of the V-I characteristic of a photodiode.

3.- Study of the photovoltaic and photoconductive modes of a photodiode.

4.- Study the "ON/OFF" operation mode of a phototransistor.

5.- Measurement of light intensity using a photovoltaic cell.

6.- Study of the properties of light dependent resistors (LDR).

7.- Study of different real applications using IR sensors.

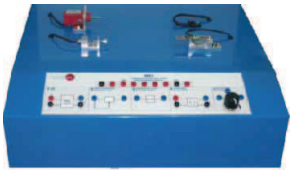
8.- Study of a real application for controlling the light intensity using PID control elements.

LIEBA. **Basic Electronics and Electricity Integrated Laboratory:**

② Modules

➤**Electronics Applications**

M45. **Linear Position and Force**



SPECIFICATIONS SUMMARY

This module enables to carry out different practices related with linear position and force sensors.

Elements included:

- Force sensor.
- Linear Position Sensor.
- LVDT.
- Extensiometric gauge.
- Potentiometer.

Dimensions (approx.)= 405 x 300 x 350 mm.

Weight: 6 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electronics/basic/LIEBA.pdf

PRACTICAL POSSIBILITIES

1.- Characteristics of a Linear Variable Differential Transformer (LVDT).
2.- Displacement measurement by means of LVDT.
3.- Characteristics of a variable resistance.
4.- Characteristics of a strain gauge transducer.
5.- Deformation measurement by means extensiometric gauges.
6.- Characteristic of a force sensor.
7.- Characteristic of a Lineal Position Sensor.
8.- Potentiometer.

M46. **Environmental Measurements**

SPECIFICATIONS SUMMARY

This module enables to carry out different practices related with variable environmental transducers. The module has different types of sensors.

On the chassis there are the sensors. The heater is used to control the temperature.

Elements included:

- Heater resistor.
- Temperature sensor.
- Humidity sensor.
- Differential pressure sensor.
- Air speed sensor.
- Manometer.
- Air compressor.

Dimensions (approx.)= 405 x 330 x 350 mm.

Weight: 6 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electronics/basic/LIEBA.pdf

PRACTICAL POSSIBILITIES

1.- Characteristics of the temperature sensor.
2.- Characteristics of air speed sensor.
3.- Characteristics of differential pressure sensor.
4.- Characteristics of the humidity sensor.

M15. **Development Module**

SPECIFICATIONS SUMMARY

This is a module to build and implement student's own circuits, it consists on:

- Development board.
- Power supply connector.
- Digital visual display unit.
- Logical source.
- Set of potentiometers.
- Pulse generator and inverters.
- Interrupter.
- Clock.

Dimensions (approx.)= 300 x 210 x 45 mm.

Weight: 300 gr.

More information in: www.edibon.com/products/catalogues/en/units/electronics/basic/LIEBA.pdf

M48. **Sounds Measurements**

SPECIFICATIONS SUMMARY

This module enables to carry out different practices related with variable sound measures. The module has three different types of components: two kind of microphones and a loudspeaker.

Elements included:

- Loudspeaker.
- Dynamic moving coil microphone.
- Condenser microphone.

Dimensions (approx.)= 405 x 300 x 350 mm.

Weight: 6 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electronics/basic/LIEBA.pdf

PRACTICAL POSSIBILITIES

1.- Characteristics of a dynamic microphone.
2.- Characteristics of a condenser microphone.
3.- Characteristics of a loudspeaker.

LIEBA. **Basic Electronics and Electricity Integrated Laboratory:**

➤**Control**

② Modules

RYC/B. **Basic Teaching Unit for the Study of Regulation and Control**

SPECIFICATIONS SUMMARY

RYC/B allows the user to learn the basics about regulation and control of first and second order systems.

This unit enables to carry a set of practices related with basic regulation and control, through which the user will understand how to characterize first and second order systems and how a PID controller works.

Elements included:

Power Supply. Protection fuse. Block diagrams in the front panel.

Modules:

- Reference signals:
  - Step.
  - Ramp.
  - Sine.
- PID controller:
  - P controller.
  - I controller.
  - D controller.
- Systems:
  - First Order System.
  - Second Order System.

Dimensions (approx.) = 490 x 330 x 310 mm.

Weight: 10 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electronics/basic/LIEBA.pdf

PRACTICAL POSSIBILITIES

1.- Response of a first order system in time domain. (Step-response).
2.- Response of a first order system in time domain. (Ramp-response).
3.- Response of a first order system in time domain. (Sinusoidal-response).
4.- Response of a first order system in frequency domain (Sinusoidal-response).
5.- Response of a second order system in time domain (Step-response).
6.- Response of a second order system in time domain. (Ramp-response).
7.- Response of a second order system in time domain. (Sinusoidal-response).
8.- Response of a second order system in frequency domain (Sinusoidal-response).
9.- Structure of a PID controller (Proportional-Integrative-Derivative blocks).
10.- PID control of a first order system in open-loop.
11.- PID control of a second order system in open-loop.
12.- PID control of a first order system in closed- loop. (Mathematical tuning).
13.- PID control of a first order system in closed- loop. (Experimental tuning)
14.- PID control of a first order system in closed- loop. (Ziegler-Nichols tuning).
15.- PID control of a second order system in closed- loop. (Mathematical tuning).
16.- PID control of a second order system in closed- loop. (Experimental tuning).
17.- PID control of a second order system in closed- loop. (Ziegler-Nichols tuning).

M47. **Rotational Speed & Position Control**

SPECIFICATIONS SUMMARY

On the module, mounted on its upper part, there is a miniature motor used to move the axle. The motor speed can be changed adjusting the voltage delivered to the actuator motor. The rotation speed can be measured using the different measurement transducers placed on the axle.

Elements included:

- DC Motor.
- DC Tachometer.
- Inductive sensor.
- Slot Optical Sensor.
- Refractive Infrared Sensor.
- Hall Effect Sensor.
- Encoder.

Dimensions (approx.) = 405x300x300 mm.

Weight: 6 Kg.

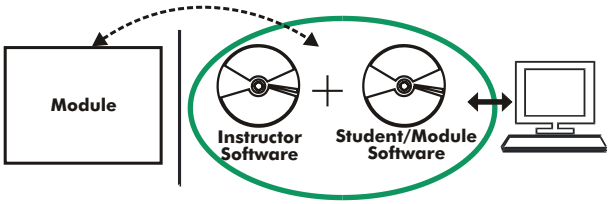
More information in: www.edibon.com/products/catalogues/en/units/electronics/basic/LIEBA.pdf

PRACTICAL POSSIBILITIES

1.- DC Motor
2.- DC Tachometer.
3.- Inductive sensor.
4.- Reflexive Infrared Sensor
5.- Slot sensor.
6.- Hall-Effect.
7.- Encoder.

LIEBA. **Basic Electronics and Electricity Integrated Laboratory:**

③ CAI. Computer Aided Instruction Software System



With no physical connection between module and computer, this complete package consists on an Instructor Software (INS/SOF) totally integrated with the Student/Module Software (M../SOF). Both are interconnected so that the teacher knows at any moment what is the theoretical and practical knowledge of the students. These, on the other hand, get a virtual instructor who helps them to deal with all the information on the subject of study.

- INS/SOF. Classroom Management Software (Instructor Software):

The Instructor can:

- Organize Students by Classes and Groups.
- Create easily new entries or delete them.
- Create data bases with student information.
- Analyze results and make statistical comparisons.
- Print reports.
- Develop own examinations.
- Detect student's progress and difficulties.

...and many other facilities.

The Instructor Software is the same for all the modules, and working in network configuration allows controlling all the students in the classroom.

Instructor Software

- M../SOF. Computer Aided Instruction Softwares (Student/Module Software):

It explains how to use the module, run the experiments and what to do at any moment. Each module has its own Student Software.

- The options are presented by pull-down menus and pop-up windows.
- Each Software contains:

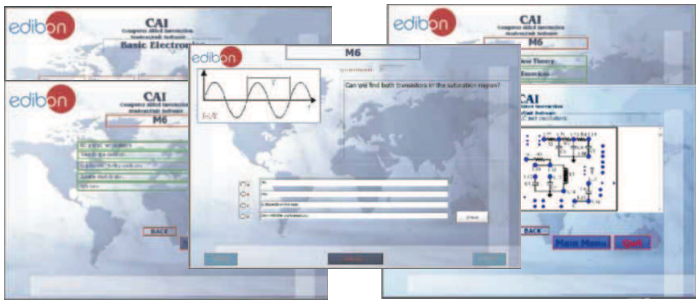
  Theory: that gives the student the theoretical background for a total understanding of the studied subject.

  Exercises: divided by thematic areas and chapters to check out that the theory has been understood.

  Guided Practices: presents several practices to be done with the module, showing how to complete the circuits and get the right information from them.

  Exams: set of questions presented to test the obtained knowledge.

Student/Module Software



Available Student/Module Softwares:

➤Basic Electronics concepts
- . M3/SOF. Semiconductors I.
- . M4/SOF. Semiconductors II.
- . M6/SOF. Oscillators.
- . M7/SOF. Operational Amplifiers.
- . M8/SOF. Filters.
- . M9/SOF. Power Electronics.
- . M60/SOF. Analog/Digital Converters.
- . M61/SOF. Digital/Analog Converters.
- . M99/SOF. Expansion Unit.
- . M99-6/SOF. Motors, Generators and Controls.

➤Digital Electronics
- . M10/SOF. Digital Systems & Converters.
- . M11/SOF. Digital Electronics Fundamentals.
- . M12/SOF. Basic Combinational Circuits.
- . M13/SOF. Basic Sequential Circuits.
- . M14/SOF. Optoelectronics.
- . M41/SOF. Resistance Transducers.

➤Basic Electricity concepts
- . M5/SOF. Power Supplies.
- . M1/SOF. Direct Current (D.C.) Circuits.
- . M2/SOF. Alternating Current (A.C.) Circuits.
- . M16/SOF. Electric Networks.
- . M17/SOF. Electromagnetism.
- . M18/SOF. Three-phase Circuits.

➤Electronics Applications
- . M43/SOF. Applications of Temperature.
- . M49/SOF. Applications of Temperature and Pressure.
- . M44/SOF. Applications of Light.
- . M45/SOF. Linear Position and Force.
- . M46/SOF. Environmental Measurements.
- . M48/SOF. Sounds Measurements.

➤Control
- . RYC/B/SOF. Study of Regulation and Control.
- . M47/SOF. Rotational Speed & Position Control.

④ LIEBA/CAL. Computer Aided Learning Software (Results Calculation and Analysis)

This Computer Aided Learning Software (CAL) is a Windows based software, simple and very easy to use, specifically developed by EDIBON.

CAL is a class assistant that helps in making the necessary calculations to extract the right conclusions from data obtained during the experimental practices.

CAL will perform the calculations.

CAL computes the value of all the variables involved.

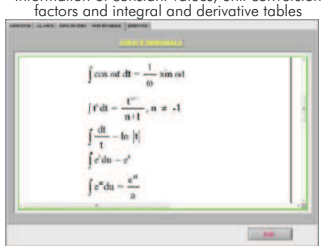
It allows to plot and print the results. Between the plotting options, any variable can be represented against any other.

Different plotting displays.

It has a wide range of information, such as constant values, unit conversion factors and integral and derivative tables.

Calculations

Information of constant values, unit conversion factors and integral and derivative tables



Plotting options

Available Softwares:

➤Basic Electronics concepts
- . M3/CAL. Semiconductors I.
- . M4/CAL. Semiconductors II.
- . M6/CAL. Oscillators.
- . M7/CAL. Operational Amplifiers.
- . M8/CAL. Filters.
- . M9/CAL. Power Electronics.
- . M60/CAL. Analog/Digital Converters.
- . M61/CAL. Digital/Analog Converters.
- . M99/CAL. Expansion Unit.
- . M99-6/CAL. Motors, Generators and Controls.

➤Digital Electronics
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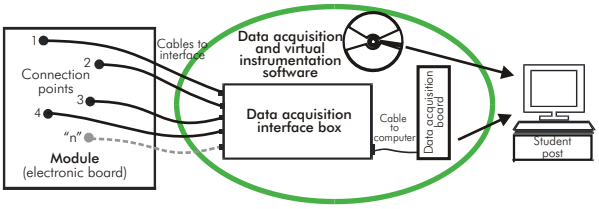
- . M46/CAL. Environmental Measurements.
- . M48/CAL. Sounds Measurements.

➤Control
- . RYC/B/CAL. Study of Regulation and Control.
- . M47/SOF. Rotational Speed & Position Control.

More information in: www.edibon.com/products/catalogues/en/units/electronics/basic/LIEBA.pdf

LIEBA. **Basic Electronics and Electricity Integrated Laboratory:**

⑤ EDAS/VIS. EDIBON Data Acquisition System + Virtual Instrumentation System



EDAS/VIS is the perfect link between the modules and the PC. With the EDAS/VIS system, information from the modules is sent to the computer. There, it can be analyzed and represented.
We easily connect the Data Acquisition Interface Box (DAIB) to the modules with the supplied cables (connection points are placed in the modules). Like any other hardware, the DAIB is connected to the PC through the Data Acquisition Board (DAB), and by using the Data Acquisition and Virtual Instrumentation Software the student can get the results from the undertaken experiment/practice, see them on the screen and work with them.

The EDAS/VIS System includes a Hardware: DAIB Data Acquisition Interface Box + DAB. Data Acquisition Board and a Software: EDAS/VIS-SOF. Data Acquisition and Virtual Instrumentation Software:

1) DAIB. **Data Acquisition Interface Box:**
Metallic box. Dimensions: 310 x 220 x 145 mm. approx.
Front panel:
16 Analog inputs.
Sampling velocity 1,250,000 samples per second for EDAS/VIS 1.25 Version.
Sampling velocity 250,000 samples per second for EDAS/VIS 0.25 Version.
2 Analog outputs. 24 Digital inputs/outputs, configurable as inputs or outputs.
4 Digital signal switches 0-5 V. 2 Analog signal potentiometers ±12 V.
Inside: Internal power supply of 12 and 5 V. Potentiometer.
Back panel: Power supply connector. SCSI connector (for connecting with the data acquisition board).
Connecting cables.

DAIB

+

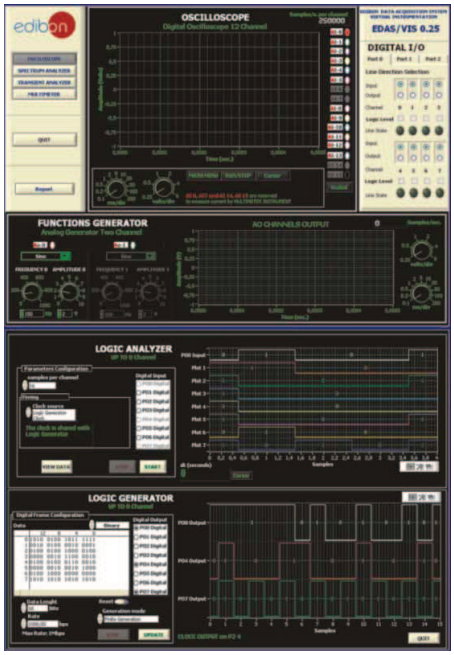
2) DAB. **Data Acquisition Board:**
PCI Data acquisition board (National Instruments) to be placed in a computer slot.
For EDAS/VIS 1.25 Version:
Analog input: Number of channels= 16. Sampling rate up to: 1,250,000 S/s (samples per second).
Analog output: Number of channels= 2. Max. output rate up to: 833 KS/s.
Digital Input/Output: Number of channels= 24 inputs/outputs.

For EDAS/VIS 0.25 Version:
This is a similar version to the 1.25, with the following differences:
Sampling rate up to: 250,000 S/s (samples per second).
Analog output: Max. output rate up to: 10 KS/s.

DAB

+

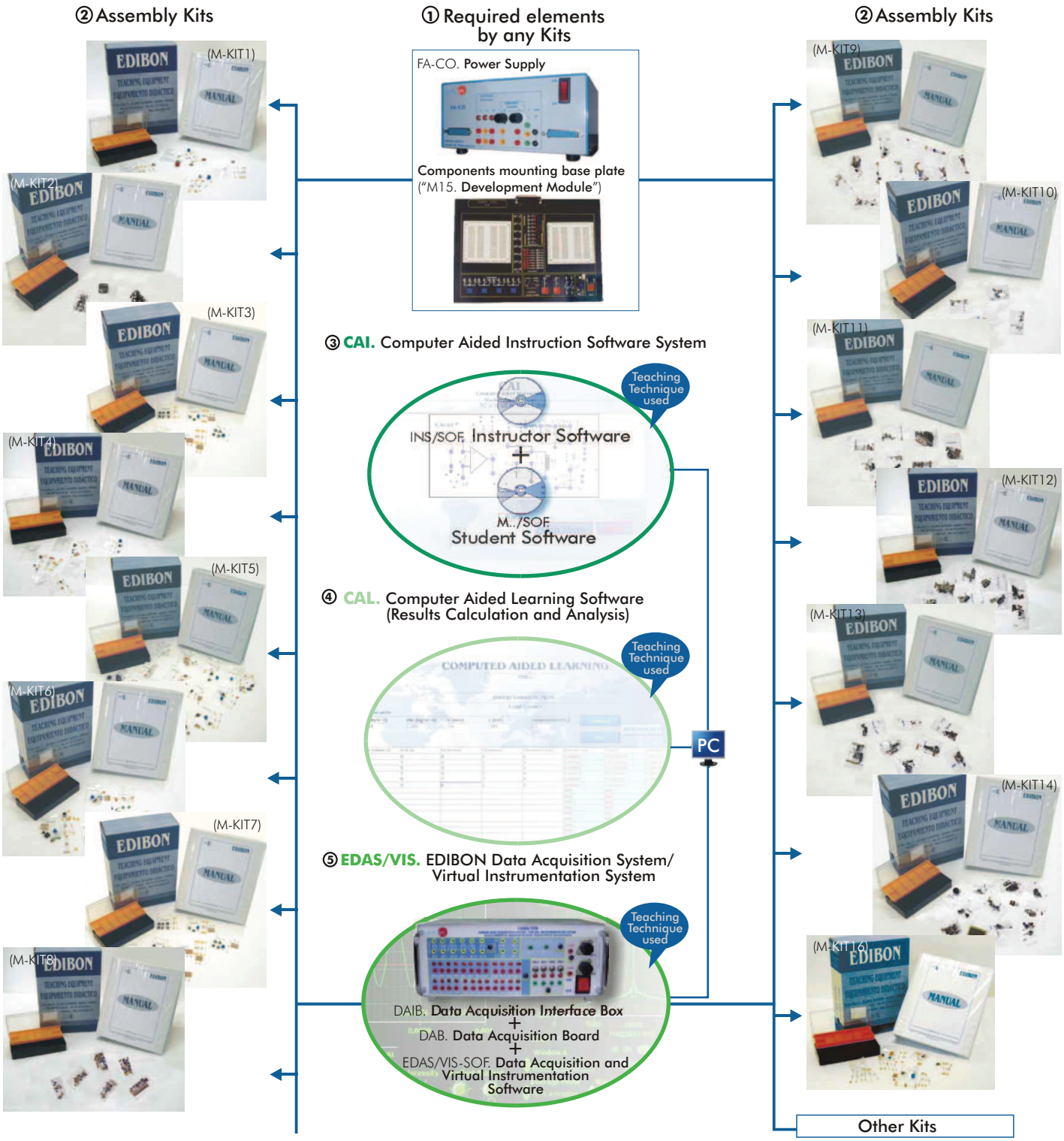
3) EDAS/VIS-SOF. **Data Acquisition and Virtual Instrumentation Software:**
Compatible with actual Windows operating systems. Friendly graphical frame.
Configurable software allowing the temporal/frequency representation of the different inputs and outputs. Visualization of a voltage of the circuits on the computer screen.
It allows data store in a file, print screens and reports of the signals at any time.
Measurement, analysis, visualization, representation and report of results.
Set of Virtual Instruments:
-**Oscilloscope:**
Channels: 12 simultaneous.
-**Function Generator:**
Two independent signal generators, for sinusoidal, triangular, saw tooth and square. Channels: 2.
-**Spectrum Analyzer:**
Channels: 12 (simultaneous).
-**Multimeter:**
Voltmeter (Channels: 12 (simultaneous)). Ammeter (Channels: 2 (simultaneous)).
-**Transient Analyzer.**
-**Logic Analyzer:**
Number of Input channels: 8.
Clock Source: 3 different sources.
This instrument allows receiving as far as 8 digital signal simultaneously at 1 or 8 Mbps (depending of the version).
-**Logic Generator:**
Number of transmission channels: 8.
This instrument allows generating up to 8 digital simultaneous signals of 1 or 8 Mbps (depending of the version).
Sampling velocity 1,250,000 samples per second for EDAS/VIS 1.25 Version.
Sampling velocity 250,000 samples per second for EDAS/VIS 0.25 Version.



EDAS/VIS-SOF

More information in: www.edibon.com/products/catalogues/en/units/electronics/basic/LIEBA.pdf

M-KITS. **Basic Electronics and Electricity Assembly Kits:**



The complete system includes parts 1 to 5 and any part can be supplied individually or additionally. (Power supply + Module (M15) + Kit/s, is the minimum supply).

Available Assembly Kits:

➤Basic Electronics concepts
- .M3-KIT. Semiconductors I.
- .M4-KIT. Semiconductors II.
- .M6-KIT. Oscillators.
- .M7-KIT. Operational Amplifiers.
- .M8-KIT. Filters.
- .M9-KIT. Power Electronics.

➤Digital Electronics
- .M10-KIT. Digital Systems & Converters.
- .M11-KIT. Digital Electronics Fundamentals.
- .M12-KIT. Basic Combinational Circuits.
- .M13-KIT. Basic Sequential Circuits.
- .M14-KIT. Optoelectronics.

➤Basic Electricity concepts
- .M5-KIT. Power Supplies.
- .M1-KIT. Direct Current (D.C.) Circuits.
- .M2-KIT. Alternating Current (A.C.) Circuits.
- .M16-KIT. Electric Networks.

More information in: www.edibon.com/products/catalogues/en/units/electronics/electronickits/M-KITS.pdf

M-KITS. **Basic Electronics and Electricity Assembly Kits:**

① Required elements by any Kits

FA-CO. **Power Supply**

SPECIFICATIONS SUMMARY

Fixed outputs: + 5 V, ± 12 V, 1 A. Variable outputs: ± 12 V, 0.5 A. AC output: 12V. or 24 V. Outputs through either 2mm. contact terminals, or through 25 pin CENTRONICS connectors (2 outputs). LED's voltage indicators. Robust construction. Supply: 110/220V A.C. Frequency: 50/60 Hz.

FA-CO includes all the requirements for full working with any kit from M1-KIT to M16-KIT.

Dimensions: 225 x 205 x 100 mm. approx. Weight: 2 Kg. approx.

M15. **Development Module**

SPECIFICATIONS SUMMARY

Components mounting baseplate.

This is a module to build and implement student's own circuits, it consist on:

Development board. Power supply connector. Digital visual display unit. Logical source. Set of potentiometers. Pulse generator and inveters. Interrupter. Clock.

Dimensions: 300 x 210 x 45 mm. approx. Weight: 300 gr. approx.

②Assembly Kits

KITS, containing each one:

Assembly and practice manuals (8 manuals supplied). Set of components and wires necessary for mounting the corresponding practice. After the first assembly, all the elements are recoverable.

➤Basic Electronics concepts

M3-KIT. **Semiconductors I**

PRACTICAL POSSIBILITIES

Characteristics of the PN junction:
1.- Study of the diode.
2.- Fault Study in Diodes.
The diode as a rectifier element:
3.- Half wave rectifier.
4.- Study of faults in Rectifier circuit.
5.- Bridge rectifier.
6.- Study of faults in bridge rectifier.
The Zener diode:
7.- Voltage regulator with a Zener diode.
8.- Study of faults in Zener circuit.
Study and characteristics of the transistor:
9.- Study of the transistor.
10.- Study of the fault in the transistor.
Transistor characteristics operating as a switch:
11.- Study of the transistor as a switch.
Common emitter amplifier:
12.- Study of the common emitter NPN amplifier.
13.- Fault Study in Amplifier circuit.
14.- Study of the common emitter PNP amplifier.

M4-KIT. **Semiconductors II**

PRACTICAL POSSIBILITIES

Complementary transistors pair:
1.- Complementary transistors pair.
2.- Transistors pair with alternating signal.
3.- Fault study of the complementary Transistor pair.
Darlington configuration:
4.- Darlington configuration.
5.- Fault study of the Darlington configuration.
Differential amplifier:
6.- Differential amplifier.
7.- Fault study in the differential amplifier.
Study and characteristics of the JFET transistor:
8.- JFET characteristics.
9.- Fault study with the JFET transistor.
Analog switch:
10.- Analog switch.
Multistage Amplifier. Direct coupling:
11.- Amplifier coupled directly.
12.- Fault study of an amplifier coupled directly.

M6-KIT. **Oscillators**

PRACTICAL POSSIBILITIES

Oscillators. RC and LC Nets:
1.- RC net oscillator.
2.- LC net oscillator.
3.- Faults study with RC and LC Net oscillators.
Wien bridge oscillator:
4.- Wien Bridge.
5.- Fault study in the Wien bridge oscillator.
Colpitts oscillator. Hartley oscillator:
6.- Colpitts oscillator.
7.- Hartley oscillator.
8.- Faults study with the Colpitts oscillator.
Astable multivibrator:
9.- Astable multivibrator.
10.- Fault study with an Astable multivibrator.
555 TIMER:
11.- 555 timer.
12.- 555 timer fault study.

More information in: www.edibon.com/products/catalogues/en/units/electronics/electronickits/M-KITS.pdf

M-KITS. **Basic Electronics and Electricity Assembly Kits:**

② Assembly Kits

➤**Basic Electronics concepts**

M7-KIT. **Operational Amplifiers**

PRACTICAL POSSIBILITIES

Operational amplifier characteristics:
1.- Operational amplifier study.
2.- Closed-loop output compensation voltage.
3.- Operational amplifier fault study.
The inverting amplifier:
4.- Inverting amplifier study.
5.- Inverting amplifier fault study.
The non-inverting amplifier:
6.- Study of the non-inverting amplifier.
7.- Voltage follower.
8.- Fault study in the non-inverting amplifier.
The adder amplifier:
9.- Adding amplifier study.
10.- Fault study in the adding amplifier.
The differential amplifier:
11.- Differential amplifier study.
12.- Differential amplifier fault study.
Comparators:
13.- Comparator study.
14.- Comparators fault study.

M8-KIT. **Filters**

PRACTICAL POSSIBILITIES

RC and LC filter responses:
1.- Frequency response.
2.- Low-pass filter.
3.- High-pass filter.
4.- LC Circuit.
5.- Study of Error in Low-pass filter.
6.- Study of Error in High-pass filter.
T-shaped Filter:
7.- Filter with double T link.
8.- Generator circuit of the signal S1.
9.- Study of Error in RC filter with double T.
Active filters:
10.- Low-pass filter.
11.- Low-pass filter with load and operational amplifier.
12.- High-pass filter.
13.- High-pass filter with load and operational amplifier.
14.- The attenuation is cumulative.
15.- Use of Operational Amplifier.
16.- Study of Faults in filters.
Association of filters:
17.- Behaviour of the filter.
18.- Filter of distorted signal.
19.- Filter in cascade; low pass filter and high pass filter.
20.- Filter in parallel.
21.- Study of Error in filters.

M9-KIT. **Power Electronics**

PRACTICAL POSSIBILITIES

The bipolar power transistor:
1.- Study of the power transistor.
2.- Study of faults in the power transistor.
The MOSFET transistor:
3.- Study of the MOSFET transistor.
4.- Study of faults in the MOSFET transistor.
The thyristor:
5.- Study of the thyristor.
6.- Study of error of the thyristor.
The UJT transistor and trigger circuits of the thyristor:
7.- Study of the trigger circuits of the thyristor.
8.- Study of insulation circuits.
The TRIAC:
9.- Study of the TRIAC.
10.- Practical assembly of the TRIAC.

➤**Digital Electronics**

M10-KIT. **Digital Systems & Converters**

PRACTICAL POSSIBILITIES

Analog switching. The bistable, astable and monostable family:
1.- Characteristics of an analog switch chip.
2.- Study of errors in the Analog Multiplexer.
3.- Study of errors in the Analog Multiplexer.
4.- Characteristics of an S-R type Latch Integrated circuit.
5.- Error study in the bistable.
6.- Characteristics of an integrated astable circuit.
7.- Error study in the astable.
8.- Characteristics of an integrated Monostable circuit.
Behaviour of Binary/BCD Counters & 7-segments Displays:
9.- Characteristics of Binary UP/DOWN Counter 74LS193 and 7-Segment Display.
10.- Error study in the binary counter.
11.- Characteristics of the BCD UP/DOWN counter and 7-Segment Display.
12.- Error study in the BCD counter.
Comparators and analog integrators:
13.- Characteristics of an analog comparator.
14.- Analog integrator.
15.- Error study in the analog integrator.
16.- Triangular wave generation.
A/D and D/A conversion:
17.- D/A Converter.
18.- A/D Converter.
Applications:
19.- Random number generator.
20.- Measuring the time between two events.

M11-KIT. **Digital Electronics Fundamentals**

PRACTICAL POSSIBILITIES

Numbers systems:
1.- Voltage measurement in a circuit of SOURCES.
2.- Fault study in the circuit.
Logical circuits:
3.- Logical Diode.
4.- Fault study in sources.
5.- Logic with transistor and diodes.
6.- Fault study in transistor/diode circuit.
TTL gates:
7.- Basic function gates.
8.- Study of faults in TTL circuit.
9.- Study of faults in Logic Gates.
CMOS gates:
10.- Basic function gates.
11.- Study of faults in CMOS circuit.
Boolean Algebra and logical functions:
12.- Study of use of the circuit.
Open collector gates:
13.- Study of the use of the circuit.
Others types of integrated gates:
14.- Study of simple operations with a Schmitt Trigger inverter.
15.- Operation study of a three-state buffer.
16.- Study of the fault in the circuit.

M12-KIT. **Basic Combinational Circuits**

PRACTICAL POSSIBILITIES

Encoders:
1.- Study of an encoder.
2.- Fault study in the encoder.
Decoders:
3.- Study of a decoder.
4.- Fault study in the decoder.
Multiplexers:
5.- Study of a multiplexer.
6.- Study of errors in the multiplexers.
Demultiplexers:
7.- Study of a demultiplexer.
8.- Study of errors in demultiplexers.
Digital Comparators:
9.- Study of a comparator.
10.- Study of errors in a comparator.
Arithmetic and logic operations:
11.- Study of an adder.
12.- Study of error of the arithmetic and logic operations.
13.- Study of a parity generator.
14.- Study of error in the Parity generator.

More information in: www.edibon.com/products/catalogues/en/units/electronics/electronickits/M-KITS.pdf

2.2- Electronics Kits

M-KITS. **Basic Electronics and Electricity Assembly Kits:**

②Assembly Kits

➤**Digital Electronics**

M13-KIT. **Basic Sequential Circuits**

PRACTICAL POSSIBILITIES

Bistables:
1.- Bistables.
2.- Bistable S-R using NAND gates.
3.- Practical performance.
4.- Study of error in the Bistables.

Shift registers:
5.- Shift registers.
6.- Study of faults of the Shift registers.

Counters:
7.- Practice of the Counters.
8.- Study of faults of the Counters.

Synchronised sequential circuits:
9.- Practice of the Synchronised.
10.- Study of errors of the Synchronised sequential circuits.

Memories:
11.- Exercises

M14-KIT. **Optoelectronics**

PRACTICAL POSSIBILITIES

Light transmitters and liquid crystal display (LCD):
1.- Light transmitters.
2.- Bar graph.
3.- LCD display and 7-segment display.
4.- Fault study in light transmitters and liquid crystal display.

Photo-conducting cells:
5.- Light dependent resistors.
6.- Alarm.
7.- Fault study on the photo-conducting cell.

Fibre optics:
8.- Fibre optics practice.
9.- Fault study using fibre optics.

Infrared:
10.- Circuit with infrared diodes.
11.- Fault study of the infrared diodes.

➤**Basic Electricity concepts**

M5-KIT. **Power Supplies**

PRACTICAL POSSIBILITIES

Rectification:
1.- Rectification.
2.- Bridge rectifier.

Fixed voltage sources:
3.- Power supply with the Zener diode.
4.- Stabilization through Zener and Transistor.
5.- Fault study in "Stabilization through Zener and Transistor".
6.- Protection against overcurrents.
7.- Protection against overvoltages.
8.- Study of fault "Protection against overcurrents".

Symmetrical voltage power sources:
9.- Symmetrical source; 78XX regulator.
10.- Symmetrical source; 79XX regulator.

Voltage regulators with integrated circuits:
11.- Adjustable regulator; LM317.
12.- Study of fault in adjustable LM317 regulator.
13.- Adjustable L200 regulator.
14.- Fault study in adjustable L200 Regulator.

Introduction to switched power supplies:
15.- Switching technique.
16.- Switching technique. PWM.
17.- Switching technique. Boost.

M1-KIT. **Direct Current (D.C.) Circuits**

PRACTICAL POSSIBILITIES

Measurement managing and checking instruments:
1.- Electronic instrumentation operation. Use of multimeter.
2.- Study of faults in Resistance circuit.

Ohm's Law:
3.- Ohm's Law verification.
4.- Power calculation.

Resistors: characteristics and types:
5.- Resistor measurements. Color code. Ohmmeter.
6.- Study of Faults in Resistors circuit .

Resistors association and the Wheatstone Bridge:
7.- Voltage and current measurement in a circuit with resistors connected in series.
8.- Series/Parallel configuration study.
9.- The Wheatstone Bridge.
10.- Study of Fault in Series Resistors circuit.
11.- Study of Fault in Parallel Resistors circuit.
12.- Study of Faults in Wheatstone Bridge circuit.

Kirchoff's laws:
13.- Kirchoff's first law.
14.- Kirchoff's second law.
15.- Fault study using Kirchoff's law.

M2-KIT. **Alternating Current (A.C.) Circuits**

PRACTICAL POSSIBILITIES

Alternating signal characteristics. Instruments:
1.- Waveforms study in A.C.
2.- Introduction of anomalies in the Wave form circuit.
3.- Study of Faults in the Wave form circuit.
4.- Relation between peak values and RMS for sinusoidal waves.
5.- Resistance in a sinusoidal alternating current.
6.- Measurements using the oscilloscope.
7.- Voltage and current phase angles for resistors in sinusoidal alternating current.
8.- Sinusoidal A.C. resistors in series.
9.- Sinusoidal A.C. resistors in parallel.

Behaviour of A.C. capacitors and inductors:
10.- Capacitance with square waveform and a sinusoidal input current.
11.- Inductance with square waveform and a sinusoidal input voltage.
12.- Reactive reactance, Xc, variations with the frequency.
13.- Study of faults in capacitors.
14.- Reactive capacitance variations with capacitance.
15.- A.C. capacitors in parallel.
16.- A.C. capacitors in series.
17.- A.C. capacitors as voltage dividers.
18.- Inductance in an A.C circuit.
19.- Inductive reactance variations with the inductance.
20.- Inductors in series in an A.C. circuit.

Basic theorems and capacitance and inductance circuits:
21.- A.C. Resistor-Capacitor circuits in series.
22.- A.C. Resistor-Capacitor circuits in parallel.
23.- A.C. Resistor-Inductor circuits in series.
24.- Study of Faults in the Circuit.
25.- A.C. Resistor-Inductor circuits in parallel.

RLC Circuits:
26.- Resistance-Capacitance Filters.
27.- Filters inductive resistance. Low-Pass and High-Pass filters.

Resonance:
28.- A.C. L-C Circuits in parallel with low Impedance source.
29.- Study of Faults in the resonance circuit.
30.- A.C. L-C Circuits in parallel with high impedance source.
31.- Circuit frequency response and bandwidth.
32.- A.C. R-L-C Circuits in series.
33.- Study of Faults in the resonance circuit.

The transformer:
34.- The transformer.
35.- The transformer with load.
36.- Current measurement in the secondary transformer with charge.

M16-KIT. **Electric Networks**

PRACTICAL POSSIBILITIES

Ohm's law:
1.- Calculation of the internal resistance of a continuous source.
2.- Error study in an internal resistance.
3.- Internal resistance calculation of an alternating source.

Electrical power:
4.- Power transferred by a DC source to load.
5.- Power transferred to a load by an AC source.

Power supplies combination:
6.- DC+DC assembly.
7.- Error study in the circuit, DC assembly.
8.- DC+AC assembly.

Thévenin's and Norton's theorems:
9.- Thévenin and Norton equivalent circuits. Conversion. Kirchoff's laws.

Superposition theorem:
10.- Application of the Superposition theorem.
11.- Error study in the Superposition circuit.
Component values modifications.

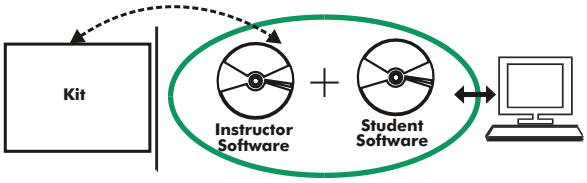
Star-triangle transformation:
12.- Resistance measurement between terminals. Delta | Y configurations.

Wheatstone bridge:
13.- Calibration of a Wheatstone bridge fed by a DC source.
14.- Error study in the Wheatstone bridge circuit.
15.- Wheatstone bridge calibration fed by an AC source.

More information in: www.edibon.com/products/catalogues/en/units/electronics/electronickits/M-KITS.pdf

M-KITS. **Basic Electronics and Electricity Assembly Kits:**

③ CAI. Computer Aided Instruction Software System



With no physical connection between the kit and the computer, this complete package consists on an Instructor Software (INS/SOF) totally integrated with the Student/Kit Software (M../SOF). Both are interconnected so that the teacher knows at any moment what is the theoretical and practical knowledge of the students. These, on the other hand, get a virtual instructor who helps them to deal with all the information on the subject of study.

- INS/SOF. Classroom Management Software (Instructor Software):

The Instructor can:

- Organize Students by Classes and Groups.
- Create easily new entries or delete them.
- Create data bases with student information.
- Analyze results and make statistical comparisons.
- Print reports.
- Develop own examinations.
- Detect student's progress and difficulties.

...and many other facilities.

The Instructor Software is the same for all the kits, and working in network configuration allows controlling all the students in the classroom.

Instructor Software

- M../SOF. Computer Aided Instruction Softwares (Student/Kit Software):

It explains how to use the module, run the experiments and what to do at any moment. Each kit has its own Student Software.

- The options are presented by pull-down menus and pop-up windows.
- Each Software contains:

  Theory: that gives the student the theoretical background for a total understanding of the studied subject.

  Exercises: divided by thematic areas and chapters to check out that the theory has been understood.

  Guided Practices: presents several practices to be done with the kit, showing how to complete the circuits and get the right information from them.

  Exams: set of questions presented to test the obtained knowledge.

Student/Kit Software

Available Student/Kit Softwares:

➤Basic Electronics concepts
- M3/SOF. Semiconductors I.
- M4/SOF. Semiconductors II.
- M6/SOF. Oscillators.
- M7/SOF. Operational Amplifiers.
- M8/SOF. Filters.

- M9/SOF. Power Electronics.

➤Digital Electronics
- M10/SOF. Digital Systems & Converters.
- M11/SOF. Digital Electronics Fundamentals.
- M12/SOF. Basic Combinational Circuits.
- M13/SOF. Basic Sequential Circuits.

- M14/SOF. Optoelectronics.

➤Basic Electricity concepts
- M5/SOF. Power Supplies.
- M1/SOF. Direct Current (D.C.) Circuits.
- M2/SOF. Alternating Current (A.C.) Circuits.
- M16/SOF. Electric Networks.

④ CAL. Computer Aided Learning Software (Results Calculation and Analysis)

This Computer Aided Learning Software (CAL) is a Windows based software, simple and very easy to use, specifically developed by EDIBON.

CAL is a class assistant that helps in making the necessary calculations to extract the right conclusions from data obtained during the experimental practices.

CAL will perform the calculations.

CAL computes the value of all the variables involved.

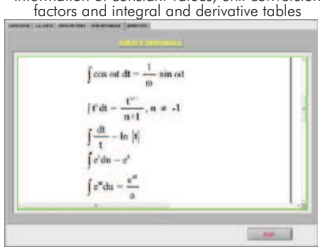
It allows to plot and print the results. Between the plotting options, any variable can be represented against any other.

Different plotting displays.

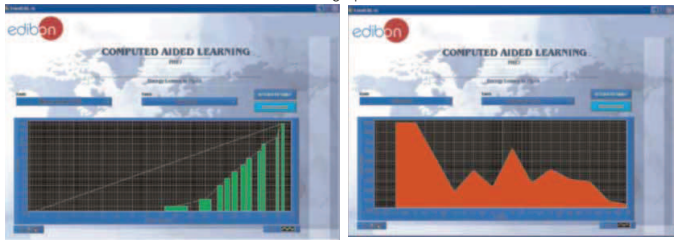
It has a wide range of information, such as constant values, unit conversion factors and integral and derivative tables.

Calculations

Information of constant values, unit conversion factors and integral and derivative tables



Plotting options



Available Softwares:

➤Basic Electronics concepts
- M3/CAL. Semiconductors I.
- M4/CAL. Semiconductors II.
- M6/CAL. Oscillators.
- M7/CAL. Operational Amplifiers.
- M8/CAL. Filters.

- M9/CAL. Power Electronics.

➤Digital Electronics
- M10/CAL. Digital Systems & Converters.
- M11/CAL. Digital Electronics Fundamentals.
- M12/CAL. Basic Combinational Circuits.
- M13/CAL. Basic Sequential Circuits.

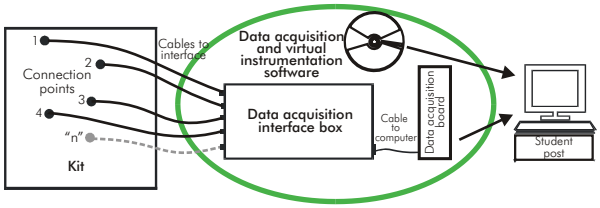
- M14/CAL. Optoelectronics.

➤Basic Electricity concepts
- M5/CAL. Power Supplies.
- M1/CAL. Direct Current (D.C.) Circuits.
- M2/CAL. Alternating Current (A.C.) Circuits.
- M16/CAL. Electric Networks.

More information in: www.edibon.com/products/catalogues/en/units/electronics/electronickits/M-KITS.pdf

M-KITS. **Basic Electronics and Electricity Assembly Kits:**

⑤ EDAS/VIS. EDIBON Data Acquisition System + Virtual Instrumentation System



EDAS/VIS is the perfect link between the modules and the PC. With the EDAS/VIS system, information from the modules is sent to the computer. There, it can be analyzed and represented.
We easily connect the Data Acquisition Interface Box (DAIB) to the modules with the supplied cables (connection points are placed in the modules). Like any other hardware, the DAIB is connected to the PC through the Data Acquisition Board (DAB), and by using the Data Acquisition and Virtual Instrumentation Software the student can get the results from the undertaken experiment/practice, see them on the screen and work with them.

The EDAS/VIS System includes a Hardware: DAIB Data Acquisition Interface Box + DAB. Data Acquisition Board and a Software: EDAS/VIS-SOF. Data Acquisition and Virtual Instrumentation Software:

1) DAIB. **Data Acquisition Interface Box:**
Metallic box. Dimensions: 310 x 220 x 145 mm. approx.
Front panel:
16 Analog inputs.
Sampling velocity 1,250,000 samples per second for EDAS/VIS 1.25 Version.
Sampling velocity 250,000 samples per second for EDAS/VIS 0.25 Version.
2 Analog outputs. 24 Digital inputs/outputs, configurable as inputs or outputs.
4 Digital signal switches 0-5 V. 2 Analog signal potentiometers ±12 V.
Inside: Internal power supply of 12 and 5 V. Potentiometer.
Back panel: Power supply connector. SCSI connector (for connecting with the data acquisition board).
Connecting cables.

DAIB

+

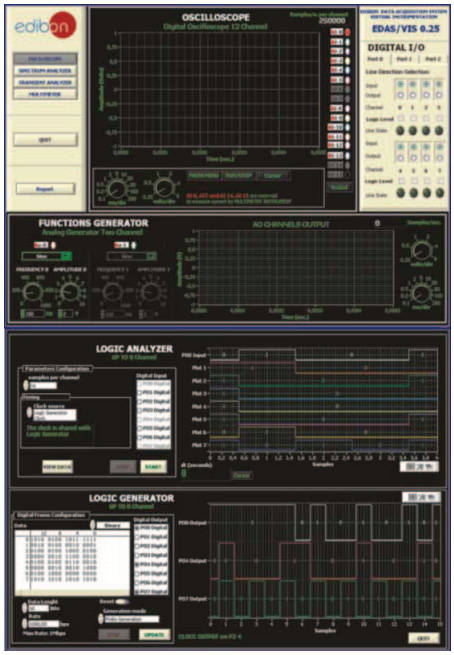

DAB

+

2) DAB. **Data Acquisition Board:**
PCI Data acquisition board (National Instruments) to be placed in a computer slot.
For EDAS/VIS 1.25 Version:
Analog input: Number of channels= 16. Sampling rate up to: 1,250,000 S/s (samples per second).
Analog output: Number of channels= 2. Max. output rate up to: 833 KS/s.
Digital Input/Output: Number of channels= 24 inputs/outputs.

For EDAS/VIS 0.25 Version:
This is a similar version to the 1.25, with the following differences:
Sampling rate up to: 250,000 S/s (samples per second).
Analog output: Max. output rate up to: 10 KS/s.

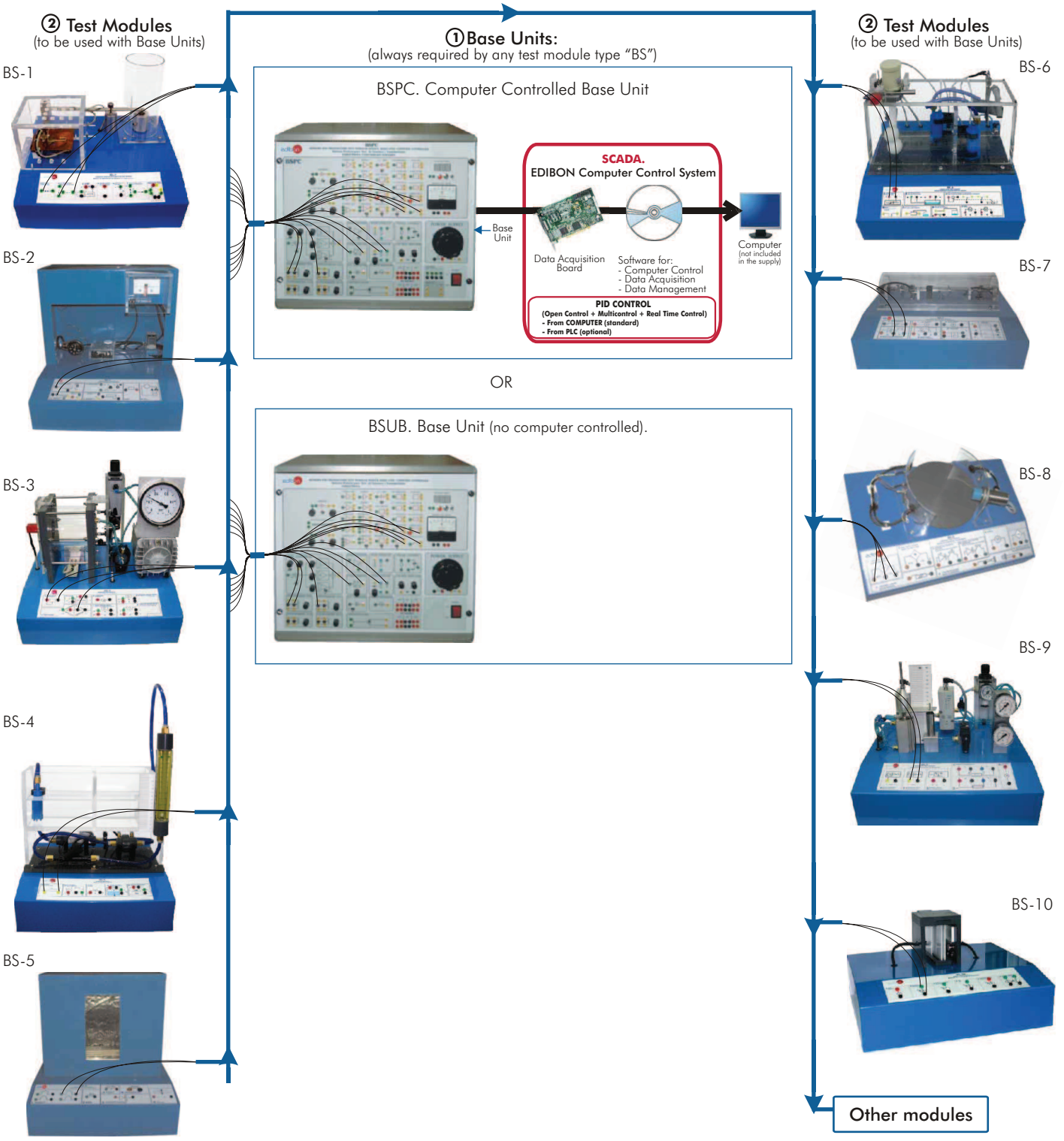
3) EDAS/VIS-SOF. **Data Acquisition and Virtual Instrumentation Software:**
Compatible with actual Windows operating systems. Friendly graphical frame.
Configurable software allowing the temporal/frequency representation of the different inputs and outputs. Visualization of a voltage of the circuits on the computer screen.
It allows data store in a file, print screens and reports of the signals at any time.
Measurement, analysis, visualization, representation and report of results.
Set of Virtual Instruments:
-**Oscilloscope:**
Channels: 12 simultaneous.
-**Function Generator:**
Two independent signal generators, for sinusoidal, triangular, saw tooth and square. Channels: 2.
-**Spectrum Analyzer:**
Channels: 12 (simultaneous).
-**Multimeter:**
Voltmeter (Channels: 12 (simultaneous)). Ammeter (Channels: 2 (simultaneous)).
-**Transient Analyzer.**
-**Logic Analyzer:**
Number of Input channels: 8.
Clock Source: 3 different sources.
This instrument allows receiving as far as 8 digital signal simultaneously at 1 or 8 Mbps (depending of the version).
-**Logic Generator:**
Number of transmission channels: 8.
This instrument allows generating up to 8 digital simultaneous signals of 1 or 8 Mbps (depending of the version).
Sampling velocity 1,250,000 samples per second for EDAS/VIS 1.25 Version.
Sampling velocity 250,000 samples per second for EDAS/VIS 0.25 Version.



EDAS/VIS-SOF

More information in: www.edibon.com/products/catalogues/en/units/electronics/electronickits/M-KITS.pdf

BS. **Modular System for the Study of Sensors:**



"BS" System includes a set of electronic components with a twofold purpose: to control the signal produced by the transducers, and to evaluate and quantify it. Sensors or transducers are common elements in the state of our technology. Therefore this SYSTEM has been developed to show the basic principles of different types of sensors and their way of processing signals.

This system consists of:

① Base Unit, to control the system:

BSPC. Computer Controlled Base Unit, including EDIBON Computer Control System. OR

BSUB. Base Unit (no computer controlled).

② Test Modules:

BS-1. Vibration and/or Deformation Test Module.
BS-2. Temperature Test Module.
BS-3. Pressure Test Module.
BS-4. Flow Test Module.
BS-5. Ovens Test Module.
BS-6. Liquid Level Test Module.
BS-7. Tachometers Test Module.
BS-8. Proximity Test Module.
BS-9. Pneumatic Test Module.
BS-10. Light Test Module.

More information in: www.edibon.com/products/catalogues/en/units/electronics/transducerssensors/BS.pdf

BS. **Modular System for the Study of Sensors:**

①Base Units

BSPC. **Computer Controlled Base Unit**

SPECIFICATIONS SUMMARY

Unit to control the system. Common for the different test modules type "BS". Elements of the unit are included in a metallic box. In the back panel of the box, we can find the outlet and the general switch of the unit for its operation. In the front panel there are two masks with all type of signal conditioners, and even an analogical voltmeter.

Amplifiers: Several amplifier circuits of DC are included in the Base Unit, but only three are used specifically for the amplifiers applications: Amplifier 1, Amplifier 2, Amplifier 3. AC amplifier. Power amplifier. Current amplifier. Two buffer amplifiers. Inverter amplifier. Two circuits of differential amplifiers are supplied.

Signal Converters Circuits: Converter from Voltage to Current. Converter from Current to Voltage. Converter from Voltage to Frequency. Converter of Frequency to Voltage (F/V). Full-Wave Rectifier. Phase rectifier. Phase shifter. Semiconductor detector of temperature.

Comparators, Generators, Oscillators and Filters: Comparator. Alarm oscillator. Electronic switch. Oscillator. Filters. Integrator. The differentiator. Circuit "Sample and Hold". Pulse generator. Pulse Receiver. PID Control. Power Control. Low Frequency Oscillator. Current generator.

Others:Supply Sources of Direct Current (1A). Power source (4A). 4 Potentiometers of 1K, 5K, 10K and 20K.

SCADA. EDIBON Computer Control System:

Control Interface integrated in the unit box (BSPC). Data acquisition board to be installed in a computer slot.

Computer Control Software.

Cables and Accessories, for normal operation. It is supplied with 8 manuals.

Dimensions (approx.)= 490 x 450 x 470 mm. Weight: 30 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electronics/transducerssensors/BS.pdf

BSUB. **Base Unit** (no computer controlled)

SPECIFICATIONS SUMMARY

Unit to control the system. Common for the different test modules type "BS". Elements of the unit are included in a stainless steel box. In the back panel of the box, we can find the outlet and the general switch of the unit for its operation. In the front panel there are two masks with all type of signal conditioners, and even an analogical voltmeter.

Amplifiers: Several amplifier circuits of DC are included in the Base Unit, but only three are used specifically for the amplifiers applications: Amplifier 1, Amplifier 2, Amplifier 3. AC amplifier. Power amplifier. Current amplifier. Two buffer amplifiers. Inverter amplifier. Two circuits of differential amplifiers are supplied.

Signal Converters Circuits: Converter from Voltage to Current. Converter from Current to Voltage. Converter from Voltage to Frequency. Converter of Frequency to Voltage (F/V). Full-Wave Rectifier. Phase rectifier. Phase shifter. Semiconductor detector of temperature.

Comparators, Generators, Oscillators and Filters: Comparator. Alarm oscillator. Electronic switch. Oscillator. Filters. Integrator. The differentiator. Circuit "Sample and Hold". Pulse generator. Pulse Receiver. PID Control. Power Control. Low Frequency Oscillator. Current generator.

Others:Supply Sources of Direct Current (1A). Power source (4A). 4 Potentiometers of 1K, 5K, 10K and 20K.

Cables and Accessories, for normal operation. It is supplied with 8 manuals.

Dimensions (approx.)= 490 x 450 x 470 mm. Weight: 30 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electronics/transducerssensors/BS.pdf

②Modules

BS-1. **Vibration and/or Deformation Test Module**

SPECIFICATIONS SUMMARY

This Test Module has been designed to teach mechanical vibration and displacement variable measurement techniques.

Painted steel box. Connection diagrams for each transducer are represented graphically.

Extensiometric gauges:

Characteristics: Resistance at 24°C: 120 Ω. Gauge factor at 24°C: 2.120.

Heating resistance and thermocouple:

Resistance used to produce temperature variations in the vibrant bar and to see how situation affects the extensiometric gauges. Thermocouple type "K". Temperature range: -50°C to 350°C.

LVDT Sensor: Input Voltage range: 10 to 24 VDC.

Sensor connections with the Base Unit (BSPC or BSUB) and with power supplies is through 2 mm. terminals located in the front panel of the Test Module.

Manuals: It is supplied with 8 manuals.

Each module may operate independently of another.

Dimensions (approx.)= 405 x 300 x 350 mm. Weight: 10 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electronics/transducerssensors/BS.pdf

PRACTICAL POSSIBILITIES

1.- To measure the vibration of a vibrant girder using extensiometric gauges.

2.- To use a heating resistance to rise the girder temperature in order to study the effect on the sensors. (Thermocouple and heating resistance).

3.- To detect the displacement of the BS-1 system vibrant girder using a LVDT sensor.

4.- Effect of temperature variation on an extensiometric beam.

5.- Effect of deformation on the resistance of a beam.

6.- Measure of the three deformation dimensions or deformation of spherical or cylindrical systems.

7.- Linear variable differential transformer (LVDT) for measuring displacements.

8.- Analysis of how to compensate the variation of resistance of a gauge due to temperature variations, using shorted circuits with compensating gauges.

9.- Linear variable differential transformers (LVDT) as a weighing system.

10.- Effect on the vibration of a beam with different masses.

BS. **Modular System for the Study of Sensors:**

②Modules

BS-2. **Temperature Test Module**

SPECIFICATIONS SUMMARY

The Temperature Test Module has been designed to teach the use and applications of sensors of temperature as a measure, and its control.
Painted steel box. Connection diagrams for each transducer are represented graphically.
Bimetallic switch sensor:
Opening temperature: 50°C. Closing temp.: 30°C.
Adjustable bimetallic thermostat, with heater resistor:
Temperature range: 0°C to 30°C.
Relay AC:
Voltage and current (nominal): 250V-10A. 3 sockets. Switching voltage: 12 V.
Capillary thermostat: Temperature range: 0°C-90°C. Max. bulb temperature: 150°C. Socket current: 15A, 250V AC.
Thermocouples:
3 Cromel-Alumel thermocouples type K. Temperature range: -50°C to 250°C.
Sensor connections with the Base Unit (BSPC or BSUB) and with power supplies is through 2 mm. terminals located in the front panel of the Test Module.
Manuals: It is supplied with 8 manuals.
Each module may operate independently of another.
Dimensions (approx.) = 405 x 280 x 335 mm. Weight: 10 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electronics/transducerssensors/BS.pdf

PRACTICAL POSSIBILITIES

1.- How to use the Curie effect as application of a high temperature thermostatic controller.
2.- Adjustable bimetallic thermostat. To use the bimetallic thermostat as a temperature control, calculating its hysteresis.
3.- Adjustable bimetallic thermostat. How we can reduce the hysteresis by adding a resistor to the heating circuit.
4.- To use the thermostat based on a bimetallic sensor to control the temperature.
5.- Capillary thermostatic controller.

BS-3. **Pressure Test Module**

SPECIFICATIONS SUMMARY

The Pressure Test Module has been designed to teach the use and applications of this kind of sensors measurement systems. It shows the different pressure measurement techniques.
Painted steel box. Connection diagrams for each transducer are represented graphically.
Linear positioning sensor (Potentiometer):
Resistor range: 500 Ω to 5 KΩ. Operation force: 200-750 g.
LVDT sensor: Sensibility: 780mV/mm. Power voltage: 10 to 24 Vdc.
Differential pressure sensor:
Measurement range: 0 to 30 psi. Sensibility: 3.33mV/psi. Overpressure: 60 psi.
Extensiometric gauges:
Nominal resistor @ 25°C: 120 Ω. Gauge factor: 2.00 to 2.1 typical.
Manometric pressure sensor:
Measurement range: 0 to 30 psi. Overpressure: 60 psi.
Absolute pressure sensor:
Measurement range: 2 to 30 psi. Overpressure: 60 psi.
Air Compressor:
Air flow: 10 l/min. Pressure: 1.83 Kg/cm^2.
Sensor connections with the Base Unit (BSPC or BSUB) and with power supplies is through 2 mm. terminals located in the front panel of the Test Module.
Manuals: It is supplied with 8 manuals.
Each module may operate independently of another.
Dimensions (approx.) = 400 x 270 x 320 mm. Weight: 10 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electronics/transducerssensors/BS.pdf

PRACTICAL POSSIBILITIES

1.- Use of linear positioning sensor (potentiometer) to detect the displacement produced by a diaphragm expansion caused by the air pressure.
2.- Use of a LVDT as an element to measure the diaphragm distortion that is consequence of the pressure inside the pressure chamber.
3.- Differential pressure sensor with hole-board system. Use of a differential pressure sensor of the semiconductor type to measure the pressure fall in a hole-board system.
4.- Extensiometric Gauges. To detect objects using an infrared sensor by light beam interruption.
5.- Measure the pressure in the chamber, using two different types of sensors (manometric and absolute pressure sensor).
6.- Extensiometric gauges for measuring deformations: their resistance changes as the diaphragm expands due to the pressure coming from the pressure container.

BS-4. **Flow Test Module**

SPECIFICATIONS SUMMARY

The objective this module is to show techniques to measure changeable fluids.
Painted steel box. Connection diagrams for each transducer are represented graphically.
Flow optical sensor:
Power supply: 4.5 to 24 Vdc. Standard flow range: 0.5 to 5 GPM.
High resolution optical flow sensor: Measurement range: 0.25 to 6.5 l/min.
Underwater pump.
Level sensor by pressure:
It is a differential pressure sensor. Pressure range: 0 to 1psi. Overpressure: 20 psi.
Differential pressure sensor (Hole board system):
Measurement range: 0 to 30 psi. Overpressure: 60 psi.
Changeable flow meter: Range:0 -2 l/min.
V narrowing.
Main and secondary tanks.
Sensor connections with the Base Unit (BSPC or BSUB) and with power supplies is through 2 mm. terminals located in the front panel of the Test Module.
Manuals: It is supplied with 8 manuals.
Each module may operate independently of another.
Dimensions (approx.) = 405 x 280 x 400 mm. Weight: 10 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electronics/transducerssensors/BS.pdf

PRACTICAL POSSIBILITIES

1.- To measure the water volume produced by an underwater pump in the module using an optical flow sensor.
2.- To use a high-resolution optical flow sensor to measure low volumes.
3.- Level sensor by pressure. To use a differential pressure sensor to measure the liquid level in one of the tanks.
4.- Differential pressure sensor. To measure the pressure-fall in the module hole board system, as a necessary parameter to determine volume.
5.- To measure the flow volume generated by the underwater pump using a flow meter of changeable area.
6.- To obtain the flow-volume value in the secondary tank using the V narrowing weir.

BS. **Modular System for the Study of Sensors:**

②Modules

BS-5. **Ovens Test Module**

SPECIFICATIONS SUMMARY

With "BS-5" Test Module it is possible to study temperature measurement techniques using several kinds of sensors placed inside the sealed place that is used as oven.
Painted steel box. Connection diagrams for each transducer are represented graphically.
Oven chamber.
Heating resistance: Maximum dissipation power of 500 W.
Fan: Maximum air flow: 2.5 l/s.
Thermocouples:
4 thermocouples placed inside the oven, each one of them at a different height. Temperature range: -184°C to 400°C.
Platinum resistance thermometer:
Temperature range: -70°C to 600°C.
Thermistor:
NTC thermistor. Resistence at 25°C: 5.8 KΩ. Temperature range: -40°C to 125°C.
Semiconductor temperature sensor: Reverse polarized diode.
Sensor connections with the Base Unit (BSPC or BSUB) and with power supplies is through 2 mm. terminals located in the front panel of the Test Module.
Manuals: It is supplied with 8 manuals.
Each module may operate independently of another.
Dimensions (approx.) = 405 x 300 x 470 mm. Weight: 10 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electronics/transducerssensors/BS.pdf

PRACTICAL POSSIBILITIES

1.- Heating resistance. Raise the oven internal temperature over the environmental temperature using a heating resistance to make tests and practices related with temperature measurement.
2.- To use a fan as refrigerating element of the oven.
3.- To use thermocouples as temperature sensors elements inside the oven. Temperature measurement using a thermocouple.
4.- To measure temperature inside the oven using a platinum resistance thermometer.
5.- To measure temperature inside the oven using a thermistor temperature sensor.
6.- Temperature measurement using a thermistor, based on its negative temperature coefficient.
7.- To obtain the temperature value inside the oven, using a semiconductor sensor (diode).
8.- PID control.

BS-6. **Liquid Level Test Module**

SPECIFICATIONS SUMMARY

The Liquid Level Test Module "BS-6" has been designed to teach the use and applications of level sensors and their measurement systems. This module teaches techniques to measure and control the liquid level in a tank.
Painted steel box. Connection diagrams for each transducer are represented graphically.
Water tanks.
Capacitative level sensor.
Pressure level sensor: Pressure range: 0-1 psi.
Level gauge changeable resistance with path end and beginning switches.
Conduction sensor.
Magnetic float level sensor.
Optical level sensor.
2 Minipumps:
Power supply: 12Vdc (max. voltage). Nominal current: 1 A DC.
Sensor connections with the Base Unit (BSPC or BSUB) and with power supplies is through 2 mm. terminals located in the front panel of the Test Module.
Manuals: It is supplied with 8 manuals.
Each module may operate independently of another.
Dimensions (approx.) = 400 x 300 x 400 mm. Weight: 10 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electronics/transducerssensors/BS.pdf

PRACTICAL POSSIBILITIES

1.- To use a capacitative sensor to measure the liquid level in the tank.
2.- To use the differential pressure sensor as an element to determine the water level in a tank.
3.- To use a changeable resistance fixed to a float system as a liquid level measurement element.
4.- Conduction Sensor. Use of a sensor made up of to steel electrodes to measure the water level of a tank.
5.- Magnetic float level sensor. Detect a precise tank liquid level with a magnetic switch sensor.
6.- Control the BS-6 system left tank liquid level using an optical level sensor.

BS-7. **Tachometers Test Module**

SPECIFICATIONS SUMMARY

This module has been designed to teach linear and angular speed measurement techniques.
Painted steel box. Connection diagrams for each transducer are represented graphically.
Inductive Sensor: Output voltage: up to 10 Vpp.
DC Motor:
Nominal voltage: 12V. Resistance: 9,7 Oh. Max. vacuum speed: 8500 r.p.m. Max. load speed: approx. 3500 r.p.m. Start voltage: 210 mV.
DC Tachometer.
Refractive Infrared Sensor.
Slot Sensor:
Slotted optical switch where an input LED and an output phototransistor are capsulated.
Hall Effect position sensor.
Encoder.
Sensor connections with the Base Unit (BSPC or BSUB) and with power supplies is through 2 mm. terminals located in the front panel of the Test Module.
Manuals: It is supplied with 8 manuals.
Each module may operate independently of another.
Dimensions (approx.) = 300 x 200 x 200 mm. Weight: 10 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electronics/transducerssensors/BS.pdf

PRACTICAL POSSIBILITIES

1.- DC Motor. Provide the group of sensors of the BS-7 system fixed to the central axle of the equipment with movement power.
2.- DC Tachometer. To use a DC motor as a tachometer to measure the revolutions of the BS-7 system central axle.
3.- Inductive Sensor.
4.- Refractive Infrared Sensor. To measure the central axle revolutions of the BS-7 system using a light reflection optical sensor.
5.- To obtain the central axle speed value using a slotted optical sensor through light interruption.
6.- To obtain the central axle speed value using a Hall-effect position sensor.
7.- To measure the central axle revolutions of the BS-7 system using the encoder.

BS. **Modular System for the Study of Sensors:**

②Modules

BS-8. **Proximity Test Module**

SPECIFICATIONS SUMMARY

This Module has been designed to teach techniques to detect the proximity of objects, focusing on the distance at which each sensor is able to detect the object and the type of material it can detect.
Painted steel box. Connection diagrams for each transducer are represented graphically.
DC Motor: Nominal power supply: 12 Vdc.
Proximity capacitative sensor: Detection distance: 10 mm.
Hall effect sensor.
Infrared sensor by reflection:
Emission narrow beam GaAs IR Emitter. Detection narrow beam IR Photodetector.
Transmission infrared sensor:
Emission narrow beam GaAs IR Emitter. Detection narrow beam IR Photodetector.
Conduction sensor.
Inductive sensor: Detection distance: 2 mm.
Ultrasound sensor:
Transmitter sensibility: 106 dB. Receiver sensibility: -65 dB. Resonance frequency: 40kHz.
Sensor connections with the Base Unit (BSPC or BSUB) and with power supplies is through 2 mm. terminals located in the front panel of the Test Module.
Manuals: It is supplied with 8 manuals.
Each module may operate independently of another.
Dimensions (approx.) = 400 x 270 x 200 mm. Weight: 10 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electronics/transducerssensors/BS.pdf

PRACTICAL POSSIBILITIES

1.- How to use a capacitative sensor to detect metal objects as the pass in front of the sensor.
2.- To use a Hall effect sensor as an element to detect the presence of magnetic objects.
3.- Reflection infrared sensor. To use an optical sensor that works through infrared light reflection.
4.- Infrared sensor by transmission. To detect objects using an infrared sensor by light beam interruption.
5.- Conduction sensor. To detect magnetic objects using a REED switch sensor.
6.- To detect the presence of ferrous object using an inductive sensor.
7.- Ultrasound sensor. To detect metallic and non-metallic object using high frequency sounds.

BS-9. **Pneumatic Test Module**

SPECIFICATIONS SUMMARY

The Pneumatics Test Module "BS-9" has been designed to teach techniques of control and handling of a pneumatic piston.
Painted steel box. Connection diagrams for each transducer are represented graphically.
Proportional valve 1 and 2:
Nominal voltage: 24Vdc. Pressure range: 8 bar max., 0 to 6 bar control.
Differential pressure sensor: Measurement range: 0 to 30 psi.
Pneumatic switch: Max. pressure: 6 bars.
LVDT Sensor.
Regulation filter: Manual drainage. Max. input pressure: 8 bars.
Sensor connections with the Base Unit (BSPC or BSUB) and with power supplies is through 2 mm. terminals located in the front panel of the Test Module.
Manuals: It is supplied with 8 manuals.
Each module may operate independently of another.
Dimensions (approx.) = 300 x 300 x 300 mm. Weight: 10 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electronics/transducerssensors/BS.pdf

PRACTICAL POSSIBILITIES

1.- Proportional valves. To control electronically the vertical displacement of a double effect pneumatic piston using proportional valves.
2.- Differential pressure sensor. To use a pressure sensor for measuring the pressure difference between both pneumatic piston air inlets.
3.- Pneumatic switch. To deflect the air flow in the BS-9 system using a pneumatic switch.
4.- LVDT Linear Displacement Sensor. To measure pneumatic piston displacement using an excitation and DC output LVDT.

BS-10. **Light Test Module**

SPECIFICATIONS SUMMARY

The objective of this module is to show some of the techniques used to measure light or illumination intensity.
Painted steel box. Connection diagrams for each transducer are represented graphically.
Photodiode.
Phototransistor.
Light Dependent Resistor.
Photovoltaic Cell.
Infrared emitter-receiver.
Sensor connections with the Base Unit (BSPC or BSUB) and with power supplies is through 2 mm. terminals located in the front panel of the Test Module.
Manuals: It is supplied with 8 manuals.
Each module may operate independently of another.
Dimensions (approx.) = 405 x 300 x 350 mm. Weight: 10 Kg.

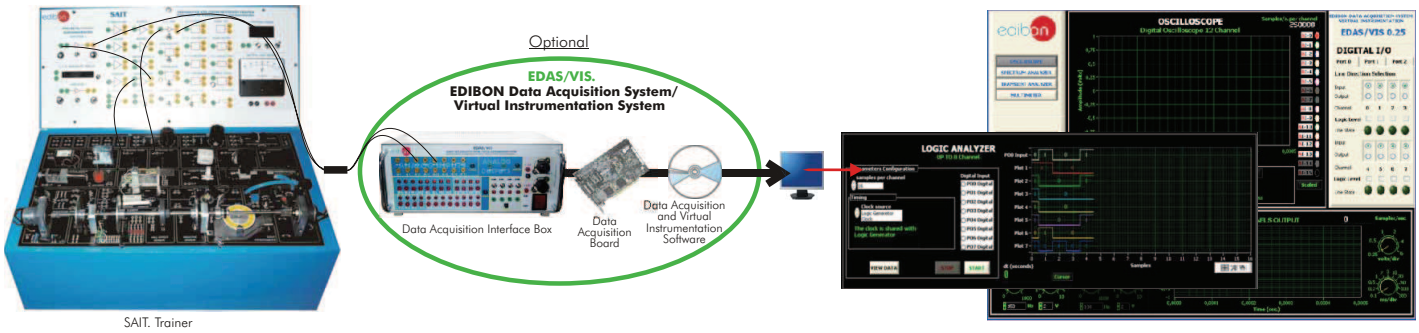
More information in: www.edibon.com/products/catalogues/en/units/electronics/transducerssensors/BS.pdf

PRACTICAL POSSIBILITIES

1.- Study of the equivalent electrical circuit of a photodiode. Study the V-I characteristic of a photodiode.
2.- Study of the normal operation mode of a photodiode. Study the "ON/OFF" operation (light switch) of a phototransistor.
3.- Measurement of light intensity using a solar cell.
4.- Study of the properties of light dependent resistors (LDR).
5.- Study of the operation of IR sensors.
6.- Study of a real application for controlling the light intensity using PID control elements.

2.3- Transducers and Sensors

SAIT. **Transducers and Instrumentation Trainer**



SAIT. Trainer

SPECIFICATIONS SUMMARY

The SAIT trainer shows didactically the function principles of the transducers most used in industry. It is divided into two parts: the lower part, in which all the input and output transducers are found, while in the upper part, the system of signal conditioning and those of instrumentation are found; the electrical and pneumatic power supplies are housed in its interior.

Input Transducers:

Resistance Transducers for applications in angular or linear position:

Linearly sliding potentiometer. Rotary carbon-track potentiometer. Rotary coil potentiometer. Precision servo- potentiometer. The Wheatstone Bridge circuit.

Applications of temperature:

NTC (Negative Temperature Coefficient) Thermistors. RTD Sensor (Platinum Transducer with Temperature dependent Resistance). Temperature sensor IC "Integrated Circuit LM 335". Type "K" Thermocouples.

Applications of light:

Photovoltaic Cell. Phototransistor. Photodiode PIN. Photoconductive Cell.

Linear position and force:

Linear Variable Differential Transformer LVDT. Extensiometric Transducer.

Environmental measurements:

Air flow Sensor. Air pressure Sensor. Humidity sensor.

Rotational speed and position control:

Slotted optoelectronic Sensor. Opto-reflective Sensor. Inductive sensor. Hall effect Sensor. Permanent D.C. magnet tachogenerator.

Sound measurements:

Dynamical microphone. Ultrasonic receiver.

Visualization Devices:

Timing device/ counter with LED display. Graphic bar visualizer. Mobile coil voltmeter.

Output Transducers:

Electrical Resistance. Incandescent Lamp.

Applications for the sound output:

Buzzing (Buzzer). Mobile coil loud speaker. Ultrasonic transmitter.

Applications of linear or angular motion:

D.C. Soleinod. D.C. Relay. Solenoid Valve. Permanent Magnet D.C. Motor.

Signal Conditioners:

D.C. Amplifiers. A.C. Amplifier. Power Amplifier. Current Amplifier. Buffers. Inverting Amplifier. Differential amplifier. V/F and F/V Converters. V/I and I/V Converters. Full Wave Rectifier. Hysteresis convertible Comparator. Electronic switch. Oscillator 40 kHz. Filter 40 kHz. Time-constant convertible Low Pass Filter.

Circuit with Mathematical Operation: Adding amplifier. Integrator with different time constants. Differentiator with different time constants. Instrumentation Amplifier. Circuit SAMPLE & HOLD. Amplifiers with gain control and offset.

Furthermore it contains a linearly mounted system of a D.C. motor, tachodynamo, reflective, slotted opto-sensors to detect the absolute and incremental position.

Cables.

Manuals: 8 manuals supplied.

Dimensions (approx.): 400 x 400 x 300 mm.

Weight: 10 Kg.

More information in:
www.edibon.com/products/catalogues/en/units/electronics/transducerssensors/SAIT.pdf

PRACTICAL POSSIBILITIES

1.- Basic Control Systems description.

Characteristics of the Control System:

2.- Characteristics of an ON/OFF temperature control System.
3.- Characteristics of an ON/ OFF Lighting System.
4.- Investigation of the Characteristics of a Positional Control System.
5. - Proportional Control.
6.- Proportional+Integral Control.
7. - Proportional+Derivate Control.
8. - Proportional+Integral+Derivate Control.
9. - Characteristics of a Speed Control System.
10.- Operation in Open Loop.
11.- Operation in Closed Loop, Proportional Control.
12.- Proportional+Integral Control.
13.- Proportional+Integral+Derivate Control.

Display devices:

14.- Application of the Timer/Counter as a meter of time.
15.- Application of the Timer/Counter as a simple counter.
16.- Application of the Timer/Counter as rev-counter or frequency-meter.
17.- Characteristics of an L.E.D. bargraph display unit.
18.- Characteristic of a Mobile Coil Meter.
19.- Comparison of Digital, Bargraph and Mobile Coil meters.
20.- To widen the voltage index of the B. M. meter.

Variable Resistance transducers in angle or linear arrangement:

21.- Variation of the Output Voltage for a Potentiometer used as a Position transducer.
22.- The Buffer as compensator for the effect of the load on the output voltage of a potentiometer.
23.- Servo potentiometer. Variation of the output voltage with respect to its position.
24.- Measuring the Resistance using a Wheatstone Bridge Circuit.
25.- Measuring the Voltage using "Null Balance" Procedures (Method1).
26.- Measuring Voltages using "Null Balance" Procedures (Method 2).Measuring voltages smaller than the normal available voltage.
27.- Measuring Voltages using "Null Balance" Procedures (Method 2).Measuring voltages greater than the normal voltage.

Transducers for Applications of Temperature Measurement:

28.- Characteristics of an Integrated Temperature Circuit.
29.- Construction of a Digital Thermometer using the facilities of the TRANSDUCER TRAINER.
30.- Characteristics of a Platinum Temperature Dependent Resistance (T.D.R.) Transducer.
31.- The N.T.C. (Negative Temperature coefficient)Thermistor.
32.- Characteristics of an N.T.C. Thermistor (Resistance measuring method).
33.- Characteristics of the N.T.C. Thermistor used in an alarm circuit (double thermistor).
34.- Characteristics of a Type "K" Thermocouple.

Transducers for Light Measuring Applications:

35.- Characteristics of a photovoltaic cell.
36.- Characteristics of a photo-transistor.
37.- Luminous intensity detector.
38.-The P.I.N. Photodiode.
39.- Characteristics of a P.I.N. Photodiode.

Linear Position transducers.

40.- Characteristics of a Linear Variable Differential Transformer (LVDT).
41.- Characteristics of a Variable Resistance.
42.- Characteristics of a Strain gauge Transducer.

Transducers for Environmental Measurement Applications:

43.- Characteristics of a air flow transducer.
44.- Characteristics of a pressure sensor.
45.- Characteristics of a humidity sensor.

Rotational Velocity Transducers or Position Measuring Applications:

46.- Characteristics of a slotted opto-transducers and its applications for counting and speed measurement.
47.- Characteristics of the reflective optotransducers and Gray code disk.
48.- Characteristics of an inductive transducer.
49.- Characteristics of a Hall effect transducer.
50.- Characteristics of a D.C. Permanent magnet Tachogenerator.

Transducers for Measuring Sound:

51.- Characteristics of a Dynamic Microphone.
52.- Characteristics of an ultrasonic receiver.

Transducers for Sound Output:

53.- Characteristics of the mobile coil loudspeaker.
54.- Characteristics of a Buzzer.

Output Transducer for Linear or Angular Movement:

55.- Characteristics of a D.C. Solenoid.
56.- Characteristics of a D.C. Relay.
57.- Characteristics of a Solenoid air valve.
58.- Characteristics of a Permanent Magnet Motor.

Signal Conditioning Circuits:

59.- Characteristics of the Direct Current amplifiers 1, 2 and x100.
60.- Characteristics of a current amplifier and application of a buffer amplifier.
61.- Characteristics of Power and Buffer Amplifiers.
62.- Characteristics of an Inverter Amplifier.
63.- Characteristics of a Differential Amplifier.

Signal Converter Circuits:

64.- Characteristics of a Voltage to Current Converter.
65.- Characteristics of a Current to Voltage Converter.
66.- Characteristics of a Voltage to Frequency Converter.
67.- Characteristics of a Frequency to Voltage Converter.
68.- Characteristics of a Full Wave Rectifier.

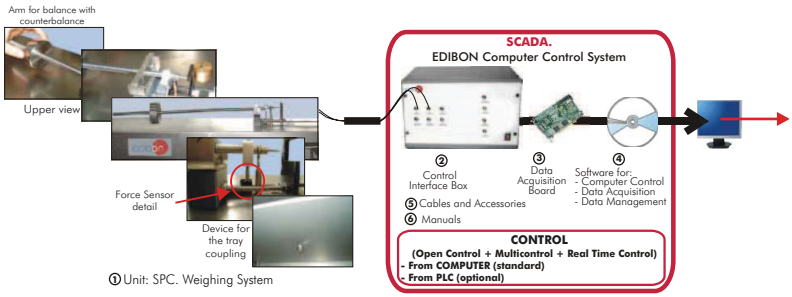
Comparators, Oscillator and Filters:

69.- Characteristics of a Comparator.
70.- Characteristics of an Alarm Oscillator circuit.
71.- Characteristics of an Electronic Switch.
72.- Characteristics of the Oscillator of 40 kHz.
73.- Characteristics of Filters.

Circuits that carry out Mathematical Operations:

74.- Characteristics of a Adding Amplifier.
75.- Characteristics of an Integrator.
76.- Characteristics of a Differentiator Circuit.
77.- Characteristics of a Sample and Hold Circuit.

SPC. Computer Controlled **Weighing System**



① Unit: SPC. Weighing System

SPECIFICATIONS SUMMARY

Items supplied as standard

① SPC Unit:

Anodized aluminium structure.

Stainless steel arm for balance. Counterbalance of 0.5 and 1 Kg. Anodized aluminium tray. High precision force sensor of 0-10N.

② SPC/CIB. Control Interface Box :

With process diagram in the front panel. The unit control elements are permanently computer controlled. Simultaneous visualization in the computer of all parameters involved in the process. Calibration of all sensors involved in the process. Real time curves representation. All the actuators' values can be changed at any time from the keyboard. Shield and filtered signals to avoid external interferences. Real time control with flexibility of modifications from the computer keyboard of the parameters, at any moment during the process. Open control allowing modifications, at any moment and in real time, of parameters involved in the process. 3 safety levels: mechanical in the unit, electronic in the control interface, and the third one in the control software.

③ DAB. Data Acquisition Board:

PCI Data acquisition National Instruments board to be placed in a computer slot. 16 Analog inputs. Sampling rate up to: 250 KS/s. 2 Analog outputs. 24 Digital Inputs/Outputs.

④ SPC/CCSOF. Computer Control + Data Acquisition + Data Management Software:

Flexible, open and multicontrol software. Management, processing, comparison and storage of data. Sampling velocity up to 250,000 data per second. It allows the registration of the alarms state and the graphic representation in real time.

⑤ Cables and Accessories, for normal operation.

⑥ Manuals: This unit is supplied with 8 manuals.

Dimensions (approx.) = Unit: 700 x 400 x 400 mm. Weight: 20 Kg. Control Interface: 490 x 330 x 310 mm. Weight: 10 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electronics/transducerssensors/SPC.pdf

PRACTICAL POSSIBILITIES

1.- Sensor Calibration.
2.- Hysteresis study.
3.- Weight high precission measurement.

SCSP. **Pressure Sensors Calibration System**

SPECIFICATIONS SUMMARY

Bench-top unit.

Anodized aluminium structure and panel in painted steel.

Diagram in the front panel.

Vacuum-meter of range (-9800 [mmH_2O] to 0).

Vacuum-meter of range (-1000 [mmH_2O] to 0).

Manometer of range (0 to 1000 [mmH_2O]).

Manometer of range (0 to 2,5 [bars]).

Mobile Piston (syringe).

8 valves.

Non-return valve.

Polyurethane tubes.

This system is supplied with atm, bares, psi, mmHg, mmH_2O, conversion tables.

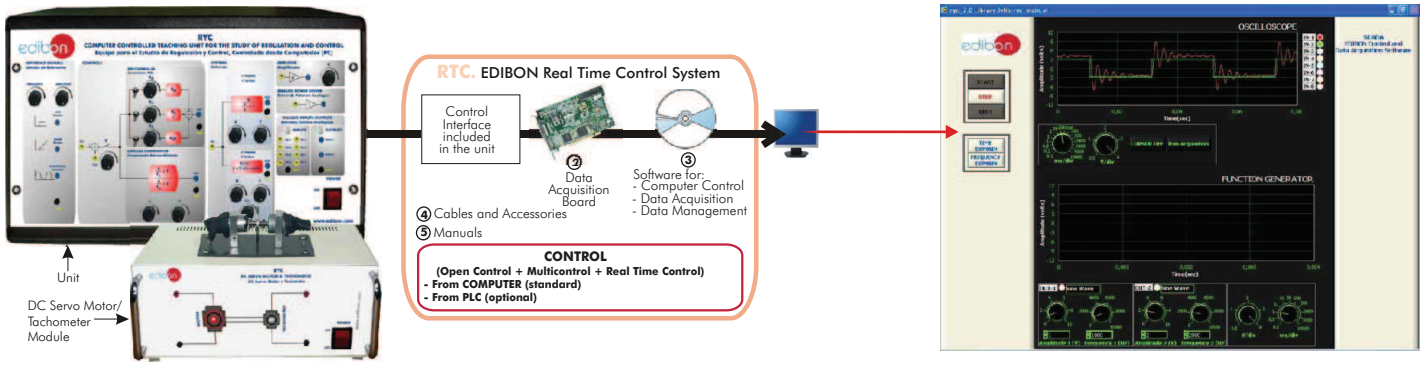
This system allows the calibration of 6 sensors (same type) simultaneously.

Manuals: This unit is supplied with 8 manuals.

Dimensions (approx.) = 720 x 300 x 570 mm. Weight: 15 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electronics/transducerssensors/SCSP.pdf

RYC. Computer Controlled **Teaching Unit for the Study of Regulation and Control**



① Unit: RYC. Teaching Unit for the Study of Regulation and Control

SPECIFICATIONS SUMMARY

Items supplied as standard

① RYC. Unit:

The RYC is a Regulation and Control training unit designed by EDIBON. It allows students to learn the most important concepts about Regulation and Control in an easy and quick way.

The unit is provided with a set of practices, through which the user will understand how to characterize first and second order systems and how a PID controller works.

Unit:

Metallic box.

Diagram in the front panel with similar distribution to the elements in the real unit.

This unit includes the following modules:

Reference signals module: It allows to generate three different types: step, ramp and sinusoidal. The frequency and amplitude of the signals can be adjusted using the potentiometers.

PID controller module: It is subdivided into proportional, integrative and derivative blocks. Each block has its own potentiometer to adjust each parameter independently.

Lead / Lag Compensator: It represents a compensator system in the Laplace domain. The system has a potentiometer z to modify the zero, p to modify the pole and K to modify the gain of the compensator.

First Order System: It represents a first order system in the Laplace domain. The system has a potentiometer T to modify the time constant of the system. The gain can be also adjusted using the K potentiometer.

Second Order System: It represents a second order system in Laplace domain. The system has three potentiometers to modify the three parameters of the system: gain K, damping coefficient and the natural frequency.

Amplifier module: It can be used for signal amplification. There is a potentiometer, K, to adjust the gain of the amplifier.

Analog Power Driver: It consists of a power amplifier that can be used as the last stage when a application requires high power supply (for example a DC Motor, pump, etc).

Analog I/O: It is provided with 8 analog inputs and 2 analog outputs. The inputs are used to visualize different signals in the computer. The analog outputs are for signal generation.

Control Interface included.

DC Servo Motor/Tachometer Module:

Metallic box.

DC Servo Motor (speed: 3600 rpm max.).

Tachometer (speed: 3600 rpm max.).

② DAB. Data Acquisition Board:

PCI Data acquisition board (National Instruments) to be placed in a computer slot.

16 Analog inputs. Sampling rate up to: 250 KS/s.

2 Analog outputs. 24 Digital Inputs/Outputs.

③ RYC/CCSOF. Computer Control+Data Acquisition+Data Management Software:

Registration and visualization of all process variables in an automatic and simultaneously way.

Flexible, open and multicontrol software, developed with actual windows graphic systems, acting simultaneously on all process parameters.

Management, processing, comparison and storage of data.

Sampling velocity up to 250 KS/s (kilo samples per second).

Comparative analysis of the obtained data, after the process and modification of the conditions during the process.

④ Cables and Accessories, for normal operation.

⑤ Manuals: This unit is supplied with 8 manuals.

Dimensions (approx.) = Unit: 490 x 330 x 310 mm. Weight: 10 Kg.

DC Servo Motor/Tachometer Module: 310 x 220 x 145 mm. Weight: 10 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electronics/control/RYC.pdf

PRACTICAL POSSIBILITIES

1.- Response of a first order system in time domain. (Step-response).

2.- Response of a first order system in time domain. (Ramp-response).

3.- Response of a first order system in time domain. (Sinusoidal-response).

4.- Response of a first order system in frequency domain. (Sinusoidal-response).

5.- Response of a second order system in time domain. (Step-response).

6.- Response of a second order system in time domain. (Ramp-response).

7.- Response of a second order system in time domain. (Sinusoidal-response).

8.- Response of a second order system in frequency domain. (Sinusoidal-response).

9.- Phase Lead Compensator experiment.

10.- Phase Lag Compensator experiment.

11.- Structure of a PID controller (Proportional-Integrative-Derivative blocks).

12.- PID control of a first order system in open-loop.

13.- PID control of a second order system in open-loop.

14.- PID control of a first order system in closed- loop. (Mathematical tuning)

15.- PID control of a first order system in closed- loop. (Experimental tuning)

16.- PID control of a first order system in closed- loop. (Ziegler -Nichols tuning).

17.- PID control of a second order system in closed- loop. (Mathematical tuning).

18.- PID control of a second order system in closed- loop. (Experimental tuning).

19.- PID control of a second order system in closed- loop. (Ziegler -Nichols tuning).

20.- Characterization of a DC motor.

21.- DC motor speed control with a PID controller.

RYC/B. **Basic Teaching Unit for the Study of Regulation and Control**

SPECIFICATIONS SUMMARY

RYC/B allows the user to learn the basics about regulation and control of first and second order systems. This unit enables to carry a set of practices related with basic regulation and control, through which the user will understand how to characterize first and second order systems and how a PID controller works.

Metallic enclosure, including all the modules and elements.

Power Supply.

Protection fuse.

Block diagrams in the front panel.

The unit includes the following modules:

Reference signals:

Step, Ramp and Sine.

PID controller:

P controller, I controller and D controller.

Systems:

First Order System.

Second Order System.

Cables and Accessories, for normal operation.

Manuals: This unit is supplied with 8 manuals.

Dimensions (approx.) = Unit: 490 x 330 x 310 mm.

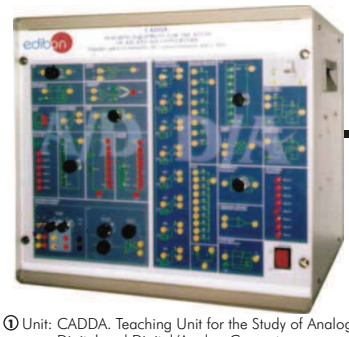
Weight: 10 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electronics/control/RYC-B.pdf

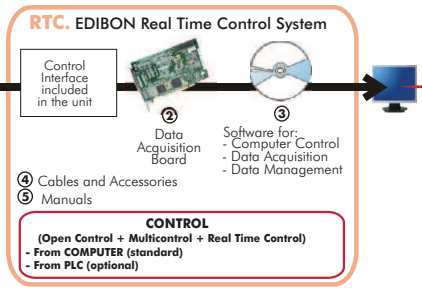
PRACTICAL POSSIBILITIES

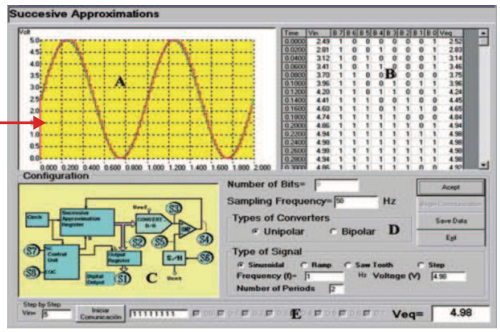
1.- Response of a first order system in time domain. (Step-response).
2.- Response of a first order system in time domain. (Ramp-response).
3.- Response of a first order system in time domain. (Sinusoidal-response).
4.- Response of a first order system in frequency domain (Sinusoidal-response).
5.- Response of a second order system in time domain (Step-response).
6.- Response of a second order system in time domain. (Ramp-response).
7.- Response of a second order system in time domain. (Sinusoidal-response).
8.- Response of a second order system in frequency domain (Sinusoidal-response).
9.- Structure of a PID controller (Proportional-Integrative-Derivative blocks).
10.- PID control of a first order system in open-loop.
11.- PID control of a second order system in open-loop.
12.- PID control of a first order system in closed- loop. (Mathematical uning).
13.- PID control of a first order system in closed- loop. (Experimental tuning)
14.- PID control of a first order system in closed- loop. (Ziegler - Nichols tuning).
15.- PID control of a second order system in closed- loop. (Mathematical tuning).
16.- PID control of a second order system in closed- loop. (Experimental tuning).
17.- PID control of a second order system in closed- loop. (Ziegler-Nichols tuning).

CADDA. Computer Controlled **Teaching Unit for the Study of Analog/Digital and Digital/Analog Converters**



① Unit: CADDA. Teaching Unit for the Study of Analog/ Digital and Digital/Analog Converters.





SPECIFICATIONS SUMMARY

Items supplied as standard

① CADDA. Unit:

Metallic box. Diagram in the front panel with similar distribution to the elements in the real unit.

In this unit, the elements are separated in two parts: lefthand part for analog to digital conversions, and right hand part for digital to analog conversions.

Analog/Digital converter board. Digital/Analog converter board.

Signal generator board, with 100 to 330 µF capacitors, 10 to 50K potentiometers and 1 to 100K resistors. Female and male connectors, interconnections. Power supply.

LPF-Low Pass Filter: 2nd order low pass filter, needed to convert analog signals to digital. Sample/Hold module. Comparator module. Clock module. Analog switch. Ramp module. A/D control module. D/A module, this module includes an integrated digital to analog converter. A/D module, this module includes an integrated analog to digital converter. Counter module. Waveform generator. 8 analog switches, all are managed by a PC.

Weighted resistors: 8 resistances are connected to a common point. D/A module: same module than described before "D/A". Analog input and output for PC. Serial lock 1 module. Adding module: same module as previously described "Adding". Serial lock 2 module: same module than serial lock 1, but based only on an inverter. R/2R: stair of resistance R/2R. Potentiometer. D/A control module. Operational amplifier. Two capacities of 100nF with common connection. Sample/Hold module: same module as previously described "Sample/Hold". Control Interface.

② DAB. Data Acquisition Board:

PCI Data acquisition board (National Instruments) to be placed in a computer slot. 16 Analog inputs. Sampling rate up to: 250 KS/s. 2 Analog outputs. 24 Digital Inputs/Outputs.

③ CADDA/CCSOF. Computer Control + Data Acquisition + Data Management Software:

Registration and visualization of all process variables in an automatic and simultaneously way. Flexible, open and multicontrol software, developed with actual windows graphic systems, acting simultaneously on all process parameters. Management, processing, comparison and storage of data. Sampling velocity up to 250 KS/s (kilo samples per second). Comparative analysis of the obtained data, after the process and modification of the conditions during the process.

④ Cables and Accessories, for normal operation.

⑤ Manuals: This unit is supplied with 8 manuals.

Dimensions (approx.) = Unit: 490 x 450 x 470 mm. Weight: 40 Kg.

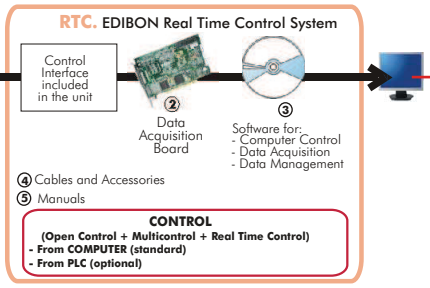
More information in: www.edibon.com/products/catalogues/en/units/electronics/control/CADDA.pdf

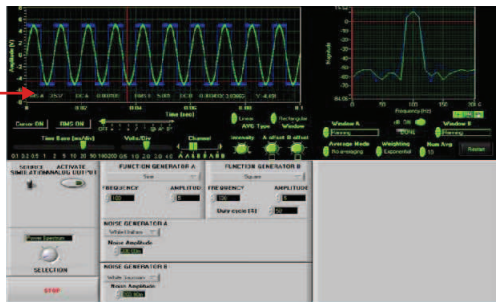
PRACTICAL POSSIBILITIES

1.- Sampling theorem.
2.- Analog/Digital integrated converter. Monopolar assembly.
3.- Analog/Digital integrated converter. Bipolar assembly.
4.- Monopolar binary ramp converter.
5.- Quantification effects.
6.- Bipolar binary ramp converter.
7.- Binary ramp converter with continuous monopolar counting.
8.- Binary ramp converter with bipolar continuous counting.
9.- Monopolar simple ramp.
10.- Bipolar simple ramp converter.
11.- Monopolar double ramp converter.
12.- Double bipolar ramp converter.
13.- Monopolar converter of successive approximations.
14.- Bipolar converter of successive approximations.
15.- Integrated Digital/Analog converter. Monopolar assembly.
16.- Digital/Analog integrated converter. Bipolar assembly.
17.- Digitalization and reconstruction of monopolar signals.
18.- Digitalization and reconstruction of bipolar signals.
19.- Digital/Analog monopolar converter of weighted resistance.
20.- Digital/Analog bipolar converter of weighted resistance.
21.- Analog switches errors.
22.- R/2R monopolar stair converter.
23.- R/2R bipolar stair converter.
24.- Current division in R/2R stairs.
25.- Digital/Analog converter of monopolar inverted stair.
26.- Digital/Analog bipolar converter of inverted stair.
27.- Digital/Analog monopolar converter of series blocking.
28.- Digital/Analog bipolar converter of series blocking.
29.- Digital/Analog converter of load balance.
30.- Bipolar Digital/Analog converter of load balance.
31.- Monopolar Digital/Analog converter of pulse width modulation.
32.- Digital/Analog bipolar converter of pulse width modulation.

TDS. Computer Controlled **Teaching Unit for the Study of Digital Signal Processing**

① Unit: TDS. Teaching Unit for the Study of Digital Signal Processing





SPECIFICATIONS SUMMARY
Items supplied as standard

① TDS Unit:

Metallic box.

Diagram in the front panel with similar distribution to the elements in the real unit.

Front Panel:

2 Function generators modules, that can generate 3 different signals: sinusoidal, square and triangular.

Each one includes: wave forms selector, frequency selector, amplitude selector.

Duty cycle selector.

Signal output.

Noise generator module, that can generate two noise type.

Including: 2 noise outputs, attenuator selector per each noise type.

Microphone pre-amplifier module, including: input (microphone), outputs (2 connectors).

Power amplifier module, including: inputs (2 connectors), output (1 connector), volume selector.

Speaker module.

PC input/output module, including: 2 inputs. 2 outputs.

Power On/Off switch.

Lateral panel:

SCSI connector for connecting with the data acquisition board (DAB) to be placed in the computer.

Back panel:

Power supply connector.

Safety fuse.

Inside:

Power supply. 2 Signal generation boards (PBC).

White and pink noise generation board (PBC).

Power amplifier board (PBC).

Pre-amplifier board (PBC).

Control interface.

Possibility of working simultaneously with two external signals, thanks to its inputs, facilitating operations that required more than one signal.

Moreover it is possible to generate signals directly by the software and send them to the unit outputs and then visualizing by an external oscilloscope or listening by the speaker.

② DAB. Data Acquisition Board:

PCI Data acquisition board (National Instruments) to be placed in a computer slot.

16 Analog inputs. Sampling rate up to: 250 KS/s.

2 Analog outputs. 24 Digital Inputs/Outputs.

③ TDS/CCSOF. Computer Control + Data Acquisition + Data Management Software:

Registration and visualization of signals in an automatic and simultaneously way.

2 signals can be visualized simultaneously.

Flexible, open and multicontrol software, developed with actual windows graphic systems, acting simultaneously on all process parameters.

Management, processing and comparison of data.

Sampling velocity up to 250 KS/s (kilo samples per second).

Comparative analysis of the obtained data, after the process and modification of the conditions during the process.

④ Cables and Accessories, for normal operation.

⑤ Manuals: This unit is supplied with 8 manuals.

Dimensions (approx.) = Unit: 490 x 330 x 310 mm. Weight: 30 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electronics/digital/TDS.pdf

PRACTICAL POSSIBILITIES

1.- Continuous wave form generation, with the possibility of varying the frequency and amplitude of signals, besides of duty cycle.

2.- Characterization of signals. To analyze the nature of the signals: sinusoidal, square, triangular and sawtooth.

3.- Possibility of working simultaneously with two external signals.

4.- Possibility of generating signals directly by the software and send them to the unit outputs and then visualizing or listening by the speaker or an external oscilloscope.

5.- Signal digitalization, permitting the most suitable sampling time, avoiding "aliasing".

6.- Digitalization of signals with the possibility of adjusting the sampling frequency.

7.- Fast Fourier Transforms (Power Spectrum).

8.- Addition, subtraction, multiplication, convolution and auto-convolution of signals.

9.- Study of "aliasing".

10.- Application of the frequency convolution theorem.

11.- Study of different noise types: White Uniform noise. White Gaussian noise. 1/f noise. Poisson noise. Random noise. Gamma noise.

12.- Representation of the Bode diagram and Nyquist diagram of any transfer function, and phase information.

13.- Study and use of filters:

-Possibility of filtration of any signal.

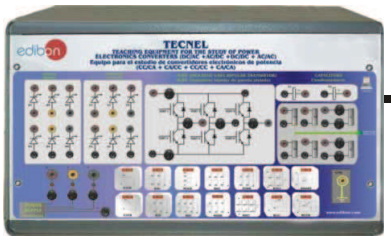
-Reconstructions of signals through the application of filters.

-Finite Impulse Response (FIR) Filters.

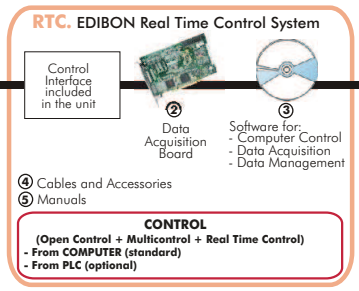
-Infinite Impulse Response (IIR) Filters.

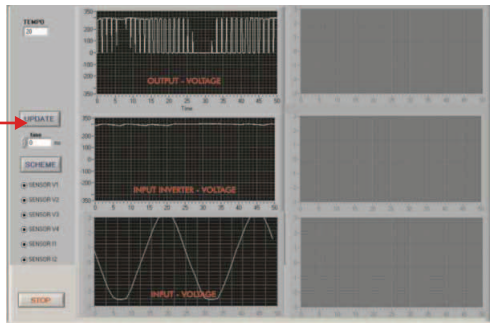
-Possibility to use Bartlett, Hanning, Hamming, Kaiser, Parzen, etc. windows for applying on the signal.

TECNEL. **Computer Controlled Teaching Unit for the Study of Power Electronics** (with IGBTS)
(Converters: DC/AC+AC/DC+DC/DC+AC/AC)



① Unit: TECNEL. Teaching Unit for the Study of Power Electronics (with IGBTS), including Control Interface. (Converters: DC/AC+ AC/DC+DC/DC+AC/AC).





SPECIFICATIONS SUMMARY
Items supplied as standard

①TECNEL. Unit:
Unit with Computer Control and Data Acquisition System designed to study the basis of Power Electronics. It allows students to study AC/DC, DC/AC, DC/DC, AC/AC converters.
Metallic box. Diagram in the front panel with similar distribution to the elements in the real unit.
Front panel: Diodes module: 6 diodes. Thyristors module: 6 thyristors. IGBTS Module: 6 IGBTS. Snubber net. Sensors module: 4 voltage sensors, 2 current sensors. Power supply connections for Vr, Vs, Vt, Neutral and Ground. Practices schemes.
Back panel: Data Acquisition Board Connector (SCSI connector). Tachodynamo connector. Main fuses (Vr, Vs, Vt) and LEDs. Circuit breaker (main switch).
Single-phase driver. Three-phase driver. IGBT driver. TSI board. PIC board. SKHI61 board. Four relays board. 2 Three-phase relays. Commuted power supply. Three-phase magnetothermal.
Control interface.

② DAB. Data Acquisition Board:
PCI Data acquisition board (National Instruments) to be placed in a computer slot. 16 Analog inputs. Sampling rate up to: 250 KS/s. 2 Analog outputs. 24 Digital Inputs/Outputs.

③ TECNEL/CCSOF. Computer Control+Data Acquisition+Data Management Software:
Registration and visualization of all process variables in an automatic and simultaneously way. Flexible, open and multicontrol software, developed with actual windows graphic systems, acting simultaneously on all process parameters. Management, processing, comparison and storage of data. Sampling velocity up to 250 KS/s (kilo samples per second). Comparative analysis of the obtained data, after the process and modification of the conditions during the process.

④ Cables and Accessories, for normal operation.

⑤ Manuals: This unit is supplied with 8 manuals.

Dimensions (approx.) =Unit: 490 x 330 x 310 mm. Weight: 40 Kg.

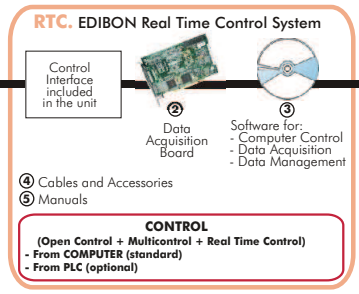
More information in: www.edibon.com/products/catalogues/en/units/electronics/industrial/TECNEL.pdf

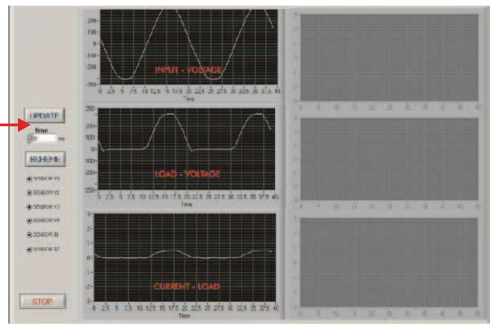
PRACTICAL POSSIBILITIES

1.- Single phase half-wave rectifier with load R.
2.- Single phase half-wave rectifier with load R-L.
3.- Single-phase half-wave rectifier with R-L load with free wheeling diode (FWD).
4.- Single-phase full-wave rectifier.
5.- Three-phase half-wave uncontrolled rectifier.
6.- Three-phase full-wave uncontrolled rectifier.
7.- Single-phase half-wave controlled rectifier.
8.- Single-phase full-wave controlled rectifier.
9.- Single-phase full-wave controlled rectifier with a DC motor.
10.- Three-phase full-wave completely controlled.
11.- Single-phase semi controlled rectifier.
12.- Three-phase full-wave semi-controlled rectifier.
13.- Chopper.
14.- Single-phase square-wave inverter.
15.- Single-phase displaced phase inverter.
16.- Single-phase inverter. PWM control.
17.- Three-phase inverter. PWM control with R load and R-L load.
18.- Three-phase inverter. PWM control with AC motor.
19.- Alternating regulators: R and R-L load.
20.- Asynchronous three-motor with rotor in short circuit (squirrel cage).

TECNEL/B. **Computer Controlled Basic Teaching Unit for the Study of Power Electronics** (no IGBTS)
(Converters: AC/DC+AC/AC)

① Unit: TECNEL/B. Basic Teaching Unit for the Study of Power Electronics (no IGBTS), including Control Interface. (Converters: AC/DC+AC/AC).





SPECIFICATIONS SUMMARY
Items supplied as standard

①TECNEL/B. Unit:
Unit with Computer Control and Data Acquisition System designed to study the basis of Power Electrics. It allows students to study AC/DC, AC/AC converters.
Metallic box. Diagram in the front panel with similar distribution to the elements in the real unit.
Front panel: Diodes module: 6 diodes. Thyristors module: 6 thyristors. Snubber net. Sensors module: 4 voltage sensors, 2 current sensors. Power supply connections for Vr, Vs, Vt, Neutral and Ground. Practices schemes.
Back panel: Data Acquisition Board connector (SCSI connector). Tachodynamo connector. Main fuses (Vr, Vs, Vt) and LEDs. Circuit breaker (main switch).
Single-phase driver. Three-phase driver. TSI board. Four relays board. 2 Three-phase relays. Commuted power supply. Three-phase magnetothermal. Control Interface.

② DAB. Data Acquisition Board:
PCI Data acquisition board (National Instruments) to be placed in a computer slot. 16 Analog inputs. Sampling rate up to: 250 KS/s. 2 Analog outputs. 24 Digital Inputs/Outputs.

③ TECNEL/B/CCSOF. Computer Control+Data Acquisition+Data Management Software:
Registration and visualization of all process variables in an automatic and simultaneously way. Flexible, open and multicontrol software, developed with actual windows graphic systems, acting simultaneously on all process parameters. Management, processing, comparison and storage of data. Sampling velocity up to 250 KS/s (kilo samples per second). Comparative analysis of the obtained data, after the process and modification of the conditions during the process.

④ Cables and Accessories, for normal operation.

⑤ Manuals: This unit is supplied with 8 manuals.

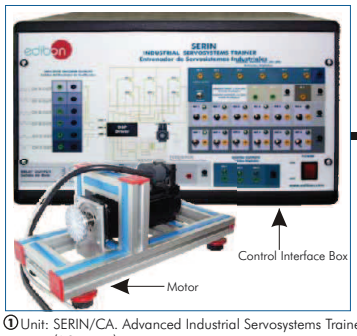
Dimensions (approx.) =Unit: 490 x 330 x 310 mm. Weight: 35 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electronics/industrial/TECNEL-B.pdf

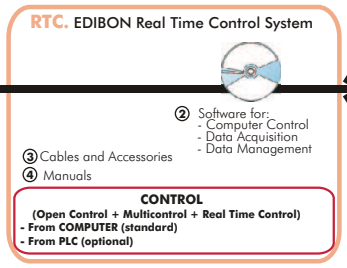
PRACTICAL POSSIBILITIES

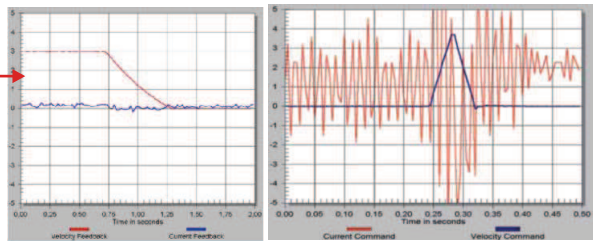
1.- Single phase half-wave rectifier with load R.
2.- Single phase half-wave rectifier with load R-L.
3.- Single-phase half-wave rectifier with R-L load with free wheeling diode (FWD).
4.- Single-phase full-wave rectifier.
5.- Three-phase half-wave uncontrolled rectifier.
6.- Three-phase full-wave uncontrolled rectifier.
7.- Single-phase half-wave controlled rectifier.
8.- Single-phase full-wave controlled rectifier.
9.- Single-phase full-wave controlled rectifier with a DC motor.
10.- Three-phase full-wave completely controlled.
11.- Single-phase semi-controlled rectifier.
12.- Three-phase full-wave semi-controlled rectifier.
13.- Alternating regulators: R and R-L load.

SERIN/CA. Computer Controlled **Advanced Industrial Servosystems Trainer (AC motors)**



①Unit: SERIN/CA. Advanced Industrial Servosystems Trainer (AC motors)





SPECIFICATIONS SUMMARY
Items supplied as standard

① SERIN/CA Unit:

The SERIN/CA trainer consists on an Control Interface Box connected to a three-phase motor and to a PC. The control interface has a resolver for three-phase motors that controls the speed, position and current of the motor. The communication between the control interface and the PC provides the SERIN/CA the possibility of commanding the motor from the PC and visualize the most important signals of the motor. Velocity, Position and Torque Control. It allows predefined moves and programming.

Control Interface Box:

Front panel:

3 Digital outputs: They have a green LED that indicates if the output is active or not. Emulative encoder outputs: two pair of outputs (CH A Out, CH B Out and their respective denied outputs) that are TTL signals of incremental position generated by the resolver feedback, and one pair of outputs (CH S Out and their denied) that TTL works as marker of pulses. Analog output 4 (relay). Analog_outputs of the DAC monitor: these analog outputs are monitored points of general character. 6 digital inputs for those signals that are introduced to enable the different available functions in the software. 6 buttons to enable the digital inputs. 6 switches, with the same function as the buttons, but with the only difference that they are switches. Switch outfitter of digital inputs: there is a switch that enables the digital inputs. Analog input: this input allows an analog use directly of the user. It is an A/D input. Voltage supply: 3 sources of D.C. in the unit (+24 V. , +12V., and -12V. DC.) 2 Potentiometers.

Back panel:

Voltage supply (220 V A.C.). Three-phase output when solving: it is a three-phase output that feeds when you are solving and, therefore, allows their movement. Connection port in series: to connect the unit with the PC by the port in series. Connection with the feedback: it is a connection with the motor feedback. It allows the encoder to manage the motor.

Motor: AC motor, 0.7kW, 2.8A ac, 4200 rpm, 320V dc. Sensor RESOLVER :1 Speed, 1X/RX, 3 phase.

② SERIN/CA/CCSOF.Computer Control+Data Acquisition+Data Management Software:

Registration and visualization of signals in an automatic and simultaneously way. Flexible, open and multicontrol software. Management, processing, comparison and storage of data. Comparative analysis of the obtained data, after to the process and modification of the conditions during the process.

③ Cables and Accessories, for normal operation.

④ Manuals: This unit is supplied with 8 manuals.

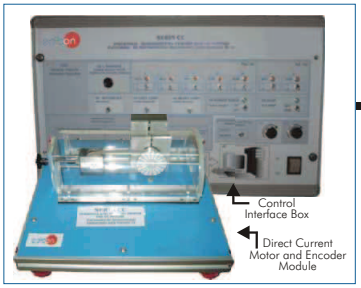
Dimensions (approx.) =Unit: 490 x 330 x 310 mm. Weight: 40 Kg. Motor:410 x 170 x 150 mm. Weight: 5 Kg.

PRACTICAL POSSIBILITIES

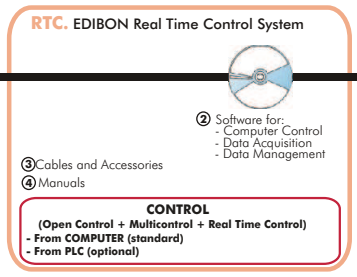
1.- Homing.
2.- Clutch/Control.
3.- Turn movement (w/correction phase).
4.- Registration movements.
5.- Dry movements.
6.- Stop and blockade. Transitory states.
7.- Stop and blockade. Influence on the filtered velocity.
8.- Transitory velocity study.
9.- Feedback gain manage.
10.- Modification of Feedback Parameters and Phases U, V and W.
11.- Use and modification of the feedback filters.
12.- Phase voltages U, V and W showing.

More information in: www.edibon.com/products/catalogues/en/units/electronics/industrial/SERIN-CA.pdf

SERIN/CC. Computer Controlled **Advanced Industrial Servosystems Trainer (DC motors)**



①Unit: SERIN/CC. Advanced Industrial Servosystems Trainer (DC motors)



SPECIFICATIONS SUMMARY
Items supplied as standard

① SERIN/CC Unit:

It is formed by a Control Interface Box and a Direct Current Motor and Encoder Module. The Control Interface Box has a 4-quadrants servo amplifier for DC motors that controls the motor speed, position and current of the motor. In order to do this control the feedback is done thanks to an encoder. The communication between the Control Interface Box and the computer (PC) provides the possibility of commanding the motor from the PC and to visualize the most important signals of the motor. The 4-quadrant servo amplifier controls the motor operation and the braking operation in both rotation directions clockwise and counterclockwise. Velocity, Position and Torque Control. It allows predefined moves and programming.

Control Interface Box:

Front panel: Diagram in the front panel with similar distribution to the elements in the real unit.

7 Digital outputs. 13 Digital inputs. 2 Analog inputs with voltages in the range of 0-5V. 2 Potentiometers to select the value of the analog inputs (0-5 V DC).

Back panel:

Voltage supply that feeds the unit with 220 V of alternating current. Motor power supply: it is a 24 V DC motor power supply. Connection plug to connect the Control Interface with the PC by the RS-232 port, in order to allow the software to manage the motor. Connection with the motor Feedback, it is a connection with the motor Feedback, it allows the encoder to manage the motor.

Direct Current Motor and Encoder Module:

DC Motor, 90W, position, speed and current are controlled by the Control Interface. Digital encoder, 500 pulses per revolution, with RS232 communication port.

2 Power supply wires. 2 Communication RS232 wires.

② SERIN/CC/CCSOF.Computer Control+Data Acquisition+Data Management Software:

Registration and visualization of signals in an automatic and simultaneously way. Flexible, open and multicontrol software. Management, processing, comparison and storage of data. Comparative analysis of the obtained data, after to the process and modification of the conditions during the process.

③ Cables and Accessories, for normal operation.

④ Manuals: This unit is supplied with 8 manuals.

Dimensions (approx.)=Unit: 490 x 330 x 310 mm. Weight: 40 Kg. Motor+Esconder Module: 300 x 300 x 120 mm. Weight: 5 Kg.

PRACTICAL POSSIBILITIES

1.- Autotuning.
2.- Manual tuning of the position regulator.
3.- Motion commands in MPBUS RS232 mode.
4.- Signals Graph, Transient Analysis.
5.- Batch Commands.
6.- User´s parameters, Position Val., velocity Val., Acceleration Val.
7.- Digital inputs and outputs in I/O mode.
8.- Load and braking simulation.
9.- Searching reference.
10.- Input/Output functions.
11.- State commands and Exception.
12.- Velocity, Position and Torque control.

More information in: www.edibon.com/products/catalogues/en/units/electronics/industrial/SERIN-CC.pdf

SERIN/CCB. **Basic Servosystems Trainer (DC motors)**

SPECIFICATIONS SUMMARY

"SERIN/CCB" is an unit whose goal is studing low power servo systems. It is a low power DC motor speed control trainer that has a breakdown simulator.

This trainer is a basic version of the Advanced and Computerised "SERIN/CC" Trainer, being advisable for an introductory study of closed and open loop control systems.

The trainer includes:

Base Unit:

Metallic box. Diagram in the front panel with similar distribution to the elements in the real unit.

Electromechanic unit. Tachometric adaptor. Generation and control of set point. Ramp generator, as well as of sinusoidal, triangular and square wave generator. PWM modulator.

Open loop control.

Close loop control:

Proportional Control (P). Integrative Proportional Control (PI). Proportional derivative Control (PD). Proportional Integrative derivative (PID).

Current limiter. Turn inversion control. Stop/starting control. Power stage and excitation of the power stage. Brake control.

Fault simulator that allows the entries of a considerable amount of disfunctions in order to the students diagnose its nature and find out the components that cause them.

Direct current motor (DC) and tachometric generator.

Computer Control Software.

Cables and Accessories, necessary for its correct operation.

Manuals: This unit is supplied with 8 manuals.

Dimensions (approx.) = 400 x 330 x 310 mm.

Weight: 10 Kg.

More information in: www.edibon.com/products/catalogues/en/units/electronics/industrial/SERIN-CCB.pdf

PRACTICAL POSSIBILITIES

1.- Open loop control response.

2.- Demonstration of a bracking ramp functioning.

3.- Functioning of a PWM modulator and the response of the system.

4.- Closed loop or feedback control through a Proportional control (P).

5.- Closed loop or feedback control through a Derivative control (D).

6.- Closed loop or feedback control through a Proportional-Integral controller (PI).

7.- Closed loop or feedback control through a Proportional Derivative controller (PD).

8.- Achievement of an over damped system using a closed loop system.

9.- Achievement of a critically damped system using a closed loop PID.

10.- Instability, a characteristic of closed loop systems.

11.- Stabilisation of an unstable system.

12.- Faults simulation:

Type of faults including on the unit:

Fault 1: The absolute value of the feedback signal from the tachogenerator is not calculated for its subtraction from the reference, thus, for one of the turning senses, the error is wrong.

Fault 2: The value of the Proportional constant of the PID is divided by ten with the user unable to detect it but its effect.

Fault 3: The value of the Integral constant of the PID is divided by ten with the user unable to detect it but its effect.

Fault 4: The value of the Derivative constant of the PID is divided by ten with the user unable to detect it but its effect.

Fault 5: The signal from the tachogenerator is modified, making the PID control to believe that the speed is ten times lower to the real one.

None of these faults are exclusive, being possible to combine them.

SERIN/CACC. Computer Controlled **Advanced Industrial Servosystems Trainer (AC and DC motors)**

SERIN/CAB. **Basic Servosystems Trainer (AC motors)**