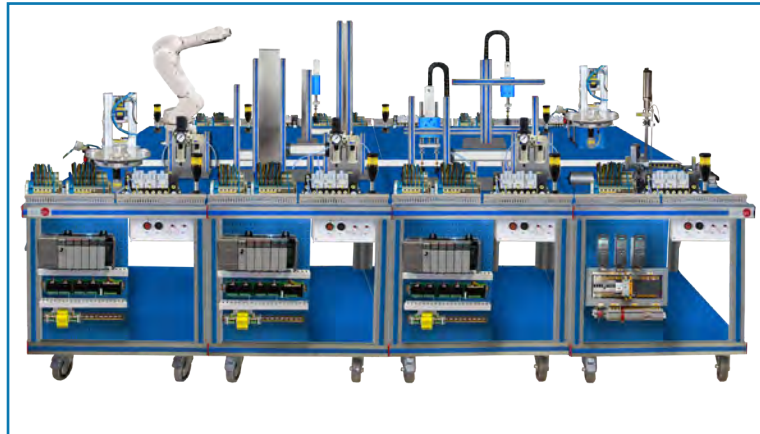
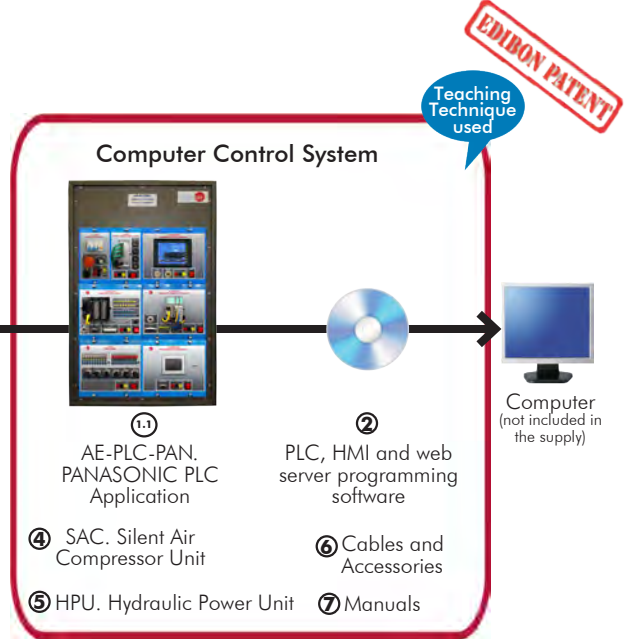


Available with PLC, as:  
- PANASONIC  
- SIEMENS  
- MITSUBISHI  
- ALLEN BRADLEY  
- OMRON  
Etc...

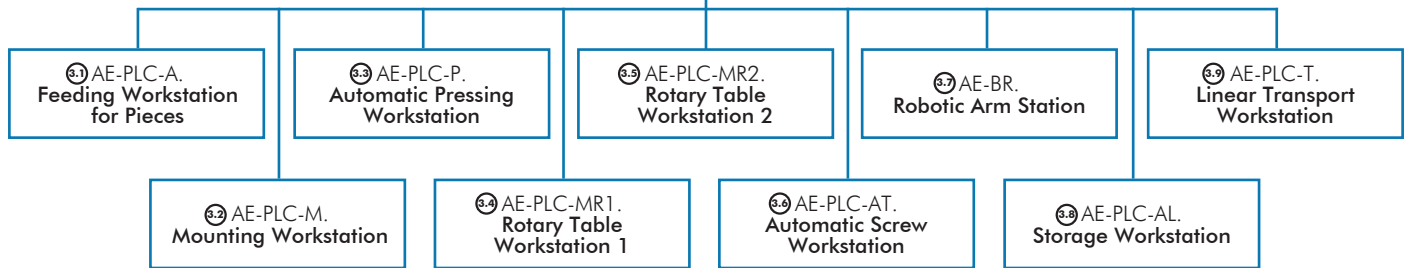


① Unit: AE-PLC-FMS1. Flexible Manufacturing System 1



\* Minimum supply always includes: 1 + 2 + 3 + 4 + 5 + 6 + 7 (Computer not included in the supply)

③ Component Workstations:



Key features:

- **Open Control + Multicontrol + Real-Time Control.**
- **PLC, HMI and web server programming software.**
- **Projector and/or electronic whiteboard compatibility allows the unit to be explained and demonstrated to an entire class at one time.**
- **Capable of doing applied research, real industrial simulation, training courses, etc.**
- **Remote operation and control by the user and remote control for EDIBON technical support, are always included.**
- **Totally safe, utilizing 3 safety systems (Mechanical, Electrical & Electronic).**
- **Designed and manufactured under several quality standards.**
- **Optional software to perform 2D and 3D simulations of the processes studied and supervise and control the real system (SCADA).**
- **Optional ICAI software to create, edit and carry out practical exercises, tests, exams, calculations, etc. Apart from monitoring user's knowledge and progress reached.**

**OPEN CONTROL  
+  
MULTICONTROL  
+  
REAL TIME CONTROL**

**www.edibon.com**  
PRODUCTS  
↳ 60.- MECHATRONICS & COMPUMECHATRONICS

For more information about Key Features, click here



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

## INTRODUCTION

Since the 1950s, the computer integration in the manufacturing systems it has been a complete revolution, increasing productivity and quality of all type of products. These computer integration systems included a lot of component from very different technologies as hydraulic, pneumatic, electrical, robotics, chemical, etc. For this reason these types of systems requires workers with specific skills to ensure that they are working properly.

The Flexible Manufacturing System 1, "AE-PLC-FMS1", has been designed by EDIBON to study how a complete manufacturing system works.

The "AE-PLC-FMS1" system includes a set of practical exercises through which the student will understand how work a piece feeding system, an automatic pressing system, four different mounting systems, a robotic arm system and an automatic storing system.

## GENERAL DESCRIPTION

The Flexible Manufacturing System 1, "AE-PLC-FMS1" is a modular system composed of five workstations: the Feeding Workstation for Pieces "AE-PLC-A", the Mounting Workstation "AE-PLC-M", the Automatic Pressing Workstation, "AE-PLC-P", the Rotary Table Workstation 1 "AE-PLC-MR1", the Rotary Table Workstation 2 "AE-PLC-MR2", the Automatic Screw Workstation "AE-PLC-AT", the Robotic Arm Workstation "AE-BR", the Storage Workstation "AE-PLC-AL" and the Linear Transport Workstation "AE-PLC-T".

The objective of the "AE-PLC-FMS1" system is to provide a base piece and mount three different pieces and screws inside it, once the piece is complete, the system storage them in a specific position of the depot.

The process of the "AE-PLC-FMS1" is explained in the following lines:

- First, the feeding system provides the base pieces with the correct dimensions and place them on the linear transport system.
- Then, the mounting workstation provide another piece, and after verify that is correct, mount them inside the base piece placed on the linear transport system.
- The next workstation perform the pressing of the mounted piece in the base piece, this pressing process is performed by a hydraulic cylinder.
- After that, two rotary table workstations provide two pieces of different colors, dimensions and materials to be mounted inside the base piece.
- Then, the automatic screw workstation put four screws in the Base pieces to finish them.
- Before that, the robotic arm workstation perform the automatic screwing of the mounted screws. To perform this task the robotic arm mount an automatic screwing machine.
- Finally, the storage workstation that take the base pieces through an automatic manipulator and place them in the desired place of the storage.

Each workstation is locally commanded by a PLC device and, in turn, a central PLC coordinates all workstations. The communication network between workstations and PC is based on the Ethernet protocol.

The "AE-PLC-FMS1" system design by EDIBON allows the users to learn the basic concepts of automation as the operation of an Ethernet network or how to program a PLC and about other areas as pneumatic, electro-pneumatic, vacuum technology, etc.

The optional "AE-AS" software is design to teach the students how works real automation software. This software allows making 2D and 3D processes simulations, supervising and controlling SCADA systems, programming and communicating PLCs, simulating hydraulic, pneumatic and electronic devices operation, etc.

With this unit there are several options and possibilities:

- Main items: 1, 2, 3, 4, 5, 6 and 7
- Optional items: 8, 9 and 10.

Let us describe first the main items (1 to 7):

**① AE-PLC-FMS1. Unit:**

\* Available PLC models of different manufacturers: PANASONIC, SIEMENS, OMRON, MITSUBISHI, ALLEN BRADLEY, etc.

**② AE-PLC-PAN-UB. PANASONIC PLC Base Unit, includes:**

• **N-ALI02. Domestic Power Supply.**

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

ON-OFF removable key.

Output Voltage Connections:

Two Single-Phase: 230 VAC.

Single-Phase supply wire connecting plug.

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



N-ALI02

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

Supply voltage (Single-Phase): 100-240Vac 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 24Vdc.

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).



N-CPU-PAN

There are available the following optionals Kits to work with the AE-PLC-PAN-UB:

The PLC-PAN-K1, **PANASONIC PLC Kit 1 (Optional)** includes:

• **N-MT. Test module.**

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

20 Digital Signal Generators:

10 Switches.

10 Push buttons.

Every output has attached a green LED.

Output voltage levels of 0Vdc and 24Vdc.

6 Analog Signal Generators:

6 Potentiometers.

Output voltage range from -10V to +10V.

Single-Phase supply hose connecting plug.

Differential magneto-thermal, 2 poles, 25A, 30mA AC 6KA.



N-MT

The PLC-PAN-K2, **PANASONIC PLC Kit 2 (Optional)** includes:

- N-ESA-PAN. **Panasonic Analog I/O Module.**

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

Expansion unit for analog inputs:

Input voltage range from -10V to +10V.

4 analog inputs.

Resolution of 12 bits.

Expansion unit for analog outputs:

Output voltage range from -10V to +10V.

4 analog outputs.

Resolution of 12 bits.

Connector for the analog input and output signals.

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



N-ESA-PAN

- N-SWT-4. **4 Ports Ethernet Switch Module.**

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

Compact switch module:

4 Ethernet ports.

Work as Ethernet interconnection point.



N-SWT-4

The PLC-PAN-K4, **PANASONIC PLC Kit 4 (Optional)** includes:

- N-HMIA-PAN. **Panasonic Large HMI Module.**

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

HMI device:

Touchscreen.

TFT display of 64K colors and 16:9 format.

Size of the display: 187 x 147mm (7 inches).

Resolution: 800 x 480 WVGA.

Backlight with high brightness of 300cd/m<sup>2</sup>.

SD card slot.

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



N-HMIA-PAN

- N-SWT-4. **4 Ports Ethernet Switch Module.**

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

Compact switch module:

4 Ethernet ports.

Work as Ethernet interconnection point.



N-SWT-4

The PLC-PAN-K5, **PANASONIC PLC Kit 5 (Optional)** includes:

- N-MOD. **Modem Communication Module.**

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

Internet router with RJ-11 socket to connect the phone line.



N-MOD

• N-SWT-8. **8 Ports Ethernet Switch Module.**

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

Compact switch module:

8 Ethernet ports.

Work as Ethernet interconnection point.



N-SWT-8

• AE-AS. **Automation Systems Simulation Software. (Optional).**

2D and 3D systems simulations.

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

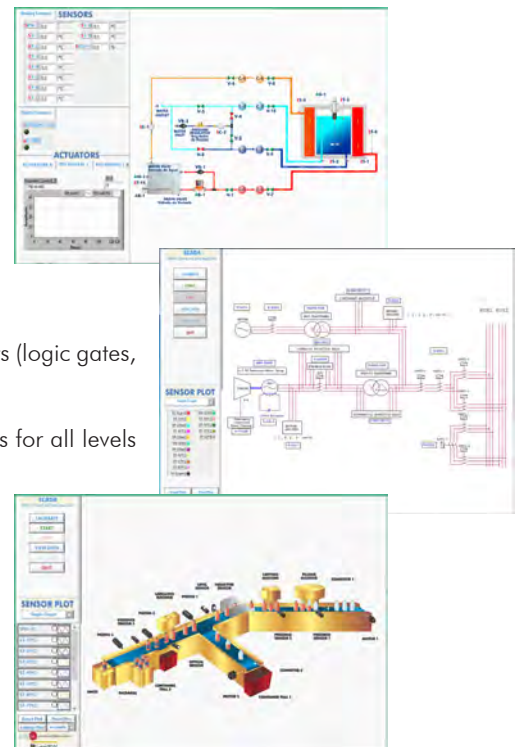
3D editor to import pieces made with formats compatible with most 3D design programs (.STEP, .STL and .IGES). Capacity to generate 2D and 3D animations associated to the results of the simulation the user is working with.

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.



AE-AS

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.

## ② 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.

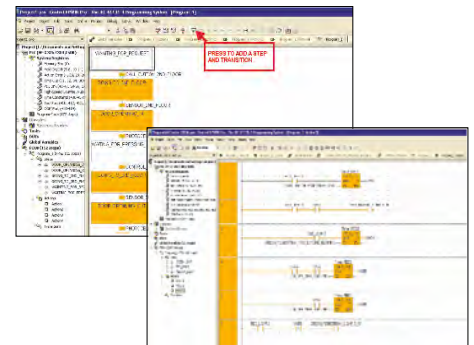
Minimum size of program.

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.

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:

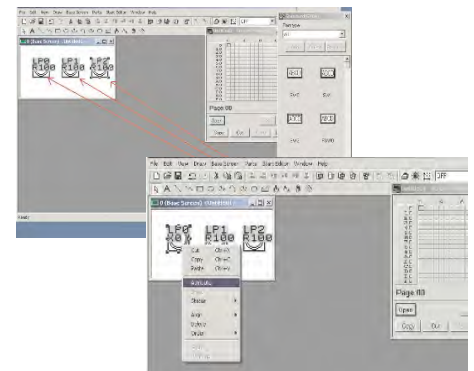
Libraries can be registered and stored to be used in later projects.

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.



Programming software of the HMI Touchscreen

### 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.

③ **Component Workstations:**

⑥ **AE-PLC-A. Feeding Workstation for Pieces**

Its function is to supply the base piece to the system. The "AE-PLC-A" includes a place where the pieces are stored before being supplied one by one by a pneumatic cylinder. Then, the position of the piece will be verified in order to activate the mechanism that checks whether the shape of the piece is correct. Afterwards, the piece is displaced from the station to the Linear Transport Workstation "AE-PLC-T" by a vacuum system consisting of suction pads mounted on a manipulator arm to continue with the manufacturing process.

Specifications:

Mounted with aluminum profiles.

10 pieces made of aluminum.

Vertical storage for pieces.

Table with four wheels with brake.

Control panel:

Emergency pushbutton.

Start/Stop pushbuttons.

Manual/automatic switch.

Light indicators for signaling.

Pneumatic circuit:

Air treatment unit:

Filter-regulator with water trap.

Manometer with double scale indicator.

Shut-off valve.

Cylindrical simple effect pneumatic actuator:

Material: stainless steel.

Normally retracted rod.

Diameter: 20 mm.

Stroke of 100 mm.

Cylindrical pneumatic simple effect actuator:

Material: stainless steel.

Normally retracted rod.

Diameter: 10 mm.

Stroke of 50 mm.

2 profile pneumatic double effect actuators:

Material: stainless steel and aluminum.

Normally retracted rod.

Stroke of 200 mm.

Profile pneumatic double effect actuator:

Material: stainless steel and aluminum.

Stroke of 100 mm.

2 pneumatic monostable 3/2 solenoid valves.

3 pneumatic bistable 5/2 solenoid valves.

Individually identified tubes and push in fittings.

### ③ Component Workstations:

Vacuum circuit:

Venturi effect vacuum ejectors.

4 telescopic flat suction pads made of NBR rubber mounted on an aluminum plate.

Vacuum switch.

Pneumatic monostable 3/2 solenoid valve.

Sensors:

2 inductive effect sensors to check the position of the piece.

8 reed effect limit switches to check the position of the pneumatic actuators.

Fault generation module:

Attached to the frame of the unit.

Generates faults in the operation of different elements of the unit using switches.

**\* Available PLC models of different manufacturers: PANASONIC, SIEMENS, OMRON, MITSUBISHI, ALLEN BRADLEY, etc.**

The AE-PLC-PAN-UB, **PANASONIC PLC Base Unit** includes:

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

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

ON-OFF removable key.

Output Voltage Connections:

Two Single-Phase: 230 VAC.

Single-Phase supply wire connecting plug.

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



N-ALI02

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

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

Overcurrent protection with fuse.

PLC device, Panasonic FP7:

High processing speed: 11 ns 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 24Vdc.

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).



N-CPU-PAN



③ Component Workstations:

④ **AE-PLC-M. Mounting Workstation**

Its function is to supply a second piece and to assemble it to the base piece already supplied by the previous module "AE-PLC-A". The "AE-PLC-M" includes a vertical storage for the pieces that will be supplied one by one to the system by a pneumatic cylinder. Once the position of the piece is detected, the mechanism that measures whether the piece is correct with a linear potentiometer is activated. After checking the height, the faulty pieces will be discarded and stored in a rejection store. If the height of the piece is acceptable, an inside grip clamp pneumatic actuator coupled to a rotating pneumatic actuator, that works as rotating arm, will assemble the new piece to the base piece already supplied by the "AE-PLC-A" that reaches to the "AE-PLC-M" station through the Linear Transport Workstation "AE-PLC-T". The piece is assembled to the "AE-PLC-T" to continue with the manufacturing process.

Specifications:

Mounted with aluminum profiles.

15 pieces.

Vertical storage for base pieces.

Table with four wheels with brake.

Vertical storage for pieces.

Control panel:

Emergency pushbutton.

Start/Stop pushbuttons.

Manual/automatic switch.

Light indicators for signaling.

Pneumatic circuit:

Air treatment unit:

Filter-regulator with water trap.

Manometer with double scale indicator.

Shut-off valve.

2 cylindrical simple effect pneumatic actuators:

Material: stainless steel.

Normally retracted rod.

Diameter: 20 mm.

Stroke of 100 mm.

Rodless pneumatic actuator with bands:

Material: stainless steel and aluminum.

Stroke of 300 mm.

Limit switch sensors at the desired start and end positions.

2 pneumatic double effect inside grip clamps.

Rotary pneumatic actuator.

Rotary pneumatic actuator with 50 mm stroke rod.

2 pneumatic monoestable 3/2 solenoid valves.

4 pneumatic bistable 5/2 solenoid valves.

Spring centered 5/3 pneumatic solenoid valve.

Individually identified tubes and push in fittings.

**③ Component Workstations:**

**Sensors:**

- Linear potentiometer of 20 mm stroke to check the height of the piece.
- Inductive effect sensor to check the position of the piece.
- Two limit switches to check the position of the measuring mechanism.
- Ten reed effect limit switches to check the position of the pneumatic actuators.

**Fault generation module:**

- Attached to the frame of the unit.
- Generates faults in the operation of different elements of the unit using switches.

**\* Available PLC models of different manufacturers: PANASONIC, SIEMENS, OMRON, MITSUBISHI, ALLEN BRADLEY, etc.**

The AE-PLC-PAN-UB, **PANASONIC PLC Base Unit** includes:

• **N-ALI02. Domestic Power Supply.**

- Supply voltage (Single-Phase): 230 VAC, PH+N+G.
- ON-OFF removable key.
- Output Voltage Connections:
  - Two Single-Phase: 230 VAC.
  - Single-Phase supply wire connecting plug.
- Differential magnetothermal, 2 poles, 25A, 30mA AC 6KA.



N-ALI02

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

- Supply voltage (Single-Phase): 100-240Vac PH+N+G.
- Overcurrent protection with fuse.
- PLC device, Panasonic FP7:
  - High processing speed: 11 ns 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.



N-CPU-PAN

**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 24Vdc.

**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).

③ **Component Workstations:**

⑥③ **AE-PLC-P. Automatic Pressing Workstation**

Its function is to emulate the pressing of the previously received pieces.

The "AE-PLC-P" includes a manipulator arm formed by a rotating pneumatic actuator with a set of four suction pads made of rubber. With this arm the module displaces the piece from the Linear Transport Workstation "AE-PLC-T" to a waiting area before being introduced in the pressing area. When the piece is detected in the waiting area, a pneumatic actuator displaces the piece to the pressing area. When the piece is in the pressing area, a controlled force hydraulic actuator will emulate the piece pressing. After finishing the pressing process emulation, another pneumatic actuator will return the piece to the waiting area of the unit, where the manipulator arm will return the piece to the Linear Transport Workstation "AE-PLC-T" to continue with the manufacturing process.

Specifications:

Mounted with aluminum profiles.

Table with four wheels with brake.

Control panel:

Emergency pushbutton.

Start/Stop pushbuttons.

Manual/automatic switch.

Light indicators for signaling.

Pneumatic circuit:

Air treatment unit:

Filter-regulator with water trap.

Manometer with double scale indicator.

Shut-off valve.

2 cylindrical simple effect pneumatic actuators:

Material: stainless steel.

Diameter: 20 mm.

Stroke of 200 mm.

Profile pneumatic double effect actuator:

Material: stainless steel.

Stroke of 100 mm.

Rotary pneumatic actuator.

3 pneumatic monoestable 3/2 solenoid valves.

Pneumatic bistable 5/2 solenoid valve.

Spring centered 5/3 pneumatic solenoid valve.

Individually identified tubes and push in fittings.

Vacuum circuit:

Venturi effect vacuum ejectors.

4 telescopic flat suction pads made of NBR rubber.

Vacuum switch.

Pneumatic monostable 3/2 solenoid valve.

Hydraulic circuit:

Profile pneumatic double effect actuator:

Material: stainless steel and aluminum.

Stroke of 100 mm.

**③ Component Workstations:**

Overcenter hydraulic solenoid valve.

Hydraulic 4/2 solenoid valve.

Sensors:

Inductive effect sensor to check the position of the piece.

Limit switch to check the position of the pressing area protection mechanism.

11 reed effect limit switches to check the position of the pneumatic actuators.

Fault generation module:

Attached to the frame of the unit.

Generates faults in the operation of different elements of the unit using switches.

**\* Available PLC models of different manufacturers: PANASONIC, SIEMENS, OMRON, MITSUBISHI, ALLEN BRADLEY, etc.**

The AE-PLC-PAN-UB, **PANASONIC PLC Base Unit** includes:

• **N-ALI02. Domestic Power Supply.**

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

ON-OFF removable key.

Output Voltage Connections:

Two Single-Phase: 230 VAC.

Single-Phase supply wire connecting plug.

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



N-ALI02

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

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

Overcurrent protection with fuse.

PLC device, Panasonic FP7:

High processing speed: 11 ns 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 24Vdc.

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).



N-CPU-PAN

**③ Component Workstations:**

**④ AE-PLC-MR1. Rotary Table Workstation 1**

Its function is to supply a third piece and to assemble it to the base piece already supplied by the previous modules, being this piece made of metal or plastic. The "AE-PLC-MR1" includes a vertical storage for the pieces that will be supplied one by one to the rotating table system by a dispensing system. Once the piece is in the rotating table, it rotates and a different operation is performed on it every time it rotates. In the first position of the table the position of the piece is checked by testing its height. In the second position the piece is rotated if the height of the piece is not acceptable. In the fourth position the type of material of the piece is detected (plastic or metal) by an inductive sensor. In the fifth position the presence of the piece is determined by a capacitive sensor. In the sixth position a linear manipulator carries the piece to a rejection area if it does not comply with the specifications of the application.

The last position is only reached by the pieces that fulfill the specifications of the system. In this last stage, a rotating arm takes the piece and assembles it inside the piece supplied in previous stages. This operation will be performed directly in the Linear Transport Workstation "AE-PLC-T" to continue with the manufacturing process.

Specifications:

Mounted with aluminum profiles.

20 pieces:

2 different materials:

Aluminum.

PVC.

Vertical storage for pieces.

Table with four wheels with brake.

Rotating table:

Round table with 8 positions.

DC motor.

Control panel:

Emergency pushbutton.

Start/Stop pushbuttons.

Manual/automatic switch.

Light indicators for signaling.

Pneumatic circuit:

Air treatment unit:

Filter-regulator with water trap.

Manometer with double scale indicator.

Shut-off valve.

2 cylindrical simple effect pneumatic actuators:

Material: stainless steel.

Normally retracted rod.

Diameter: 10 mm.

Stroke of 50 mm.

Cylindrical pneumatic double effect actuator:

Material: stainless steel.

Diameter: 20 mm.

Stroke of 50 mm.

Rodless pneumatic actuator with band:

Material: stainless steel and aluminum.

Stroke of 100 mm.

Limit switch sensors at the desired start and end positions.

Pneumatic double effect external grip clamp.

Rotary pneumatic actuator.

Rotary pneumatic actuator with 50 mm rod.

7 pneumatic monoestable 3/2 solenoid valves.

Pneumatic bistable 5/2 solenoid valve.

2 spring centered 5/3 pneumatic solenoid valves.

Individually identified tubes and push in fittings.

### ③ Component Workstations:

Vacuum circuit:

- 2 flat suction pads made of NBR rubber.
- 2 vacuum switches.
- 2 Venturi effect vacuum ejectors.
- 2 pneumatic monostable 3/2 solenoid valves.

Sensors:

- Inductive effect sensor to determine the type of material of the piece (metal or plastic).
- Capacitive effect sensor to determine the presence of the piece.
- Linear potentiometer of 50 mm stroke to check the height of the piece.
- 12 reed effect limit switches to check the position of the pneumatic actuators.
- Encoder to detect the position of the rotating table.

Fault generation module:

- Attached to the frame of the unit.
- Generates faults in the operation of different elements of the unit using switches.

**\* Available PLC models of different manufacturers: PANSONIC, SIEMENS, OMRON, MITSUBISHI, ALLEN BRADLEY, etc.**

The AE-PLC-PAN-UB, **PANASONIC PLC Base Unit** includes:

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

- Supply voltage (Single-Phase): 230 VAC, PH+N+G.
- ON-OFF removable key.
- Output Voltage Connections:
  - Two Single-Phase: 230 VAC.
  - Single-Phase supply wire connecting plug.
- Differential magnetothermal, 2 poles, 25A, 30mA AC 6KA.



N-ALI02

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

- Supply voltage (Single-Phase): 100-240Vac PH+N+G.
- Overcurrent protection with fuse.
- PLC device, Panasonic FP7:
  - High processing speed: 11 ns 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 24Vdc.
- 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).



N-CPU-PAN

**③ Component Workstations:**

**⑤ AE-PLC-MR2. Rotary Table Workstation 2**

Its function is to supply a fourth piece and to assemble it to the base piece already supplied by the previous modules, being this piece black or white and made of metal or plastic. The "AE-PLC-MR2" includes a vertical storage for the pieces that will be supplied one by one to the rotating table system by a dispensing system. Once the piece is in the rotating table, it rotates and a different operation is performed on it every time it rotates. In the first position of the table the type of material of the piece is detected (plastic or metal). In the second position the presence of a piece is detected by a capacitive sensor. In the third position the color of the piece is detected by an optical sensor. In the fourth position the height of the piece is checked by a linear sensor and a cylindrical pneumatic actuator. In the fifth position, the wrong pieces are discarded by a manipulator that carries them to the rejection area. The last position is only reached by the pieces that fulfill the specifications of the system. In this last stage, a rotating arm takes the piece and assembles it inside the base piece supplied in previous stages. This operation will be performed directly in the Linear Transport Workstation "AE-PLC-T" to continue with the manufacturing process.

Specifications:

Mounted with aluminum profiles.

20 pieces:

2 different heights.

2 different materials:

Aluminum.

PVC.

3 different colors:

Silver, white and black.

Vertical storage for pieces.

Table with four wheels with brake.

Rotating table:

Round table with 8 positions.

DC motor.

Control panel:

Emergency pushbutton.

Start/Stop pushbuttons.

Manual/automatic switch.

Light indicators for signaling.

Pneumatic circuit:

Air treatment unit:

Filter-regulator with water trap.

Manometer with double scale indicator.

Shut-off valve.

Cylindrical simple effect pneumatic actuator:

Material: stainless steel.

Normally retracted rod.

Diameter: 20 mm.

Stroke of 100 mm.

Cylindrical pneumatic double effect actuator:

Material: stainless steel.

Diameter: 20 mm.

Stroke of 50 mm.

Profile pneumatic double effect actuator:

Material: stainless steel and aluminum.

Stroke of 100 mm.

2 pneumatic double effect external grip clamps.

2 rotary pneumatic actuators with 50 mm rod.

6 pneumatic NC monoestable 3/2 solenoid valves.

3 pneumatic bistable 5/2 solenoid valves.

Individually identified tubes and push in fittings.

### ③ Component Workstations:

Vacuum circuit:

- 3 flat suction pads made of NBR rubber.
- Venturi effect vacuum ejector.
- Vacuum switch.
- Pneumatic NC monostable 3/2 solenoid valve.

Sensors:

- Inductive effect sensor to determine the type of material of the piece (metal or plastic).
- Capacitive effect sensor to determine the presence of the piece.
- Optical sensor to determine the color of the piece.
- Linear potentiometer of 50 mm stroke to check the height of the piece.
- 13 reed effect limit switches to check the position of the pneumatic actuators.
- Encoder to detect the position of the rotating table.

Fault generation module:

- Attached to the frame of the unit.
- Generates faults in the operation of different elements of the unit using switches.

**\* Available PLC models of different manufacturers: PANSONIC, SIEMENS, OMRON, MITSUBISHI, ALLEN BRADLEY, etc.**

The AE-PLC-PAN-UB, **PANASONIC PLC Base Unit** includes:

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

- Supply voltage (Single-Phase): 230 VAC, PH+N+G.
- ON-OFF removable key.
- Output Voltage Connections:
  - Two Single-Phase: 230 VAC.
  - Single-Phase supply wire connecting plug.
- Differential magnetothermal, 2 poles, 25A, 30mA AC 6KA.



N-ALI02

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

- Supply voltage (Single-Phase): 100-240Vac 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.



N-CPU-PAN

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 24Vdc.

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).



**③ Component Workstations:**

**④ AE-PLC-AT. Automatic Screw Workstation**

Its function is to supply and introduce four screws into the base piece already supplied by the previous modules. The "AE-PLC-AT" includes a vertical storage for the pieces that will be supplied one by one by a dispensing system. Then, a manipulator system will attach the screw to the piece. To attach the four screws, the base piece is rotated three times in the Linear Transport Workstation "AE-PLC-T", so the manufacturing process is not interrupted.

Specifications:

Mounted with aluminum profiles.

20 pieces:

Screws made of steel.

Vertical storage for pieces.

Table with four wheels with brake.

Control panel:

Emergency pushbutton.

Start/Stop pushbuttons.

Manual/automatic switch.

Light indicators for signaling.

Pneumatic circuit:

Air treatment unit:

Filter-regulator with water trap.

Manometer with double scale indicator.

Shut-off valve.

2 cylindrical simple effect pneumatic actuators:

Material: stainless steel.

Normally retracted rod.

Diameter: 10 mm.

Stroke of 20 mm.

Cylindrical pneumatic double effect actuator:

Material: stainless steel.

Diameter: 20 mm.

Stroke of 200 mm.

Cylindrical pneumatic double effect actuator:

Material: stainless steel.

Diameter: 20 mm.

Stroke of 100 mm.

Profile pneumatic double effect actuator:

Material: stainless steel and aluminum.

Stroke of 100 mm.

Pneumatic double effect external grip clamp.

2 rotary pneumatic actuators with 50 mm rod.

5 pneumatic NC monoestable 3/2 solenoid valves.

**③ Component Workstations:**

- 3 pneumatic bistable 5/2 solenoid valves.
- Spring centered 5/3 pneumatic solenoid valve.
- Individually identified tubes and push in fittings.

Sensors:

Reed effect limit switch to check the position of the pneumatic actuator.

Fault generation module:

Attached to the frame of the unit.

Generates faults in the operation of different elements of the unit using switches.

**\* Available PLC models of different manufacturers: PANASONIC, SIEMENS, OMRON, MITSUBISHI, ALLEN BRADLEY, etc.**

The AE-PLC-PAN-UB, **PANASONIC PLC Base Unit** includes:

• **N-ALI02. Domestic Power Supply.**

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

ON-OFF removable key.

Output Voltage Connections:

Two Single-Phase: 230 VAC.

Single-Phase supply wire connecting plug.

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



N-ALI02

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

Supply voltage (Single-Phase): 100-240Vac 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 24Vdc.

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).



N-CPU-PAN

### ③ Component Workstations:

#### ⑤7 AE-BR. Robotic Arm Station

Its function is to screw up the four screws already supplied and introduced in the previous stage using an industrial robotic arm with drill. When the robotic arm has screwed up the four screws, the Linear Transport Workstation "AE-PLC-T" continues with the manufacturing process.

Specifications:

Mounted with aluminum profiles.

Table with four wheels with brake.

Control panel:

Emergency pushbutton.

Start/Stop pushbuttons.

Manual/automatic switch.

Light indicators for signaling.

Pneumatic circuit:

Air treatment unit:

Filter-regulator with water trap.

Manometer with double scale indicator.

Shut-off valve.

Pneumatic bistable 5/2 solenoid valve.

Robotic arm:

6 degrees of freedom.

Maximum load capacity: 2 Kg.

Weight: 19 Kg.

Position repeatability:  $\pm 0.02$  mm.

Detection method: absolute encoder.

Arm length: 500 mm max.

Console to program the robotic arm.

Electric drill to install in the robotic arm.

Pneumatic double effect external grip clamp to install in the robotic arm.

Protection screen made of polycarbonate.

\* Available PLC models of different manufacturers: PANSONIC, SIEMENS, OMRON, MITSUBISHI, ALLEN BRADLEY, etc.

The AE-PLC-PAN-UB, **PANASONIC PLC Base Unit** includes:

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

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

ON-OFF removable key.

Output Voltage Connections:

Two Single-Phase: 230 VAC.

Single-Phase supply wire connecting plug.

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



N-ALI02

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

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

Overcurrent protection with fuse.

PLC device, Panasonic FP7:

High processing speed: 11 ns 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 24Vdc.

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).



N-CPU-PAN

③ Component Workstations:

③ **AE-PLC-AL. Storage Workstation**

Its function is to store the pieces supplied by the previous modules. The "AE-PLC-AL" includes a manipulator system with three degrees of freedom XYZ to place the piece in the correct position. The unit includes an HMI display for easy piece storage monitoring. This unit is the end of the manufacturing process.

Specifications:

Mounted with aluminum profiles.

Table with four wheels with brake.

Control panel:

Emergency pushbutton.

Start/Stop pushbuttons.

Manual/automatic switch.

Light indicators for signaling.

Electrical components:

2 linear electrical actuators:

DC motor.

Position meter.

Length: 500 mm.

Pneumatic circuit:

Air treatment unit:

Filter-regulator with water trap.

Manometer with double scale indicator.

Shut-off valve.

Profile pneumatic double effect actuator:

Material: stainless steel and aluminum.

Stroke of 100 mm.

Pneumatic bistable 5/2 solenoid valves.

Individually identified tubes and push in fittings.

Vacuum circuit:

4 telescopic flat suction pads made of NBR rubber mounted on an aluminum plate.

Venturi effect vacuum ejector.

Vacuum switch.

Pneumatic monoestable 3/2 solenoid valve.

Sensors:

2 reed effect limit switches to check the position of the pneumatic actuators.

Tray where the pieces of the unit will be located.

Protection screen made of polycarbonate.

**③ Component Workstations:**

\* Available PLC models of different manufacturers: PANASONIC, SIEMENS, OMRON, MITSUBISHI, ALLEN BRADLEY, etc.

The AE-PLC-PAN-UB, **PANASONIC PLC Base Unit** includes:

• N-ALI02. **Domestic Power Supply.**

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

ON-OFF removable key.

Output Voltage Connections:

Two Single-Phase: 230 VAC.

Single-Phase supply wire connecting plug.

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



N-ALI02

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

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

Overcurrent protection with fuse.

PLC device, Panasonic FP7:

High processing speed: 11 ns 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 24Vdc.

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).



N-CPU-PAN

③ Component Workstations:

⑤⑨ **AE-PLC-T. Linear Transport Workstation**

Its function is to transport pieces between the different working stations that will perform the different assembly operations. The "AE-PLC-T" has eight stops where the working stations will be installed.

Specifications:

Mounted with aluminum profiles.

Four pallets to transport the pieces.

Eight stops for the pallets:

One stop per working station.

Eight retaining devices.

There is a rotating actuator with a 50 mm rod in the stop where the "AE-PLC-AT" system will be installed to make the piece rotate.

Electrical panel:

Differential magneto-thermal switch.

Power supply of 24 VDC.

Terminal block to connect the individually identified inputs and outputs of the unit.

Control panel:

Emergency pushbutton.

Start/Stop pushbuttons.

Manual/automatic switch.

Light indicators for signaling.

Pneumatic circuit:

Air treatment unit:

Filter-regulator with water trap.

Manometer with double scale indicator.

Shut-off valve.

Air intake in every working station to supply pressurized air to each unit.

13 cylindrical simple effect pneumatic actuators:

Material: stainless steel.

Normally retracted rod.

Diameter: 20 mm.

Stroke of 50 mm.

Rotating pneumatic actuator with a 50 mm rod.

14 NC pneumatic monostable 3/2 solenoid valves.

Spring centered 5/3 pneumatic solenoid valve.

Individually identified tubes and push in fittings.

Sensors:

24 inductive effect sensors to detect the presence of the pallet.

Four reed effect limit switches to check the position of the pneumatic actuators.

Single-phase motor to move the conveyor belt.

\* Available PLC models of different manufacturers: PANSONIC, SIEMENS, OMRON, MITSUBISHI, ALLEN BRADLEY, etc.

### ③ Component Workstations:

The AE-PLC-PAN-UB, **PANASONIC PLC Base Unit** includes:

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

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

ON-OFF removable key.

Output Voltage Connections:

Two Single-Phase: 230 VAC.

Single-Phase supply wire connecting plug.

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



N-ALI02

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

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

Overcurrent protection with fuse.

PLC device, Panasonic FP7:

High processing speed: 11 ns 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 24Vdc.

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).



N-CPU-PAN

The complete unit includes as well:

**Open Control + Multicontrol + Real-Time Control.**

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

**Projector and/or electronic whiteboard compatibility allows the unit to be explained and demonstrated to an entire class at one time.**

**Capable of doing applied research, real industrial simulation, training courses, etc.**

**Remote operation and control by the user and remote control for EDIBON technical support, are always included.**

**Totally safe, utilizing 3 safety systems (Mechanical, Electrical & Electronic).**

**Designed and manufactured under several quality standards.**

**Optional software to perform 2D and 3D simulations of the processes studied and supervise and control the real system (SCADA).**

**Optional ICAI software to create, edit and carry out practical exercises, tests, exams, calculations, etc. Apart from monitoring user's knowledge and progress reached.**

#### ④ SAC. Silent Air Compressor Unit

Designed to work with the EDIBON units.

Single-phase motor with 340 W.

Low noise level with 40 dB of maximum.

Boiler capacity: 9 l.

Maximum pressure: 8 bar or 0.8 MPa.

Maximum air flow: 50 l/min.

Safety relief valve.

Start/stop switch.

Double scale manometer psi and bar with a range from 0 to 12 bar to measure the air pressure before the air filter regulator.

Air Filter Regulator (FR):

Double scale manometer psi and bar with a range from 0 to 12 bar to measure the air pressure after the air filter regulator.

Air filter with drain.

Air pressure regulator from 0 to 8 bar.

6 mm quick release connector of 6mm for pneumatic flexible tubes.

Oil level indicator.

The oil necessary to work is included with the unit.

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



SAC

#### ⑤ HPU. Hydraulic Power Unit

Mounted on a structure with wheels with brakes.

Single-phase motor with 0.75 kW.

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

⑥ **Cables and Accessories**, for normal operation.

#### ⑦ **Manuals:**

This unit is **supplied with 7 manuals**: Required Services, Assembly and Installation, Control Software, Starting-up, Safety, Maintenance & Practices Manuals.

\*References 1 to 7 are the main items: AE-PLC-FMS1 + PLC, HMI and web server programming software + Component Workstations + SAC + HPU + Cables and Accessories + Manuals are included in the minimum supply for enabling normal and full operation.



## EXERCISES AND PRACTICAL POSSIBILITIES

### **Practical possibilities to be done with the Flexible Manufacturing System 1 (AE-PLC-FMS1):**

- 1.- Introduction to flexible manufacturing system (FMS).
- 2.- Introduction to pneumatics and electro-pneumatics.
- 3.- Introduction to vacuum technology.
- 4.- Study of the sensor detection.
- 5.- Testing the digital inputs and outputs of the automatic system through a PLC.
- 6.- Modify manufacturing parameters through the PLC.
- 7.- Configuration of a pneumatic application.
- 8.- Introduction to the Human-machine interface systems (HMI).
- 9.- Study of an automatic control of an industrial system.
- 10.- Control of the flexible manufacturing system through a central PLC in an Ethernet network with local PLC in each workstation.
- 11.- Manage the flexible manufacturing system through the HMI device.

### **Practical possibilities to be done with the optional software Automation Systems Simulation Software (AE-AS):**

- 12.- Introduction to the SCADA control system.
- 13.- OPC server system with Ethernet.
- 14.- SCADA control of an automatic industrial system through PC.

### **Practical possibilities to be done with the Workstation alone:**

#### **- Feeding Workstation for Pieces (AE-PLC-A).**

- 15.- Manual control of a Feeding system.
- 16.- Automatic control of a Feeding system.
- 17.- Change the parameters of the Feeding process.
- 18.- Optimize the process time.
- 19.- Study and analysis of the faults inserted in the process with the fault generation module.

#### **- Mounting Workstation (AE-PLC-M).**

- 20.- Manual control of a mounting system.
- 21.- Automatic control of a mounting system.
- 22.- Change the parameters of the mounting process.
- 23.- Optimization of the process time.
- 24.- Study and analysis of the faults inserted in the process with the fault generation module.

#### **- Automatic Pressing Workstation (AE-PLC-P).**

- 25.- Manual control of a pressing system.
- 26.- Automatic control of a pressing system.
- 27.- Change the parameters of the pressing process.
- 28.- Optimization of the process time.
- 29.- Study and analysis of the faults inserted in the process with the fault generation module.

#### **- Rotary Table Workstation 1 (AE-PLC-MR1).**

- 30.- Manual control of the rotary table system.
- 31.- Manual control of the feeding system on a rotary table.
- 32.- Manual control of the quality control and mounting process on a rotary table.
- 33.- Automatic control of the rotary table system.

- 34.- Automatic control of the feeding system on a rotary table.
- 35.- Automatic control of the quality control and mounting process on a rotary table.
- 36.- Change the parameters of the rotary table process.
- 37.- Optimize the process time.
- 38.- Study and analysis of the faults inserted in the process with the fault generation module.

#### **- Rotary Table Workstation 2 (AE-PLC-MR2).**

- 39.- Manual control of the rotary table system.
- 40.- Manual control of the quality control and drilling process on a rotary table.
- 41.- Automatic control of the rotary table system.
- 42.- Automatic control of the quality control and drilling process on a rotary table.
- 43.- Change the parameters of the rotary table process.
- 44.- Optimize the process time.
- 45.- Study and analysis of the faults inserted in the process with the fault generation module.

#### **- Automatic Screw Workstation (AE-PLC-AT).**

- 46.- Manual control of a screwing system.
- 47.- Automatic control of a screwing system.
- 48.- Change the parameters of the screwing process.
- 49.- Optimize the process time.
- 50.- Study and analysis of the faults inserted in the process with the fault generation module.

#### **- Robotic Arm Workstation (AE-BR).**

- 51.- Introduction to robotic systems.
- 52.- Robotic arm configuration.
- 53.- Set a simple movement of the robotic arm.
- 54.- Configuration of a pneumatic application.
- 55.- Set a simple pick and place task with the robotic arm.
- 56.- Modification of the task parameters.
- 57.- Optimize the task time.

#### **- Storage Workstation (AE-PLC-AL).**

- 58.- Manual control of a storing system.
- 59.- Automatic control of a storing system.
- 60.- Change the parameters of the storing process.
- 61.- Optimize the process time.
- 62.- Study and analysis of the faults inserted in the process with the fault generation module.

#### **- Linear Transport Workstation (AE-PLC-T).**

- 63.- Manual control of a transporting system.
- 64.- Automatic control of a transporting system.
- 65.- Change the parameters of a transporting process.
- 66.- Optimize the process time.
- 67.- Study and analysis of the faults inserted in the process with the fault generation module.

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

## REQUIRED SERVICES

- Electrical supply: single phase, 220V./50 Hz. or 110V./60 Hz.
- Computer.

## DIMENSIONS AND WEIGHTS

- AE-PLC-FMS1 unit:
- Dimensions: 6000 x 2500 x 1500 mm. approx.  
(236.22 x 98.42 x 59.05 inches approx.)
  - Weight: 900 Kg. approx.  
(1984 pounds approx.).

## RECOMMENDED ACCESSORIES (Not included)

- AE-AS. Automation System Simulation Software (Optional).

## AVAILABLE VERSIONS

- AE-PLC-FMS1. Flexible Manufacturing System 1.
- AE-PLC-FMS2. Flexible Manufacturing System 2.
- AE-PLC-FMS3. Flexible Manufacturing System 3.
- AE-PLC-FMS4. Flexible Manufacturing System 4.
- AE-PLC-FMS5. Flexible Manufacturing System 5.
- AE-PLC-FMS6. Flexible Manufacturing System 6.
- AE-PLC-FMS7. Flexible Manufacturing System 7.
- AE-PLC-FMS8. Flexible Manufacturing System 8.
- AE-PLC-FMS9. Flexible Manufacturing System 9.
- AE-PLC-FMS10. Flexible Manufacturing System 10.
- AE-PLC-FMS11. Flexible Manufacturing System 11.
- AE-PLC-FMS12. Flexible Manufacturing System 12.
- AE-PLC-FMS13. Flexible Manufacturing System 13.
- AE-PLC-FMS14. Flexible Manufacturing System 14.

Offered in this catalogue:

Offered in other catalogue:

## COMPLETE TECHNICAL SPECIFICATIONS (for optional items)

Additionally to the main items (1 to 7) described, we can offer, as optional, other items from 8 to 10.

All these items try to give more possibilities for:

- a) Technical and Vocational Education configuration. (ICAI)
- b) Multipost Expansions options. (Mini ESN and ESN)

### a) Technical and Vocational Education configuration

#### ⑧ AE-PLC-FMS1/ICAI. Interactive Computer Aided Instruction Software System.

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.

This software is optional and can be used additionally to items (1 to 6).

#### - 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.

#### - 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](http://www.edibon.com/en/files/expansion/ICAI/catalog)

#### Instructor Software



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

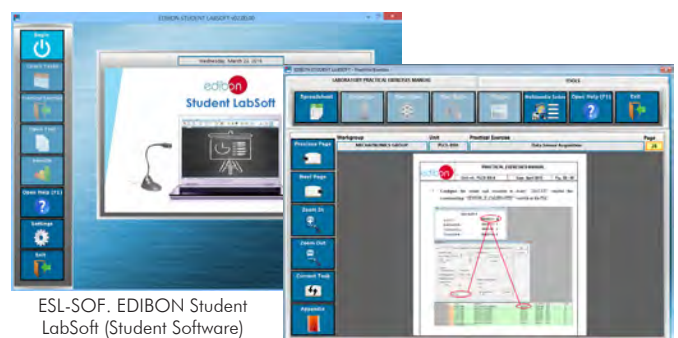
ECAL. EDIBON Calculations Program Package - Formula Editor Screen



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

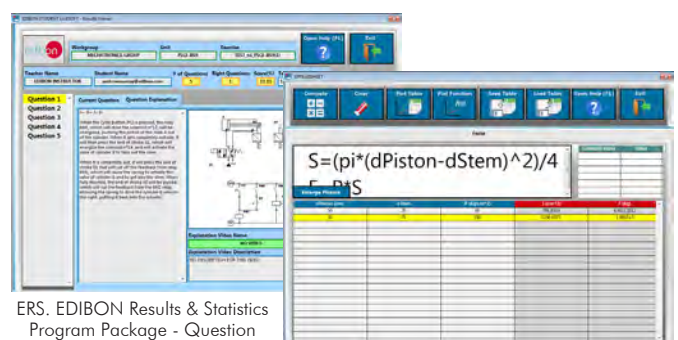
ETTE. EDIBON Training Test & Exam Program Package - Main Screen with Numeric Result Question

#### Student Software



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

EPE. EDIBON Practical Exercise Program Package Main Screen



ERS. EDIBON Results & Statistics Program Package - Question Explanation

ECAL. EDIBON Calculations Program Package Main Screen

b) Multipost Expansions options



⑨ **MINI ESN. EDIBON Mini Scada-Net System for being used with EDIBON Teaching Units.**

MINI ESN. **EDIBON Mini Scada-Net System** allows up to 30 students to work with a Teaching Unit in any laboratory, simultaneously. It is useful for both, Higher Education and/or Technical and Vocational Education.

The MINI ESN system consists of the adaptation of any EDIBON Computer Controlled Unit with SCADA and PID Control integrated in a local network.

This system allows to view/control the unit remotely, from any computer integrated in the local net (in the classroom), through the main computer connected to the unit. Then, the number of possible users who can work with the same unit is higher than in an usual way of working (usually only one).

Main characteristics:

- It allows up to 30 students to work simultaneously with the EDIBON Computer Controlled Unit with SCADA and PID Control, connected in a local net.
- Open Control + Multicontrol + Real Time Control + Multi Student Post.
- Instructor controls and explains to all students at the same time.
- Any user/student can work doing "real time" control/multicontrol and visualisation.
- Instructor can see in the computer what any user/student is doing in the unit.
- Continuous communication between the instructor and all the users/students connected.

Main advantages:

- It allows an easier and quicker understanding.
- This system allows you can save time and cost.
- Future expansions with more EDIBON Units.

For more information see Mini ESN catalogue. Click on the following link:

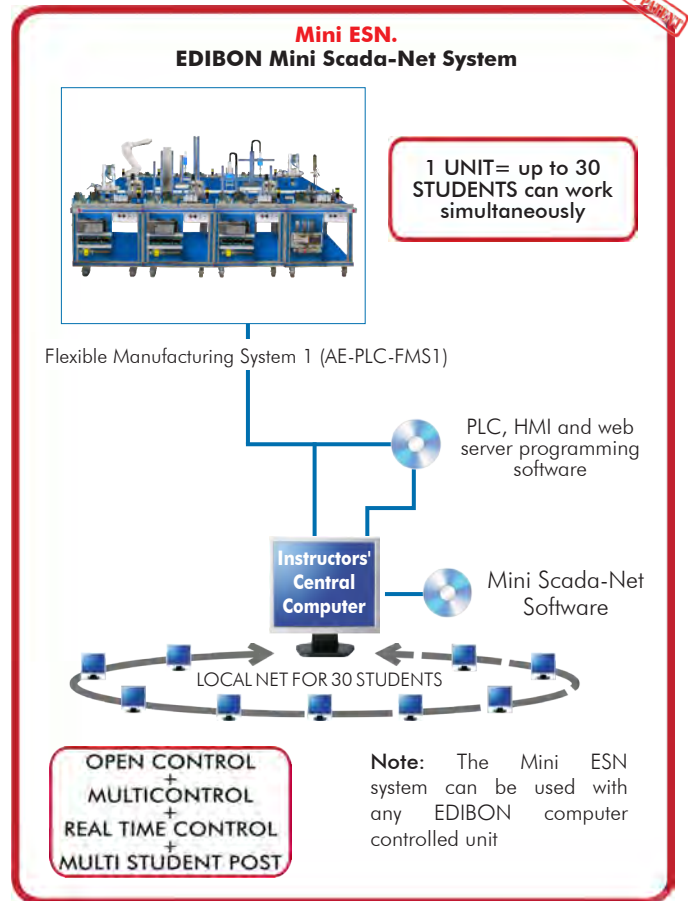
[www.edibon.com/products/catalogues/en/Mini-ESN.pdf](http://www.edibon.com/products/catalogues/en/Mini-ESN.pdf)

⑩ **ESN. EDIBON Scada-Net System.**

This unit can be integrated, in the future, into a Complete Laboratory with many Units and many Students.

For more information see ESN catalogue. Click on the following link:

[www.edibon.com/en/files/expansion/ESN/catalog](http://www.edibon.com/en/files/expansion/ESN/catalog)



## ORDER INFORMATION

### **Main items** (always included in the supply)

Minimum supply always includes:

- ① **Unit: AE-PLC-FMS1. Flexible Manufacturing System 1.**
- ② **PLC, HMI and web server programming software.**
- ③ **Component Workstations:**
  - ⑥.1 AE-PLC-A. **Feeding Workstation for Pieces.**
  - ⑥.2 AE-PLC-M. **Mounting Workstation.**
  - ⑥.3 AE-PLC-P. **Automatic Pressing Workstation.**
  - ⑥.4 AE-PLC-MR1. **Rotary Table Workstation 1**
  - ⑥.5 AE-PLC-MR2. **Rotary Table Workstation 2.**
  - ⑥.6 AE-PLC-AT. **Automatic Screw Workstation.**
  - ⑥.7 AE-BR. **Robotic Arm Station.**
  - ⑥.8 AE-PLC-AL. **Storage Workstation.**
  - ⑥.9 AE-PLC-T. **Linear Transport Workstation.**
- ④ **SAC. Silent Air Compressor Unit.**
- ⑤ **HPU. Hydraulic Power Unit.**
- ⑥ **Cables and Accessories**, for normal operation.
- ⑦ **Manuals.**

\***IMPORTANT:** Under AE-PLC-FMS1 we always supply all the elements for immediate running as 1, 2, 3, 4, 5, 6 and 7.

### **Optional items** (supplied under specific order)

a) Technical and Vocational Education configuration

- ⑧ AE-PLC-FMS1/ICAL. Interactive Computer Aided Instruction Software System.
  - b) Multipost Expansions options
- ⑨ Mini ESN. EDIBON Mini Scada-Net System for being used with EDIBON Teaching Units.
- ⑩ ESN. EDIBON Scada-Net System.

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



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