regulation and control systems
Integral equipment for the classroom-workshop

Our in-depth knowledge of the educational world allows us to design classroom-workshops configured down to the last detail and ready to use straight away.

automotion renewable energies electricity electronics
The flame of knowledge

For the last 45 years Alecop has offered technological material with maximum benefits which has led to the most important educational organisations opening their doors to us.

HUMANITY AT WORK
We belong to the educational department of MONDRAGON Corporación: A cooperative project of world renown which contributes a human component to the business world. A different work method which seeks the integral development of people and respect for the environment.

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regulation and control systems

SENSORS, PROCESS REGULATION AND PROGRAMMABLE AUTOMATONS

The training equipment designed for this area consists of a modular programme enabling study through the analysis and design of different measurement and regulation systems. Functional models with integrated industrial sensors are used to study both these sensors and closed loop regulation systems for different processes.
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## STUDY OF SPEED AND POSITION CONTROL PROCESSES
- Series 540 8

## STUDY OF TEMPERATURE CONTROL PROCESSES
- Series 540 10

## STUDY OF LEVEL PROCESSES AND FLOW
- Series 540 12

## STUDY OF PHYSICAL MAGNITUDE SENSORS
- Series 540 14
Proposed laboratory regulation and control systems

The training equipment designed for this area consists of a modular programme enabling study through the analysis and design of different measurement and regulation systems. Functional models with integrated industrial sensors are used to study both these sensors and closed loop regulation systems for different processes (speed, temperature and level).

Types of sensors and their signal conditioners

- Speed and position regulation
- Temperature regulation
- Level and pressure regulation
- Signal linearisation
- P.I.D system regulation

Proposed laboratory regulation and control systems

- Process models with ready-to-work integrated actuators and sensors. 2 mm sockets for quick connection and multi-point measurement.
- Compliant with the European low voltage and electromagnetic compatibility directives. Elements printed in accordance with the IEC (Electrotechnical Commission) standard.

Back-up resources

- This equipment includes a set of back-up elements to aid the trainer, e.g.:
  - Practical Manuals
  - Theory Manuals
  - Data collection and display software
  - Technical instruments, etc.
MODULAR PROGRAMME

The system is based on a “module” support, which can be configured according to user needs. The 540 series enables all the content to be studied, with high function integration on each module.

Assembly and power supply system

The basis of the modular programme consists of the assembly frame and the ±15 V power supply module (ALI-700 module), which is required for all training module configuration requiring an electronic power supply.

Table-mounted training frame

- This is a physical support for the modules, blocks and panels used for the practical activities.
- It transmits the electrical supply from the power supply modules to all the modules requiring it.

The frame dimensions are selected in accordance with the equipment to be mounted on the frame. Its horizontal structure consists of an aluminium section and the rectangular side supports are oven-dried painted iron sections.

As regards locating the frame on the work tables, it may be fixed (the frame can be fixed to the tables) or mobile (in which case it is supplied with removable legs with non-slip feet). The module power supply and fixing systems consist of a series of connectors, into which the connection points located on the rear of the modules are inserted, exerting a slight pressure.

Training module

ALI-700

±15 V. POWER SUPPLY

Power source: ±15 V. It transmits the power supply via the table-mounted frame. These voltages are also available at 2 mm terminals.

It provides a nominal current of 2 A, and includes thermal and short circuit protection with automatic reset after a few seconds.

Ref.: MDULAI700

Table-mounted training frame

Ref.: 9EBxPxxCP

xx: 10, 14, 18, 20, 22, 28, 36, 44: nº of insertable single modules.

x: 1, 2: frame height in tiers.
Study of speed and position control processes

Series 540

Didactic unit

MV-541

SPEED AND POSITION IN A D.C ENGINE

It consists of a model that incorporates a rotation axis powered by a DC motor, including the sensors, which are arranged in an accessible form to facilitate understanding by the student.

In associated with the motor axis, is available:

- A tacho speed for capturing
- An absolute encoder and an incremental angular displacement uptake.
- A speed reducer indicating the angle of its axis reduced
- A potentiometric angular position sensor.

The printed connection terminals are located on the front panel of the model, between the different sensors and the motor, with the conditioning and control models.

Training module

CONSIGNA-547

SETTING AND DRIVER

- This contains the signal generator for the speed setting (step or ramp) and the position setting.
- Power driver acting on the DC motor, with overvoltage protection calibrated to 1 A.

Training module

ENCODER-547

ENCODER CONDITIONER

- Display panel containing 7-segment displays of the number of pulses and turns from the absolute or incremental encoders.
- Pilot lights for right-left pulses and right-left or left-right turns, with their corresponding terminals.
- Terminals with BCD output for the value of each digit on the display.
- Selection of counter for incremental encoder and decoder for absolute encoder.
- Reset is manual or synchronised with the incremental encoder signal.
SPEED AND POSITION CORRECTOR

- These are speed and position correctors which may be either proportional, integral or proportional-integral, selectable via rotary switch.
- Corrector parameters adjustable via potentiometric controls.
- Includes conditioners for the tacho dynamo and the potentiometric sensor.
- Includes analogue comparator and adder.

4-CHANNEL MULTIPLEXER

- Enables up to four analogue and/or digital signals to be viewed on an oscilloscope.
- The four input channels have offset adjustment control and actuator switch or reset to zero.
- It is equipped with a selector switch for sync with respect to any of the inputs and another selector for alternate or chopped display.
- Outputs for connection to the oscilloscope channel and for connection to its external sync.

Standard components included:
- Table-mounted frame.
- ALI-700 power supply module.
- Series 540 model and specific control modules.

Standard accessories:
- Mains connection cable and 2 mm connectors.

Optional elements recommended:
- FPB training module: Low pass filter.
Study of temperature control processes

Series 540

Didactic unit

MT-542

A FURNACE TEMPERATURE

The model consists of a simulator of a furnace in which are located inside the heating (equipped with aluminium radiator) and the different temperature sensors.

On the left side of the oven is located a fan whose window can be closed by a lid, available on the reverse side of a ventilation window also with a lid.

The sensors contained on the model are:

- 1 integrated temperature transducer AD-590.
- 1 type J thermo-couple.
- 1 positive temperature coefficient resistance transducer PTC.
- 1 platinum resistive transducer PT-100.

The last three sensors above are in heat contact with another three integrated transducers AD-590 installed, and which serve as reference thermometers for these. Readings are taken from these transducers on the digital thermometer placed on the front panel of the model.

Printed connection terminals between the heater and the different sensors are included with the conditioning and control modules.

Training module

CSH-547

SET POINT AND HYSERESIS CONTROL

- Set point signal generator, adjustable via potentiometric control.
- Comparator with hysteresis, with adjustable strip and pilot light indicating output level (0 or 1).
Training module **ACONDITERMO-547**

**THERMOCOUPLE AND PTC CONDITIONER**

- PTC temperature sensor and thermocouple conditioners.
- Offset adjustment and gain controls.

Training module **CONDIPLAT-547**

**AD-549 AND PT100 CONDITIONER**

- Platinum resistance conditioner (PT100).
- AD-590 conditioner.
- Offset adjustment and gain controls.

Standard components included:
- Table-mounted frame.
- ALI-700 power supply module.
- Series 540 model and specific control modules.

Standard accessories:
- Mains connection cable and 2 mm connectors.
The model has a water-tight tank with two compartments, one to control the level and the other for drainage; there is a motorised pump which transfers the liquid from one place to another, and a set of sensors:

- For levels, using a float with linear potentiometer.
- For levels, by variable capacity.
- For levels, by ultrasound.
- For flow, by differences in hydrostatic pressure.
- For flow, by turbine.
- For hydrostatic pressure.

Printed connection terminals between the pump motor and the different sensors are included with the conditioning and control modules.
Regulation and control systems
Study of level processes and flow. Series 540.

Training module
NBP-547
FLOAT AND HYDROSTATIC PRESSURE CONDITIONER
• Hydrostatic pressure sensor conditioner.
• Float type sensor conditioner.
• Offset and gain adjustment.

Training module
ACONDICAUD-547
FLOW CONDITIONER
• Pressure-difference flow sensor conditioner with offset and gain adjustment.
• Turbine flow sensor conditioner with frequency/voltage converter and gain adjustment.

Training module
ACONDINIV-547
ULTRASONIC AND CAPACITIVE LEVEL CONDITIONER
• Ultrasonic level sensor conditioner with oscillator and offset and gain adjustment.
• Capacitive level sensor conditioner with oscillator and offset and gain adjustment.

Ref.: 9EQCAMDS44
Standard components included:
• Table-mounted frame.
• ALI-700 power supply module.
• Series 540 model and specific modules.

Standard accessories:
• Mains connection cable and 2 mm connectors.
Didactic unit

MF-540

PHYSICAL MEASURES

The MF-540 unit is designed to make a real, practical study of physical magnitude sensors, such as movement, linear speed and acceleration and buckling forces on a plate.

The model is made up of a vibrating cantilever consisting of two plates firmly fixed at either end to a fixed mount on the model, and to a vertical rod. As collectors items containing:

- An LVDT (linear variation differential transformer) as the sensor for movement.
- An inductive speed sensor.
- A piezoelectric acceleration sensor
- Four strain gauges, 2 working by traction and 2 by compression, to collect the buckling forces.

The drive device for the vibrating cantilever is a coil, which when excited by an oscillating signal, will make the cantilever vibrate.

The connecting terminals from the various sensors and the drive coil to the modular control cabinet is on the front panel.

Training module

BEX-547

OSCILLATOR COIL DRIVER

- Oscillator with variable amplitude and frequency, from 0 - 10 V and 0.1 Hz - 100 Hz.
- The signal is amplified by a current buffer providing up to 0.3 A.
Training module

**AVA-547**

**SPEED AND ACCELERATION CONDITIONER**

- Conditioners for the speed and acceleration sensor signals.
- Preamplifier and internal bandpass filter to eliminate mains noise.
- Adjustable amplifier and offset.

**ACONDICIONADOR-547**

**LVDT CONDITIONER AND GAUGES**

- Conditioners for displacement sensor signals (LVDT) and bending stresses (strain gauges).
- Adjustment controls for zero displacement and for calibre and gain for the LVDT.
- Gauge conditioner with rotary selector switch for setting Wheatstone bridge current.
- Controls for correction of offset and calibre and gain adjustment.

Ref.: 9EQCAMF540

Standard components included:
- Table-mounted frame.
- ALI-700 power supply module.
- Series 540 model and specific modules.

Standard accessories:
- Mains connection cable and 2 mm connectors.
- Micrometer.
- Weights.
- Allen key and adjustment screwdriver.