edibon

Engineering and Technical Teaching Equipment

Hydraulic and Electro-Hydraulic Application

AE-HD

www.edibon.com
↳PRODUCTS
↳6.- MECHATRONICS, AUTOMATION & COMPUMECHATRONICS

AE-HD. Hydraulic and Electro-Hydraulic Application

INTRODUCTION

Hydraulics is the technology that employs the properties of the liquids to operate machines. Hydraulics is used in applications in which large forces must be exerted on the load. For that purpose, this technology is based on the properties of the liquids for energy transfer.

The "AE-HD", Hydraulic and Electro-Hydraulic Application, has been designed to obtain the necessary knowledge to understand the operation of the most common elements used in hydraulics and electro-hydraulics.

The "AE-HD" includes a set of practical exercises through which the students will understand how to work with the most common elements of a hydraulic and electro-hydraulic system.

ISO 9001: Quality Management (for Design, Manufacturing, Commercialization and After-sales service)

European Union Certificate (total safety)

Certificates ISO 14001 and ECO-Management and Audit Scheme (environmental management)

Certificate and Worlddidac Member

GENERAL DESCRIPTION

The Hydraulic and Electro-Hydraulic Application, "AE-HD", is a modular unit consisting of a great variety of optional kits and elements to configure the desired Hydraulic and Electro-Hydraulic circuit.

The optional hydraulic kits available with the unit, offers the necessary elements to perform a complete study of management and utilization of the actual hydraulic circuits, with some examples of uses of this type of circuits. In the following lines there is a brief description of the objective to all hydraulic optional kits:

- HK-K0, Kit to study the hydraulics fundamentals: contain the components to understand the fundamentals concepts of the hydraulic circuits.
- HK-K1, Hydraulics kit: contain the components to understand the fundamentals and advanced concepts of the hydraulic circuits.
- HK-K2, Electro-Hydraulics kit: contain the components to understand the fundamentals and advanced concepts of the electro-hydraulic circuits.
- HK-K3, Hydraulic Actuators kit: is designed to teach the concepts behind the most common hydraulic actuators as hydraulic motors, hydraulic cylinders, etc.
- HK-K4, Measurement and Proportional Control in Hydraulics kit: is a computer controlled kit, configured to perform the analog signal and the proportional control over the hydraulic actuators to implement a PID control from the computer.
- HK-K5, Hydrostatic Steering System kit: is designed to teach the most common components of the steering system, and how it work the steering systems of the automobile industry of today.
- HK-K6, Hydraulic and Electro-Hydraulic troubleshooting kit: is a kit of defective hydraulic components designed to teach the students the most common problem in hydraulic components, how to find them and detect the problems.

AE-HD Detail

The EDIBON PLC unit is design to work with the HK-K1 and the HK-K2 kits, and in conjunction offers the components to perform a complete understanding of hydraulic and electro-hydraulic technology with a PLC control of the hydraulic components, adding more practical possibilities to the unit

There is available the optional elements of Hydraulic Power Unit, "HPU", that include all necessary components to supply pressurized working oil to the unit, the Workbenches to work at one or two sides, etc.

UNIT ELEMENTS ALLOCATION

SPECIFICATIONS

All the hydraulic components of the "AE-HD" unit:

Work with a working hydraulic pressure of 50 bar.

The components include quick and self-sealing connectors with Built-in Stop Mechanism.

Are attached to a screen printed metallic plate with the name and the standard symbol of the component. These metallic plates are designed to be placed on the EDIBON workbenches.

Optional kits of Hydraulic components:

- HK-K0, **Kit to study the hydraulics fundamentals:**

Pressure control valves:

Pressure limiting valve:

Knob to regulate the pressure level.

Pressure regulation from 5 to 50 bars.

Flow control valves:

Shut-off valve.

Adjustable flow control valve:

Knob to regulate the flow.

Graduated scale.

Manual distribution valves:

4/3 manual operated directional valve with closed center and spring return:

Mechanical activation by lever.

Closed center.

Spring return.

Maximum flow: 60 l/min.

Maximum pressure: 350 bar.

Hydraulic actuators:

Double effect cylinder:

Material: stainless steel.

Ball head at the end of the rod.

Diameter: 40 mm.

Stroke of 200 mm.

Connection parts and accessories:

Set of 5 hoses with quick-fit female connectors:

0.6 m hose (2 units).

1 m hose (2 units).

2 m hose.

Cross-shaped manifold with manometer:

3 available intakes.

Manometer with range from 0 to 100 bar with glycerin damping and diameter of 63 mm.

Tank to perform volumetric measures:

Manufactured in transparent methacrylate.

Capacity: 3 litres.

Graduated scale.

Overflow protection.

- HK-K1, **Hydraulics kit:**

Pressure control valves:

Pressure limiting valve (2 units):

Knob to regulate the pressure level.

Pressure regulation from 5 to 50 bars.

3-way pressure reducing valve:

Knob to regulate the pressure level.

Output pressure adjustable.

Pressure relief valve:

Knob to regulate the pressure level.

Pilot-operated pressure limiting valve.

Flow control valves:

Shut-off valve.

Adjustable flow control valve:

Knob to regulate the flow.

Graduated scale.

Check valve.

Pilot operated check valve.

Adjustable pressure-compensated flow control valve:

Knob to regulate the flow.

Graduated scale.

Adjustable flow control valve with bypass (2 units):

Knob to regulate the flow.

Graduated scale.

Flow dividing valve.

Manual distribution valves:

2/2 manual operated directional valve with spring return:

Mechanical activation by lever.

Spring return.

NO operation valve.

Maximum flow: 60 l/min.

Maximum pressure: 350 bar.

2/2 directional valve activated by roller:

Mechanical activation by roller.

Spring return.

Maximum flow: 60 l/min.

Maximum pressure: 350 bar.

3/2 manual operated directional valve with spring return:

Mechanical activation by lever.

Spring return.

NC operation valve.

Maximum flow: 60 l/min.

Maximum pressure: 350 bar.

4/2 manual operated directional valve with spring return:

Mechanical activation by lever.

Spring return.

Maximum flow: 60 l/min.

Maximum pressure: 350 bar.

4/3 manual operated directional valve with tandem center and spring return:

Mechanical activation by lever.

Tandem center, P-T linked.

Spring return.

Maximum flow: 60 l/min.

Maximum pressure: 350 bar.

4/3 manual operated directional valve with AB-T linked and spring return:

Mechanical activation by lever.

Center AB-T linked.

Spring return.

Maximum flow: 60 l/min.

Maximum pressure: 350 bar.

4/3 manual operated directional valve with closed center and spring return:

Mechanical activation by lever.

Closed center.

Spring return.

Maximum flow: 60 l/min.

Maximum pressure: 350 bar.

Hydraulic actuators:

Double effect cylinder:

Material: stainless steel.

Ball head at the end of the rod.

Diameter: 40 mm.

Stroke of 200 mm.

Hydraulic motor.

Sensors:

Flow meter:

Maximum flow: 5 l/min.

Maximum pressure: 350 bar.

Connection parts and accessories:

Set of 14 hoses with quick-fit female connectors:

0.6 m hose (6 units).

1 m hose (6 units).

2 m hose (4 units).

Cross-shaped manifold with manometer (3 units):

3 available intakes.

Manometer with range from 0 to 100 bar with glycerin damping and diameter of 63 mm.

Diaphragm accumulator with safety shut-off valve.

Set of pipes for pressure drop experiment with:

3 different pipe sizes.

3 different pipe lengths.

Load unit for hydraulic cylinder.

- HK-K2, **Electro-Hydraulics kit**:
  - **Pressure control valves**:
    - Pressure limiting valve:
      - Knob to regulate the pressure level.
      - Pressure regulation from 5 to 50 bars.
  - **Flow control valves**:
    - Shut-off valve.
    - Pilot operated check valve.
    - Adjustable flow control with pressure compensation:
      - Knob to regulate the flow.
      - Pressure-compensated.
      - Graduated scale.
    - Adjustable flow control valve:
      - Knob to regulate the flow.
      - Graduated scale.
    - Check valve.
    - Adjustable flow control valve with bypass.
      - Knob to regulate the flow.
      - Graduated scale.
  - **Hydraulic solenoid valves**:
    - Bistable 4/2 solenoid valve:
      - Electric activation.
      - Maximum flow: 60 l/min.
      - Maximum pressure: 350 bar.
      - LED indicator.
      - 24V DC.
    - 4/3 solenoid valve with P-T center linked:
      - Electric activation.
      - Tandem center, P-T linked.
      - Spring return.
      - Maximum flow: 60 l/min.
      - Maximum pressure: 350 bar.
    - 4/2 solenoid valve with spring return (2 units):
      - Electric activation.
      - Spring return.
      - Maximum flow: 60 l/min.
      - Maximum pressure: 350 bar.
      - LED indicator.
      - 24V DC.
    - 4/3 solenoid valve with closed center (2 units):
      - Electric activation.
      - Closed center.
      - Spring centered.
      - Maximum flow: 60 l/min.
      - Maximum pressure: 350 bar.
      - LED indicator.
      - 24V DC.
  - **Hydraulic actuators**:
    - Double effect cylinder:
      - Material: stainless steel.
      - Ball head at the end of the rod.
      - Diameter: 40 mm.
      - Stroke of 200 mm.
    - Hydraulic motor.

Electric components:

- Main power supply N-ALI02:
  - Differential magneto-thermal switch.
  - Electrical switch with security key.
  - Emergency mushroom pushbutton.
- 24V DC Power supply:
  - Sockets of 2 mm.
  - 6 outputs of 24V DC.
  - 6 GND connections.
  - ON/OFF lit switch.
  - Fuse to protect the power supply against short-circuits.
- Switches block:
  - Sockets of 2 mm.
  - 2 Pushbuttons with NO contact.
  - Two-position selector with NO contact.
- Relays blocks:
  - Sockets of 2 mm.
  - Three relays with coil of 24V DC.
  - Each relay includes 4 switching contacts with NO and NC position.
  - Activated relay LED indicator.
- Time relays block:
  - Sockets of 2 mm.
  - Configurable time.
  - Activated relay LED indicator.
- Electronic preset counter:
  - Count pulse.
  - Set and reset pulse.

Sensors:

- Pressure switch with electric contact.
  - Output as commuted relay.
- Inductive proximity sensor.
- Reed effect proximity sensor (2 units).
- Limit switch activated by retractable roller (3 units):
  - Sockets of 2 mm.
  - NO and NC contacts

Connection parts and accessories:

- Set of 14 hoses with quick-fit female connectors:
  - 0.6 m hose (6 units).
  - 1 m hose (6 units).
  - 2 m hose (4 units).
- Cross-shaped manifold with manometer (2 units):
  - 3 available intakes.
  - Manometer with range from 0 to 100 bar with glycerin damping and diameter of 63 mm.
- Diaphragm accumulator with safety shut-off valve.
- Load unit for hydraulic cylinder.

- HK-K3, **Hydraulic Actuators kit**:

Pressure control valves:

Pressure limiting valve:

Knob to regulate the pressure level.

Pressure regulation from 5 to 50 bars.

3-way pressure reducing valve:

Knob to regulate the pressure level.

Output pressure adjustable.

Back pressure limiting valve:

Knob to regulate the pressure level.

Flow control valves:

Adjustable flow control valve with bypass:

Knob to regulate the flow.

Graduated scale.

Double pilot operated check valve.

Manual distribution valves:

6/3 manual operated directional valve (2 units).

"OR" Valve

Double control valve with joystick.

Hydraulic actuators:

Double-rod cylinder:

Material: stainless steel.

Sensors:

Pressure switch with electric contact.

Flow meter (2 units):

Maximum flow: 5 l/min.

Maximum pressure: 350 bar.

Connection parts and accessories:

Cross-shaped manifold with manometer (3 units):

3 available intakes.

Manometer with range from 0 to 100 bar with glycerin damping and diameter of 63 mm.

Load unit for Double-rod cylinder.

- HK-K4, **Measurement and Proportional Control in Hydraulics kit:**

A computer is required to work with this kit.

Control Interface box:

To connect to the computer and perform a control of the unit from the PC.

PID controller:

This module is subdivided into proportional, integrative and derivative blocks:

P controller: Kc: -10 to +10.

I controller: Ti: 0 to 100 s.

D controller: Td: 0 to 100 s. Sample time: 0.1 to 100 ms.

The module allows to adjust each parameter independently.

Electric comparator:

The device allows to compare different signals and add the desired hysteresis to the output signal of the comparator.

Analog Inputs:

This module is provided with 4 analog inputs. The inputs are used to visualize different signals in the computer.

Analog Outputs:

This module is provided with 4 analog outputs. The outputs are used to control different unit devices.

The module allows to adjust each parameter independently.

DAB. Data acquisition Board:

The Data Acquisition board is part of the SCADA system.

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

Analog input:

Number of **channels= 16** single-ended or 8 differential. **Resolution=16 bits**, 1 in 65536.

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

Input range (V)=±10 V. Data transfers=DMA, interrupts, programmed I/0. DMA channels=6.

DAB

Analog output:

Number of **channels=2**. **Resolution=16 bits**, 1 in 65536.

Maximum output rate up to: 900 KS/s.

Output range(V)=±10 V. Data transfers=DMA, interrupts, programmed I/0.

Digital Input/Output:

Number of **channels=24 inputs/outputs**. D0 or DI Sample Clock frequency: 0 to 100 MHz.

Timing: Number of **Counter/timers=4**. Resolution: Counter/timers: 32 bits.

HK-K4/CCSOF: Computer Control + Data Acquisition + Data Management Software:

The three softwares are part of the SCADA system.

Compatible with actual Windows operating systems. Graphic and intuitive simulation of the process in screen. **Compatible with the industry standards.**

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

HK-K4/CCSOF

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

Management, processing, comparison and storage of data.

It allows the registration of the alarms state and the graphic representation in real time.

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

Open software, allowing the teacher to modify texts, instructions. Teacher's and student's passwords to facilitate the teacher's control on the student, and allowing the access to different work levels.

This unit allows the 30 students of the classroom to visualize simultaneously all the results and the manipulation of the unit, during the process, by using a projector or an electronic whiteboard.

Pressure control valves:

Pressure limiting valve (2 units):

Knob to regulate the pressure level.

Pressure regulation from 5 to 50 bars.

Flow control valves:

Shut-off valve.

Pilot operated check valve.

Adjustable flow control valve:

Knob to regulate the flow.

Graduated scale.

Check valve.

Adjustable flow control valve with bypass:

Knob to regulate the flow.

Graduated scale.

Hydraulic solenoid valves:

4/2 solenoid valve with spring return:

Electric activation.

Spring return.

Maximum flow: 60 l/min.

Maximum pressure: 350 bar.

LED indicator.

24V DC.

4/3 solenoid valve with AB-T center linked:

Electric activation.

AB-T linked center.

Maximum flow: 60 l/min.

Maximum pressure: 350 bar.

LED indicator.

24V DC.

4/3 solenoid valve with P-T center linked:

Electric activation.

Tandem center, P-T linked.

Spring return.

Maximum flow: 60 l/min.

Maximum pressure: 350 bar.

4/3 proportional solenoid valve:

4/3 directional valve with progressive opening and dependent on the value of the electrical control signal.

Maximum pressure: 350 bar.

LED indicator.

24V DC.

Hydraulic actuators:

Double effect cylinder with position meter:

Potentiometer to measure the position of the cylinder.

Analog output signal range: 0 to 10V DC.

Material: stainless steel.

Hydraulic motor with angle position sensor:

Potentiometer to measure the position of the hydraulic motor.

Analog output signal range: 0 to 10V DC.

Material: stainless steel.

Electric components:

Main power supply N-ALI02:

Differential magneto-thermal switch.

Electrical switch with security key.

Emergency mushroom pushbutton.

24V DC Power supply:

Sockets of 2 mm.

6 outputs of 24V DC.

6 GND connections.

ON/OFF lit switch.

Fuse to protect the power supply against short-circuits.

Switches block:

Sockets of 2 mm.

2 Pushbuttons with NO contact.

Two-position selector with NO contact.

Relays blocks:

Sockets of 2 mm.

Three relays with coil of 24V DC.

Each relay includes 4 switching contacts with NO and NC position.

Activated relay LED indicator.

Pressure transducer with digital display:

Pressure switch integrated.

Time relays block:

Sockets of 2 mm.

Configurable time.

Activated relay LED indicator.

Light and acoustic indicators block:

Sockets of 2 mm.

2 green LEDs of 24V DC.

2 red LEDs of 24V DC.

2 blue LEDs of 24V DC.

2 yellow LEDs of 24V DC.

Acoustic indicator.

Sensors:

Digital Flow sensor.

Capacitive proximity sensor.

Inductive proximity sensor (2 units).

Optical proximity sensor.

Fiber optic photoelectric sensor.

Diffuse-reflective photoelectric sensor.

Polarized retro-reflective photoelectric sensor.

Background suppression photoelectric sensor.

Target object for the photoelectric sensors.

Connection parts and accessories:

Set of 14 hoses with quick-fit female connectors:

0.6 m hose (6 units).

1 m hose (6 units).

2 m hose (4 units).

Cross-shaped manifold with manometer (4 units).

3 available intakes.

Manometer with range from 0 to 100 bar with glycerin damping and diameter of 63 mm.

Load unit for hydraulic cylinder.

- HK-K5, **Hydrostatic Steering System kit:**

  At least the HK-K1 is required to work with this unit.

  Distribution valves:

  Steering valve (Orbitrol):

  Maximum flow: 5 l/min.

  Maximum pressure: 350 bar.

  Pressure spike suppression valve:

  Maximum flow: 5 l/min.

  Maximum pressure: 350 bar.

- HK-K6, **Hydraulic and Electro-Hydraulic troubleshooting kit:**

  At least the HK-K1 is required to work with this unit.

  Pressure control valves:

  Faulty Pressure limiting valve:

  Knob to regulate the pressure level.

  Pressure regulation from 5 to 50 bars.

  Faulty pilot-operated pressure limiting valve.

  Flow control valves:

  Faulty adjustable flow control valve:

  Knob to regulate the flow.

  Graduated scale.

  Faulty check valve.

  Faulty shut-off valve.

  Distribution valves:

  Faulty 4/3 manual operated directional valve with H-center.

  Mechanical activation by lever.

  Spring return.

  Maximum flow: 60 l/min.

  Maximum pressure: 350 bar.

  Faulty 4/3 solenoid valve.

  Electric activation.

  Maximum flow: 60 l/min.

  Maximum pressure: 350 bar.

  LED indicator.

  24V DC.

  Hydraulic actuators:

  Faulty Double effect cylinder (Fault 1).

  Material: stainless steel.

  Diameter: 40 mm.

  Stroke of 200 mm.

  Faulty Double effect cylinder (Fault 2).

  Material: stainless steel.

  Diameter: 40 mm.

  Stroke of 200 mm.

  Connection parts and accessories:

  Clogged pipe with quick connection.

Specifications

- AE-PLC-PAN-UB. **PANASONIC PLC Base Unit (Optional),** included:

  At least the HK-K2 is required to work with this unit.

  Also available PLC models of different manufacturers: SIEMENS, OMRON, MITSUBISHI, ALLEN BRADLEY, etc.

  - N-ALI02. **Domestic Power Supply.**

    Supply voltage (Single-Phase): 230V AC, PH+N+G.

    ON-OFF removable key.

    Output Voltage Connections:

    Two Single-Phase: 230V AC.

    Single-Phase supply wire connecting plug.

    Differential magnetothermal, 2 poles, 25A, 30mA AC 6KA.

N-ALI02

- N-CPU-PAN. **Panasonic CPU Module.**

N-CPU-PAN

Supply voltage (Single-Phase): 100-240V AC PH+N+G.

Overcurrent protection with fuse.

PLC device, Panasonic FP7:

High processing speed: 11ns per basic instruction (step).

Programming capacity: 120k basic instructions (step).

Data logging capacity: 256k words.

Independent memory for comments: 3MB.

Supports SDHC type generic memory cards up to 32GB.

Expansion module for digital inputs:

16 digital inputs with allowable input range from 0V to 12V or 0V to 24V.

Expansion module for digital outputs:

16 relay type digital outputs with voltage level of 24V DC.

Web server function:

HTML web server included in the PLC.

Up to 16 sessions at the same time.

Compatible with most common search engines.

Connector for the digital input and output signals.

Connector to the Ethernet switch module (N-SWT-4 or N-SWT-8).

There are available several optional kits to configure a complete PLC system, for more information go to AE-PLC-PAN specific catalog.

- **PLC, HMI and web server programming software.**

  PLC programming software:

  Programming software developed according to the norm IEC 61131-3.

  Compatible with Windows operating systems.

  Five programming languages:

  Ladder diagrams (LD). Structured text (ST). Instruction list (IL). Sequential function chart (SFC). Function block diagram (FBD).

  Remote programming, service and diagnosis.

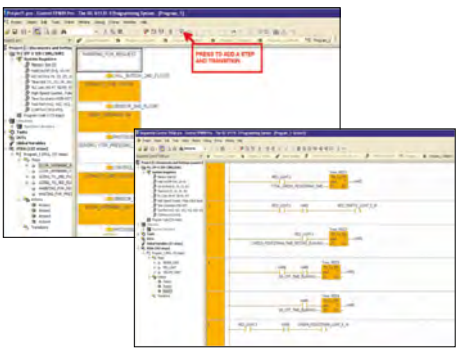
  Minimum size of program.

  Powerful debugging and monitoring tools.

  Supports functions created by the user and function blocks.

  Saves project files in the PLC.

  Examples and quick tutorial included.



PLC Programming software

Programming software of the HMI touchscreen.

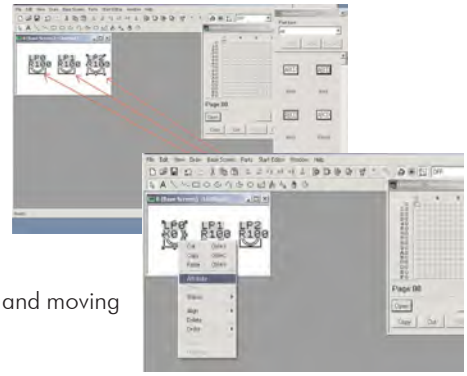
Tool to create screens:

This software is a tool created to program the touchscreen. Thanks to this tool, appropriate screens and images can be designed and created. Enables the transfer of the program to the touchscreen, uploading objects created from the terminal and print screens created.

Lots of functions. Creation of screens:

Includes many programming tools.

Text, diagram or data display devices, buttons for drawings, charts and pilot lights. Creation of functional screens adaptable to each application.



Programming software of the HMI Touchscreen

Drawing functions: creation of different programming elements through icons and bitmaps.

Easy operation (drag and drop):

A library of elements allows for programming with the mouse by just selecting and moving elements to the desired locations (drag and drop).

Easy user libraries creation:

Libraries can be registered and stored to be used in later projects.

Printing. The project screens can be printed:

Screens can be printed after previewing, selecting and configuring them.

Bitmaps editor:

This tool allows the creation, reading and modification of bitmaps to use them as programming elements in the screen. Icons (buttons) can be created from images.

Web applications programming software.

Easy programming of complete web applications to display and control all the variables of the PLC. No previous experience in web programming is required.

Library of buttons, pushbuttons, needle indicators, bar charts, etc. for a quick programming of the applications.

The web applications can take up to 14 MB and allow up to 16 users to access at the same time.

Applications can be programmed to control all the digital and analog variables of the PLC.

Search engines compatible with the web server:

Windows: Google Chrome, Mozilla Firefox, Opera and Internet Explorer.

OS X: Safari, Google Chrome and Mozilla Firefox.

IOS: Safari and Google Chrome.

Android: Google Chrome.

- WBPP-SP. **Simple Post Workbench (Optional).**

Frame made of aluminum profiles.

Tray to collect the oil wasted.

Hose holder.

Wheels with brake in two legs.

Workbench with one working post.

Dimensions: 1300 x 700 x 2000 mm.

- WBPP-DP. **Double Post Workbench (Optional).**

Frame made of aluminum profiles.

Tray to collect the oil wasted.

Hose holder.

Wheels with brake in two legs.

Workbench with two working posts that makes it possible to use the unit by both sides.

Dimensions: 1300 x 1400 x 2000 mm.

- WBDM-4. **Four drawers module (Optional).**

  General purpose chest of drawers.

  Dimensions: 430 x 550 x 705 mm.

  4 drawers, one of them with lock.

- HPU. **Hydraulic Power Unit (Optional).**

  Mounted on a structure with wheels with brakes.

  Single-phase motor with 0.75 Kw.

  Pressure remover.

  Storage tank: 30 l.

  Maximum pressure: 150 bar.

  Maximum flow: 2.4 l/min.

  Double scale manometer psi and bar.

  Temperature meter.

  Hydraulic fluid level indicator.

  Control panel with start/stop switch, emergency pushbutton and light indicator.

  Hydraulic fluid required for normal operation included, 30 L of hydraulic oil ISO 46.

  Include the connector types to work with hydraulic trainers of EDIBON.

HPU

- AE-AS. **Automation System Simulation Software (Opcional).**

  2D and 3D systems simulations.

  Configurable simulation speed with the modes "normal simulation", "slow motion simulation", "step-by-step simulation" and "pause".

  3D editor to import pieces made with formats compatible with most 3D design programs (.STEP, .STL and .IGES). Capacity to generate 2D and 3D animations associated to the results of the simulation the user is working with.

  Capacity for simulating the following systems:

  Hydraulic and electrohydraulic: according to ISO 1219-1 and 1219-2 standards, with an extensive library of hydraulic and electrohydraulic components with its standardized symbol.

  Pneumatics and electro-pneumatics: with an extensive library of pneumatic, electro-pneumatic and pneumatic logic components.

  Capacity to modify the most important parameters of each hydraulic and pneumatic component, such as: efficiency curves, external loads, leaks, viscosity, thermal characteristics, etc.

  Digital electronics: with an extensive library of standard electronic components (logic gates, amplifiers, transistors, displays, multiplexers, etc.).

  Electrical Single-Line Diagram: with a library that enables to create diagrams for all levels of voltage usually employed in power generation, transport and distribution networks.

  Electrical engineering: with a library that contains a great amount of components to create simple and complex electrical circuits. The models of the components included are generic and real and belong to several manufacturers.

  All the libraries include the components and its standardized symbol.

  Capacity to program with the following languages:

  GRAFCET: allows encapsulated stages for a better organization of the programmed control structures.

  Block Diagram: blocks included are preset but they can be completely configured by the user.

  Ladder: includes three libraries to program automata from Siemens, Allen Bradley and those fulfilling the IEC61131-3 standard, allowing the PLC to program directly. It also allows for creating and simulating the PLC program in the automated system simulated by the software.

  Digital logic: with an extensive library of logic gates and components configured by the user.

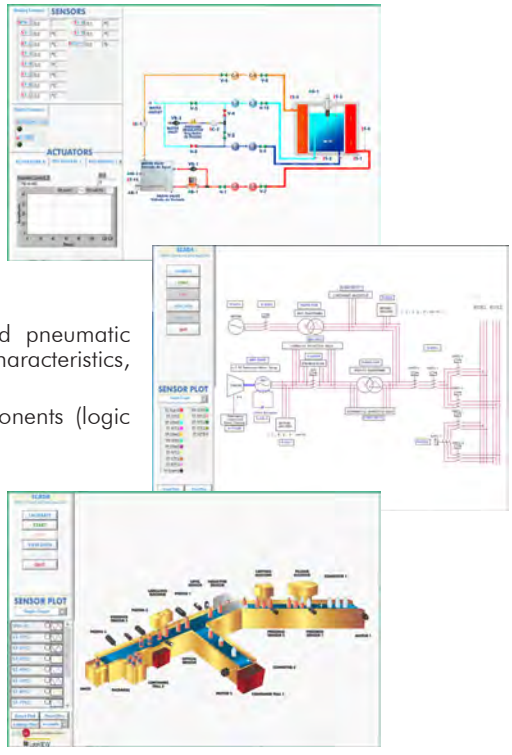
  Function blocks with configurable structured text.

  Direct programming in the PLCs from the manufacturers Siemens, Allen Bradley and those fulfilling the IEC61131-3 standard of the programs simulated in the software.

  Supervision, control and simulation of the manufacturing process of each station and the complete assembly by a SCADA system.

  Communication with the PLCs of the unit is performed via OPC protocol.

  Includes the 3D simulation of the automation system with the control panel and the visualization of the alarms generated by the system.



AE-AS

Cables and accessories for a correct operation.

Manuals:

This unit **is supplied with the following manuals:** Required services, Installation, Starting-up, Safety regulations, Maintenance and Practical exercises.

- HK-K0, Kit to study the hydraulics fundamentals:

1.- Identification of components.
2.- Hydraulic group.
3.- Direct discharge from the pump to the tank.
4.- Hydraulic cylinder activation by a 4/3 directional valve.
5.- Speed control of the double effect hydraulic cylinder.
6.- Flow control with tank bypass.

- HK-K1, Hydraulics kit:

7.- Identification of elements.
8.- Hydraulic power unit.
9.- Direct discharge of the pump to the tank.
10.- Discharge of the pump through of a vacuum discharge valve.
11.- Operation of valves with manual activation.
12.- Manual activation of a double effect cylinder.
13.- Speed adjustment of a double effect cylinder.
14.- Activation of a double effect cylinder with different loads.
15.- Activation of a hydraulic motor.
16.- Flow calculation of hydraulic fluid.
17.- Study of load losses with different size pipes.
18.- Study of load losses with different length pipes.

- HK-K2, Electro-Hydraulics kit:

19.- Identification of elements.
20.- Hydraulic power unit.
21.- Direct discharge of the pump to the tank.
22.- Operation of valves with electric activation.
23.- Activation of a double effect cylinder with a solenoid valve.
24.- Activation of a double effect cylinder with different loads.
25.- Speed adjustment of a double effect cylinder.
26.- Activation of a hydraulic motor.
27.- Flow calculation of hydraulic fluid.
28.- Study of load losses with different size pipes.
29.- Study of load losses with different length pipes.
30.- Electro-hydraulic control with solenoid valves.
31.- Pressure control through a pressure switch with electric contact.

- HK-K3, Hydraulic Actuators kit:

32.- Identification of elements.
33.- Activation of a double effect cylinder.
34.- Activation of a hydraulic motor.
35.- Activation of a double-rod cylinder.
36.- Activation of a double effect linear actuator.
37.- Study of the characteristics and operation of a 6/3 manual operated directional valve.
38.- Hydraulic "OR" valve operation.
39.- Study of the characteristics and operation of a directional valve activated by joystick.
40.- Study of hydraulic actuators with locking in middle positions.

- HK-K4, Measurement and Proportional Control in Hydraulics kit:

41.- Identification of elements.
42.- Familiarization with data acquisition and processing of system signals from PC.
43.- Operation of the Digital Flow Sensor.
44.- Operation of the Capacitive proximity sensor from PC.
45.- Operation of the Inductive proximity sensor from PC.
46.- Operation of the Optical proximity sensor form PC.
47.- Operation of the Fiber optic photoelectric sensor from PC.
48.- Operation of the Diffuse-reflective photoelectric sensor from PC.
49.- Operation of the Polarized retroreflective photoelectric sensor from PC.
50.- Operation of the Background suppression photoelectric sensor from PC.
51.- Proportional control of a proportional valve from PC.
52.- Analog measurement of pressure level from PC.
53.- Analog measurement of flow level from PC.
54.- PID control loop of the flow level from PC.
55.- Analog position sensor of the pneumatic linear actuator from PC.
56.- PID control loop of the position of a pneumatic linear actuator from PC.

- HK-K5, Hydraulic Steering System kit:

57.- Identification of elements.
58.- Study of a Steering hydrostatic system.
59.- Determination of parameters of a steering system.
60.- Study of the orbitol operation.
61.- Configuration of a steering systems.
62.- Study of a pressure spike suppression system.
63.- Pressure spike suppression valve.

- HK-K6, Hydraulics and Electro-Hydraulics Troubleshooting kit:

64.- Familiarization with most common failures of hydraulic components.
65.- Study a faulty pressure limiting valve.
66.- Study a faulty pilot operated pressure limiting valve.
67.- Study a faulty adjustable flow control valve.
68.- Study a faulty check valve.
69.- Study a faulty shut-off valve.
70.- Study a faulty 4/3 manual operated directional valve with H-center.
71.- Study a faulty 4/3 solenoid valve.
72.- Study a clogged pipe.
73.- Study a faulty double effect cylinder.

- AE-PLC-PAN (also available with others PLC manufacturers):

The practices available with the HK-K2 are:

74.- Activation of a double effect cylinder with PLC.
75.- Activation of a hydraulic motor with PLC.
76.- Electro-hydraulic control by a 4/2 solenoid valve activated from PLC.
77.- Electro- hydraulic control by 4/3 solenoid valve activated from PLC.
78.- Pressure control with PLC.
79.- Creation a hydraulic sequence with the PLC.

The practices available with the AE-PLC-PAN working alone are:

80.- Using variables.
81.- Using digital inputs I.
82.- Using digital inputs II.
83.- Testing digital inputs (PLC-PAN-K1).
84.- Using digital outputs.
85.- Testing digital outputs.
86.- Using analog signals I (PLC-PAN-K1 and PLC-PAN-K2).
87.- Using analog signals II (PLC-PAN-K1 and PLC-PAN-K2).
88.- Square wave generator.
89.- HMI simple program (PLC-PAN-K3 or PLC-PAN-K4).
90.- Using digital outputs with HMI device I (PLC-PAN-K3 or PLCPAN-K4).
91.- Using digital outputs with HMI device II (PLC-PAN-K3 or PLCPAN-K4).
92.- Reading data from a register with the HMI device (PLC-PAN-K3 or PLC-PAN-K4).
93.- Writing data to a register with the HMI device (PLC-PAN-K3 or PLC-PAN-K4).
94.- Switching screens of the HMI device (PLC-PAN-K3 or PLC-PAN-K4).
95.- Internet connection of the PLC unit (PLC-PAN-K5).
96.- Control digital inputs with a web server application (PLC-PAN-K5).
97.- Control digital outputs with a web server application (PLC-PAN-K5).
98.- Control analog inputs with a web server application (PLC-PAN-K5).
99.- Control analog outputs with a web server application (PLC-PAN-K5).

- Several other exercises can be done and designed by the user.

REQUIRED SERVICES

- Electrical supply: single phase, 200 VAC- 240 VAC/50 Hz o 110 VAC – 127 VAC/60 Hz, 1 kW.
- Pressurized oil with a 2.4 l/min of oilflow and 50 bar of pressure.
- Computer. (For the HK-K4).

DIMENSIONS AND WEIGHTS

HK-K0:
-Dimensions: 900 x 700 x 300 mm approx.
(35.43 x 27.55 x 11.81 inches approx.)
-Weight: 9 Kg approx.
(19 pounds approx.)

HK-K1:
-Dimensions: 1200 x 700 x 300 mm approx.
(47.24 x 27.55 x 11.81 inches approx.)
-Weight: 25 Kg approx.
(55 pounds approx.)

HK-K2:
-Dimensions: 1200 x 700 x 300 mm approx.
(47.24 x 27.55 x 11.81 inches approx.)
-Weight: 22 Kg approx.
(48 pounds approx.)

HK-K3:
-Dimensions: 1200 x 700 x 300 mm approx.
(47.24 x 27.55x 11.81 inches approx.)
-Weight: 8 Kg approx.
(17 pounds approx.)

HK-K4:
-Dimensions: 1200 x 700 x 400 mm approx.
(47.24 x 27.55 x 15.74 inches approx.)
-Weight: 14 Kg approx.
(30 pounds approx.)

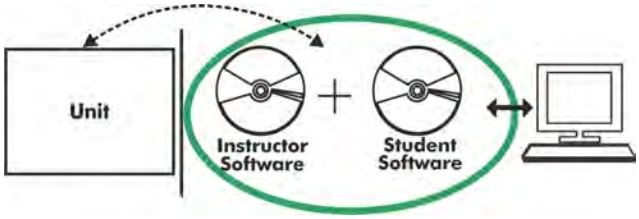
HK-K5:
-Dimensions: 1200 x 700 x 300 mm approx.
(47.24 x 27.55 x 11.81 inches approx.)
-Weight: 12 Kg approx.
(26 pounds approx.)

HK-K6:
-Dimensions: 1200 x 700 x 300 mm approx.
(47.24 x 27.55 x 11.81 inches approx.)
-Weight: 7 Kg approx.
(15 pounds approx.)

RECOMMENDED ACCESSORIES (Not included)

- HK-K0, Kit to study the hydraulics fundamentals.
- HK-K1, Hydraulics kit.
- HK-K2, Electro-Hydraulics kit.
- HK-K3, Hydraulic Actuators kit.
- HK-K4, Measurement and Proportional Control in Hydraulics kit.
- HK-K5, Hydraulic Steering System kit.
- HK-K6, Hydraulics and Electro-Hydraulics Troubleshooting kit.
- AE-PLC-PAN-UB. PANASONIC PLC Base Unit (Optional).
- AE-PLC-SIE-UB. SIEMENS PLC Base Unit (Optional).
- AE-PLC-AB-UB. ALLEN BRADLEY PLC Base Unit (Optional).
- AE-PLC-OMR-UB. OMRON PLC Base Unit (Optional).
- AE-PLC-MIT-UB. MITSUBISHI PLC Base Unit (Optional).
- WBPP-SP. Simple Post Workbench or WBPP-DP. Double Post Workbench (Optional).
- WBDM-4. Four drawers module (Optional).
- HPU. Hydraulic Power Unit (Optional).
- AE-AS Automation System Simulation Software (Opcional).

AE-HD/ICAI. Interactive Computer Aided Instruction Software System:



With no physical connection between unit and computer, **this complete software package consists of an Instructor Software (EDIBON Classroom Manager -ECM-SOF) totally integrated with the Student Software (EDIBON Student Labsoft -ESL-SOF).** Both are interconnected so that the teacher knows at any moment what is the theoretical and practical knowledge of the students.

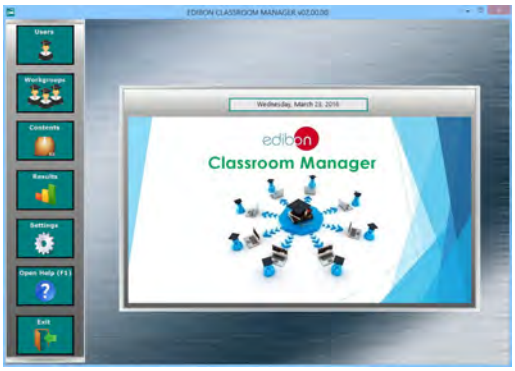
Instructor Software

- ECM-SOF. EDIBON Classroom Manager (Instructor Software).

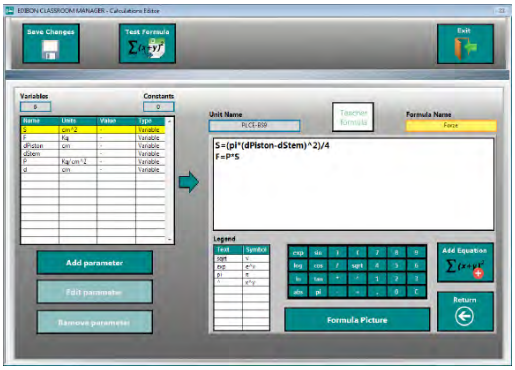
ECM-SOF is the application that allows the Instructor to register students, manage and assign tasks for workgroups, create own content to carry out Practical Exercises, choose one of the evaluation methods to check the Student knowledge and monitor the progression related to the planned tasks for individual students, workgroups, units, etc... so the teacher can know in real time the level of understanding of any student in the classroom.

Innovative features:

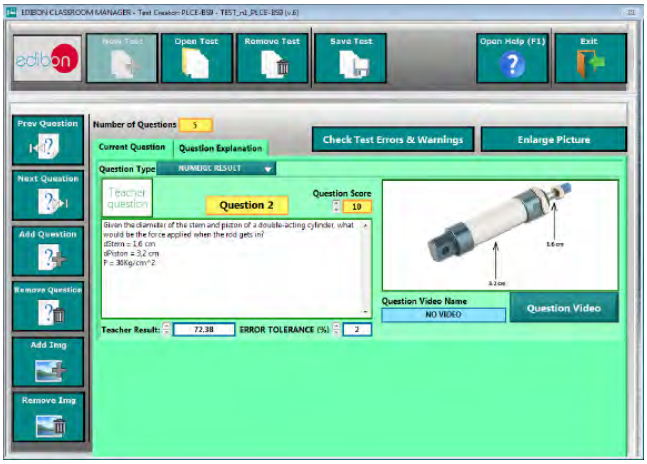
- **User Data Base Management.**
- **Administration and assignment of Workgroup, Task and Training sessions.**
- **Creation and Integration of Practical Exercises and Multimedia Resources.**
- **Custom Design of Evaluation Methods.**
- **Creation and assignment of Formulas & Equations.**
- **Equation System Solver Engine.**
- **Updatable Contents.**
- **Report generation, User Progression Monitoring and Statistics.**



ECM-SOF. EDIBON Classroom Manager (Instructor Software) Application Main Screen



ECAL. EDIBON Calculations Program Package - Formula Editor Screen



ERS. EDIBON Results & Statistics Program Package - Student Scores Histogram

ETTE. EDIBON Training Test & Exam Program Package - Main Screen with Numeric Result Question

Optional

Student Software

- ESL-SOF. EDIBON Student Labsoft (Student Software).

ESL-SOF is the application addressed to the Students that helps them to understand theoretical concepts by means of practical exercises and to prove their knowledge and progression by performing tests and calculations in addition to Multimedia Resources. Default planned tasks and an Open workgroup are provided by EDIBON to allow the students start working from the first session. Reports and statistics are available to know their progression at any time, as well as explanations for every exercise to reinforce the theoretically acquired technical knowledge.

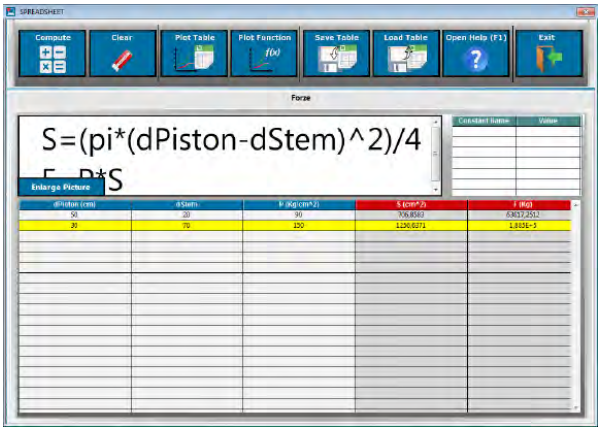
Innovative features:

- **Student Log-In & Self-Registration.**
- **Existing Tasks checking & Monitoring.**
- **Default contents & scheduled tasks available to be used from the first session.**
- **Practical Exercises accomplishment by following the Manual provided by EDIBON.**
- **Evaluation Methods to prove your knowledge and progression.**
- **Test self-correction.**
- **Calculations computing and plotting.**
- **Equation System Solver Engine.**
- **User Monitoring Learning & Printable Reports.**
- **Multimedia-Supported auxiliary resources.**

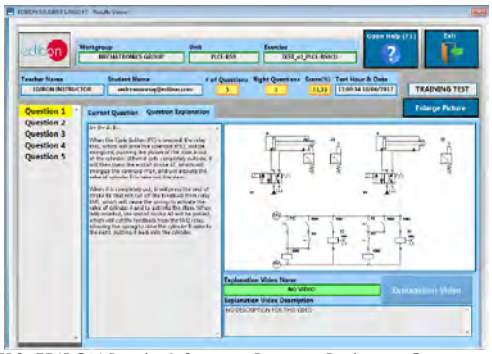
For more information see **ICAI** catalogue. Click on the following link:
www.edibon.com/en/files/expansion/ICAI/catalog

ESL-SOF. EDIBON Student LabSoft (Student Software) Application Main Screen

EPE. EDIBON Practical Exercise Program Package Main Screen



ECAL. EDIBON Calculations Program Package Main Screen



ERS. EDIBON Results & Statistics Program Package - Question Explanation

✱ Specifications subject to change without previous notice, due to the convenience of improvement of the product.

edibon INTERNATIONAL

C/ Julio Cervera, 10-12-14. Móstoles Tecnológico.
28935 MÓSTOLES. (Madrid). ESPAÑA - SPAIN.
Tel.: 34-91-6199363 Fax: 34-91-6198647
E-mail: edibon@edibon.com Web: **www.edibon.com**

Edition: ED01/19
Date: April/2019

REPRESENTATIVE: