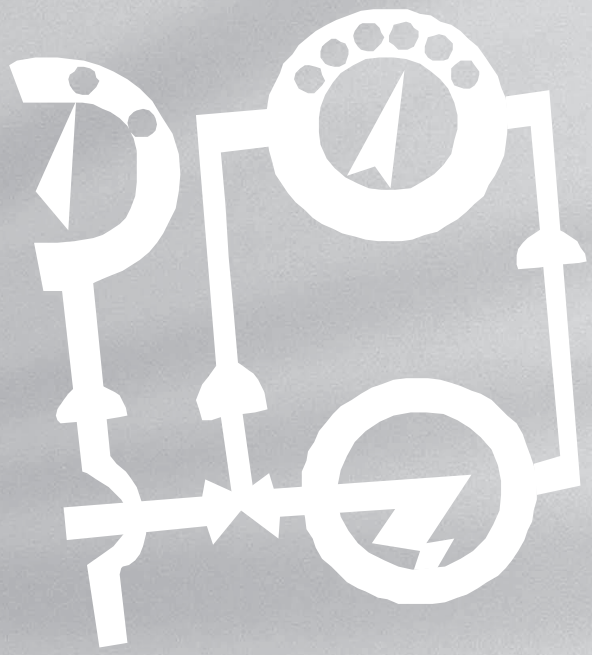
Summarized
Catalogue

two(2)

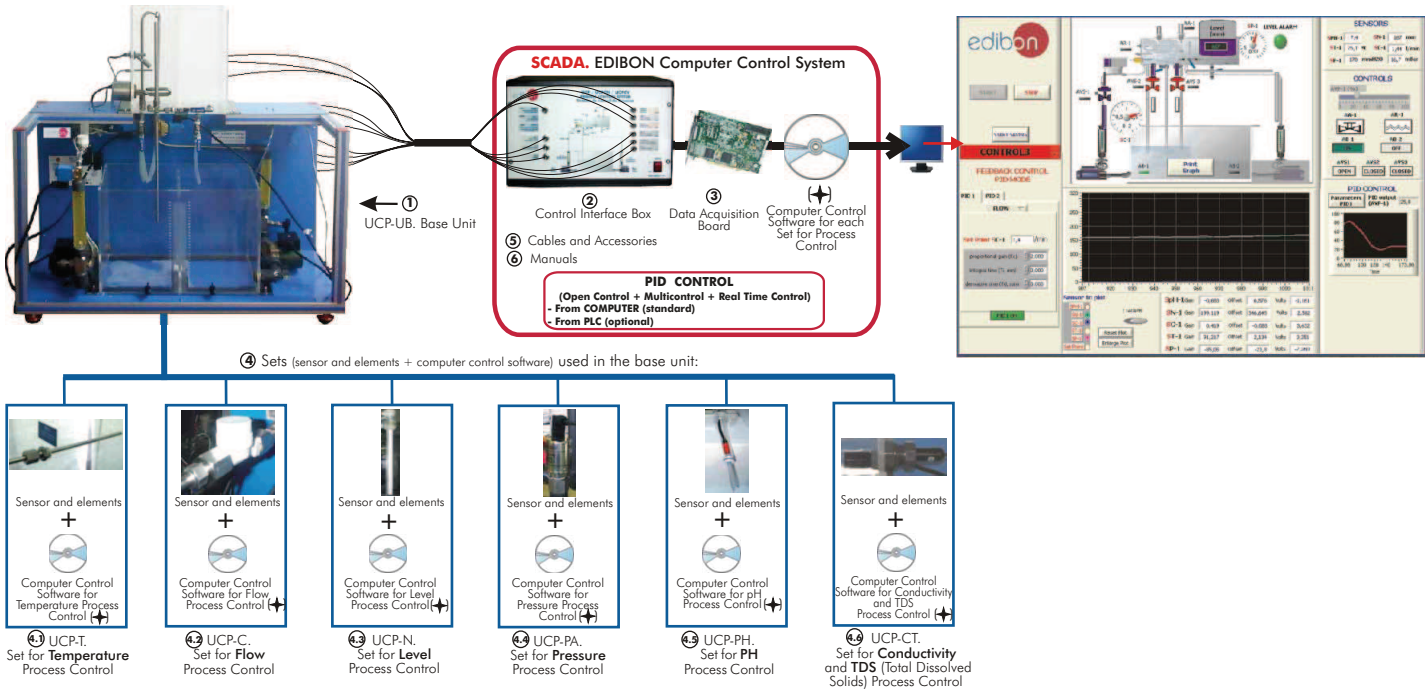


10. Process Control

edibon

www.edibon.com

UCP. Computer Controlled **Process Control System, with electronic control valve :**



SPECIFICATIONS SUMMARY

Common items for all Process Control parameters:

① UCP-UB. Unit:
This unit is common for all Sets for Process Control type "UCP" and can work with one or several sets.
Anodized aluminium structure. Diagram in the front panel with similar distribution to the elements in the real unit. Main tank and collector with an orifice in the central dividing wall. (2 x 25 dm^3), and drainage in both compartments. Dual process tank (2 x 10 dm^3), interconnected through an orifice and a ball valve and an overflow in the dividing wall; a graduate scale and a threaded drain of adjustable level with bypass. Centrifugal pumps. Variable area flow meters (0.2-2 l/min, and 0.2-10 l/min), and with a manual valve. Line of on/off regulation valves (solenoid), and manual drainage valves of the upper tank. Proportional valve: motorized control valve.

② UCP/CIB. Control Interface Box :
This is common for all Sets for Process Control type "UCP" and can work with one or several sets.
With process diagram in the front panel. The unit control elements are permanently computer controlled. Simultaneous visualization in the PC of all parameters involved in the process. Calibration of all sensors involved in the process. Real time curves representation. All the actuators' values can be changed at any time from the keyboard. Shield and filtered signals to avoid external interferences. Real time PID control with flexibility of modifications from the PC keyboard of the PID parameters, at any moment during the process. Open control allowing modifications, at any moment and in real time, of parameters involved in the process. 3 safety levels: mechanical in the unit, electronic in the control interface, and the third one in the control software.

③ DAB. Data Acquisition Board:
PCI Data acquisition National Instruments board to be placed in a computer slot. 16 Analog inputs. Sampling rate up to: 250 KS/s. 2 Analog outputs. 24 Digital Inputs/ Outputs.

④ Sets (sensor and elements + computer control software) used in the base unit: (These Sets will be supplied and installed in the Base Unit and ready for working)

④.1 UCP-T. Set for Temperature Process Control:
Temperature sensor "J type". Electric resistor (0.5 KW). Helix agitator. On/off level switch.
Computer Control Software for Temperature Process Control:
(#) Flexible, open and multicontrol software. Management, processing, comparison and storage of data. Sampling velocity up to 250,000 data per second. It allows the registration of the alarms state and the graphic representation in real time.

④.2 UCP-C. Set for Flow Process Control:
Turbine type flow sensor.
Computer Control Software for Flow Process Control. **(#)**

④.3 UCP-N. Set for Level Process Control:
0-300mm level sensor (of capacitive immersion, 4-20mA).
Computer Control Software for Level Process Control. **(#)**

④.4 UCP-PA. Set for Pressure Process Control:
Pressure sensor.
Computer Control Software for Pressure Process Control. **(#)**

④.5 UCP-PH. Set for pH Process Control:
pH sensor. Helix agitator.
Computer Control Software for pH Process Control. **(#)**

④.6 UCP-CT. Set for Conductivity and TDS (Total Dissolved Solids) Process Control:
Conductivity and TDS (Total Dissolved Solids) sensor.
Computer Control Software for Conductivity and TDS Process Control. **(#)**

⑤ Cables and Accessories, for normal operation.

⑥ Manuals: This unit is supplied with 8 manuals.

Dimensions(approx.) = UCP-UB. Unit: 500 x 1000 x 1000 mm. Weight: 40 Kg.
Control Interface: 490 x 330 x 310 mm. Weight: 10 Kg.

More information in: www.edibon.com/products/catalogues/en/units/processcontrol/fundamentals/UCP.pdf

PRACTICAL POSSIBILITIES

Temperature Process Control:
1.- Temperature control loops (Manual).
2.- Temperature control loops (On/Off).
3.- Temperature control loops (Proportional).
4.- Temperature control loops (Proportional + Integral).
5.- Temperature control loops (Proportional + Derivative).
6.- Temperature control loops (Proportional + Derivative +Integral).
7.- Adjustment of the constant of a controller of temperature (Ziegler-Nichols).
8.- Adjustment of the constant of a controller of temperature (Reaction Curves).
9.- Temperature sensor calibration.

Flow Process Control:
10.- Flow control loops (Manual).
11.- Flow control loops (On/Off).
12.- Flow control loops (Proportional).
13.- Flow control loops (Proportional + Integral).
14.- Flow control loops (Proportional + Derivative).
15.- Flow control loops (Proportional + Derivative + Integral).
16.- Adjustment of the flow controller constants (Ziegler-Nichols).
17.- Adjustment of the flow controller constants (Reaction Curves).
18.- Flow sensor calibration.

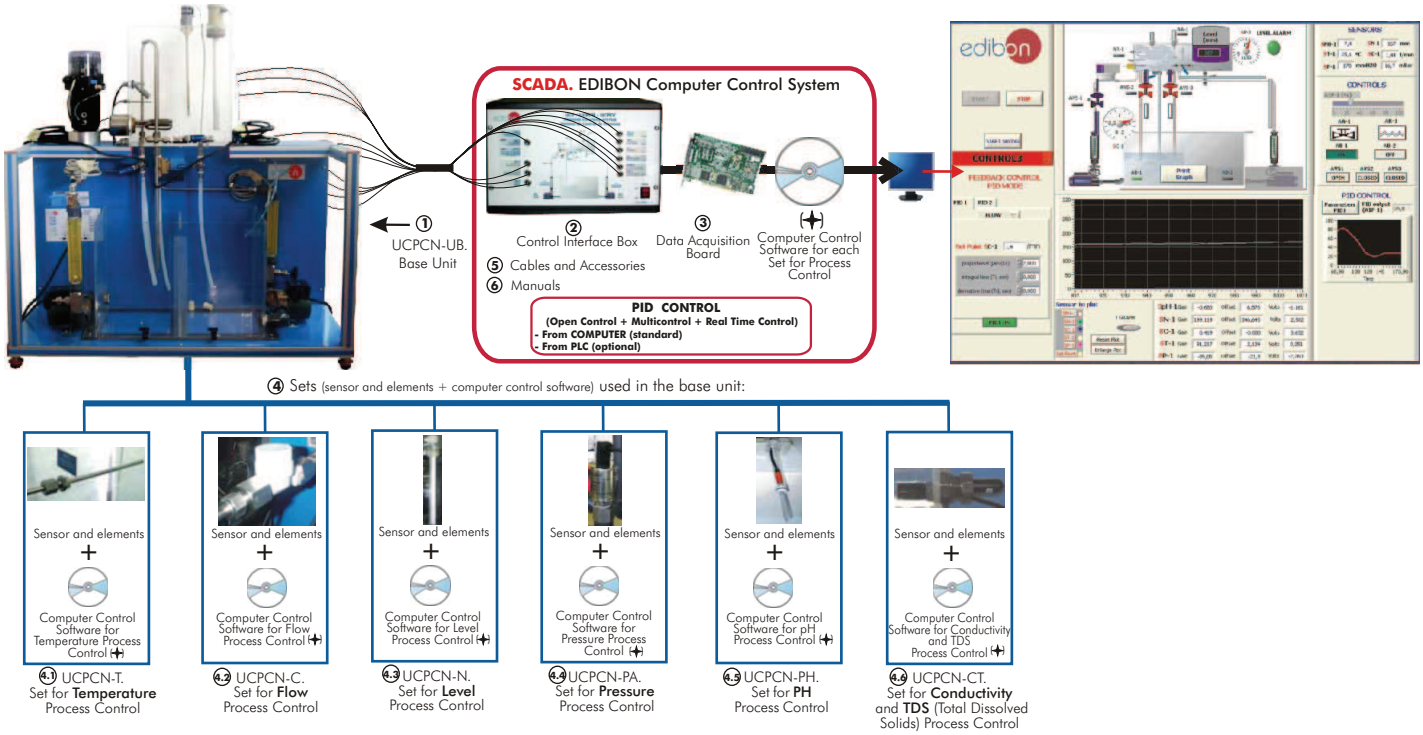
Level Process Control:
19.- Level control loops (Manual).
20.- Level control loops (On/Off).
21.- Level control loops (Proportional).
22.- Level control loops (Proportional + Integral).
23.- Level control loops (Proportional + Derivative).
24.- Level control loops (Proportional + Derivative + Integral).
25.- Adjustment of the constants of a flow controller (Ziegler-Nichols).
26.- Adjustment of the constants of a flow controller (Reaction Curves).
27.- Level sensor calibration.

Pressure Process Control:
28.- Pressure control loops (Manual).
29.- Pressure control loops (On/Off).
30.- Pressure control loops (Proportional).
31.- Pressure control loops (Proportional + Integral).
32.- Pressure control loops (Proportional + Derivative).
33.- Pressure control loops (Proportional + Derivative + Integral).
34.- Adjustment of the constant of a Pressure controller (Ziegler-Nichols).
35.- Adjustment of the constant of a Pressure controller (Reaction Curves).
36.- Pressure sensor calibration.

pH Process Control:
37.- pH control loops (Manual).
38.- pH control loops (On/Off).
39.- pH control loops (Proportional).
40.- pH control loops (Proportional + Integral).
41.- pH control loops (Proportional + Derivative).
42.- pH control loops (Proportional + Derivative + Integral).
43.- Adjustment of the constant of a pH controller (Ziegler-Nichols).
44.- Adjustment of the constant of a pH controller (Reaction Curves).
45.- pH sensor calibration.

Conductivity and TDS (Total Dissolved Solids) Process Control:
46.- Conductivity control loops (Manual).
47.- Conductivity control loops (On/Off).
48.- Conductivity control loops (Proportional).
49.- Conductivity control loops (Proportional + Integral).
50.- Conductivity control loops (Proportional + Derivative).
51.- Conductivity control loops (Proportional + Derivative + Integral).
52.- Adjustment of the constant of a Conductivity controller (Ziegler-Nichols).
53.- Adjustment of the constant of a Conductivity controller (Reaction Curves).
54.- TDS control loops (Manual).
55.- TDS control loops (On/Off).
56.- TDS control loops (Proportional).
57.- TDS control loops (Proportional + Integral).
58.- TDS control loops (Proportional + Derivative).
59.- TDS control loops (Proportional + Derivative + Integral).
60.- Adjustment of the constant of a TDS controller (Ziegler-Nichols).
61.- Adjustment of the constant of a TDS controller (Reaction Curves).
62.- Conductivity and TDS sensor calibration.
63-81.- Practices with PLC.

UCPCN. Computer Controlled **Process Control System, with pneumatic control valve :**



SPECIFICATIONS SUMMARY

Common items for all Process Control parameters:

① UCPCN-UB. Unit:

This unit is common for all Sets for Process Control type "UCPCN" and can work with one or several sets.

Anodized aluminium structure. Diagram in the front panel with similar distribution to the elements in the real unit. Main tank and collector with an orifice in the central dividing wall.(2 x 25 dm^3), and drainage in both compartments. Dual process tank (2 x 10 dm^3), interconnected through an orifice and a ball valve and an overflow in the dividing wall; a graduate scale and a threaded drain of adjustable level with bypass. Centrifugal pumps. Variable area flow meters (0.2-2 l/min, and 0.2-10 l/min), and with a manual valve. Line of on/off regulation valves (solenoid), and manual drainage valves of the upper tank. Pneumatic Control Valve.

② UCPCN/CIB. Control Interface Box :

This is common for all Sets for Process Control type "UCPCN" and can work with one or several sets.

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

③ DAB. Data Acquisition Board:

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

④ Sets (sensor and elements + computer control software) used in the base unit: (These Sets will be supplied and installed in the Base Unit and ready for working)

④.1 UCPCN-T. Set for Temperature Process Control:

Temperature sensor "J type". Electric resistor (0.5 KW). Helix agitator. On/off level switch.

Computer Control Software for Temperature Process Control:

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

④.2 UCPCN-C. Set for Flow Process Control:

Turbine type flow sensor.

Computer Control Software for Flow Process Control. **(#)**

④.3 UCPCN-N. Set for Level Process Control:

0-300mm level sensor (of capacitive immersion, 4-20mA).

Computer Control Software for Level Process Control. **(#)**

④.4 UCPCN-PA. Set for Pressure Process Control:

Pressure sensor.

Computer Control Software for Pressure Process Control. **(#)**

④.5 UCPCN-PH. Set for pH Process Control:

pH sensor. Helix agitator.

Computer Control Software for pH Process Control. **(#)**

④.6 UCPCN-CT. Set for Conductivity and TDS (Total Dissolved Solids) Process Control:

Conductivity and TDS (Total Dissolved Solids) sensor.

Computer Control Software for Conductivity and TDS Process Control.**(#)**

⑤ Cables and Accessories, for normal operation.

⑥ Manuals: This unit is supplied with 8 manuals.

Dimensions(approx.) = UCPCN-UB. Unit: 500 x 1000 x 1000 mm. Weight: 40 Kg.
Control Interface: 490 x 330 x 310 mm. Weight: 10 Kg.

More information in: www.edibon.com/products/catalogues/en/units/processcontrol/fundamentals/UCPCN.pdf

PRACTICAL POSSIBILITIES

Temperature Process Control:
1.- Temperature control loops (Manual).
2.- Temperature control loops (On/Off).
3.- Temperature control loops (Proportional).
4.- Temperature control loops (Proportional + Integral).
5.- Temperature control loops (Proportional + Derivative).
6.- Temperature control loops (Proportional + Derivative + Integral).
7.- Adjustment of the constant of a controller of temperature (Ziegler-Nichols).
8.- Adjustment of the constant of a controller of temperature (Reaction Curves).
9.- Temperature sensor calibration.

Flow Process Control:
10.- Flow control loops (Manual).
11.- Flow control loops (On/Off).
12.- Flow control loops (Proportional).
13.- Flow control loops (Proportional + Integral).
14.- Flow control loops (Proportional + Derivative).
15.- Flow control loops (Proportional + Derivative + Integral).
16.- Adjustment of the flow controller constants (Ziegler-Nichols).
17.- Adjustment of the flow controller constants (Reaction Curves).
18.- Flow sensor calibration.

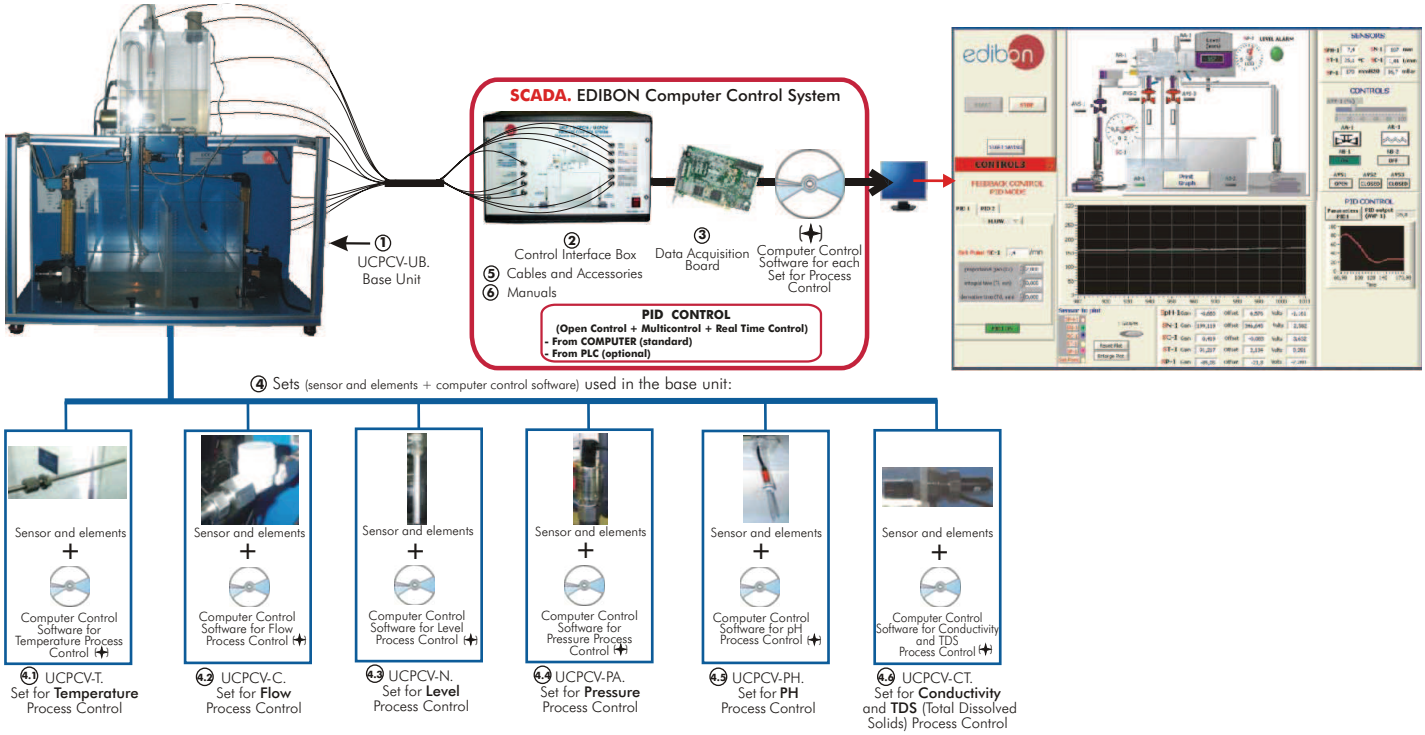
Level Process Control:
19.- Level control loops (Manual).
20.- Level control loops (On/Off).
21.- Level control loops (Proportional).
22.- Level control loops (Proportional + Integral).
23.- Level control loops (Proportional + Derivative).
24.- Level control loops (Proportional + Derivative + Integral).
25.- Adjustment of the constants of a flow controller (Ziegler-Nichols).
26.- Adjustment of the constants of a flow controller (Reaction Curves).
27.- Level sensor calibration.

Pressure Process Control:
28.- Pressure control loops (Manual).
29.- Pressure control loops (On/Off).
30.- Pressure control loops (Proportional).
31.- Pressure control loops (Proportional + Integral).
32.- Pressure control loops (Proportional + Derivative).
33.- Pressure control loops (Proportional + Derivative + Integral).
34.- Adjustment of the constant of a Pressure controller (Ziegler-Nichols).
35.- Adjustment of the constant of a Pressure controller (Reaction Curves).
36.- Pressure sensor calibration.

pH Process Control:
37.- pH control loops (Manual).
38.- pH control loops (On/Off).
39.- pH control loops (Proportional).
40.- pH control loops (Proportional + Integral).
41.- pH control loops (Proportional + Derivative).
42.- pH control loops (Proportional + Derivative + Integral).
43.- Adjustment of the constant of a pH controller (Ziegler-Nichols).
44.- Adjustment of the constant of a pH controller (Reaction Curves).
45.- pH sensor calibration.

Conductivity and TDS (Total Dissolved Solids) Process Control:
46.- Conductivity control loops (Manual).
47.- Conductivity control loops (On/Off).
48.- Conductivity control loops (Proportional).
49.- Conductivity control loops (Proportional + Integral).
50.- Conductivity control loops (Proportional + Derivative).
51.- Conductivity control loops (Proportional + Derivative + Integral).
52.- Adjustment of the constant of a Conductivity controller (Ziegler-Nichols).
53.- Adjustment of the constant of a Conductivity controller (Reaction Curves).
54.- TDS control loops (Manual).
55.- TDS control loops (On/Off).
56.- TDS control loops (Proportional).
57.- TDS control loops (Proportional + Integral).
58.- TDS control loops (Proportional + Derivative).
59.- TDS control loops (Proportional + Derivative + Integral).
60.- Adjustment of the constant of a TDS controller (Ziegler-Nichols).
61.- Adjustment of the constant of a TDS controller (Reaction Curves).
62.- Conductivity and TDS sensor calibration.
63-81.- Practices with PLC.

UCPCV. Computer Controlled **Process Control System, with speed controller :**



SPECIFICATIONS SUMMARY

Common items for all Process Control parameters:

① UCPCV-UB. Unit:

This unit is common for all Sets for Process Control type "UCPCV" and can work with one or several sets.

Anodized aluminium structure. Diagram in the front panel with similar distribution to the elements in the real unit. Main tank and collector with an orifice in the central dividing wall.(2 x 25 dm^3), and drainage in both compartments. Dual process tank (2 x 10 dm^3), interconnected through an orifice and a ball valve and an overflow in the dividing wall; a graduate scale and a threaded drain of adjustable level with bypass. Centrifugal pumps. Variable area flow meters (0.2-2 l/min, and 0.2-10 l/min), and with a manual valve. Line of on/off regulation valves (solenoid), and manual drainage valves of the upper tank. Speed controller (into the Control Interface Box).

② UCPCV/CIB. Control Interface Box :

This is common for all Sets for Process Control type "UCPCV" and can work with one or several sets.

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

③ DAB. Data Acquisition Board:

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

④ Sets (sensor and elements + computer control software) used in the base unit: (These Sets will be supplied and installed in the Base Unit and ready for working)

④.1 UCPCV-T. Set for Temperature Process Control:

Temperature sensor "J type". Electric resistor (0.5 KW). Helix agitator. On/off level switch.

Computer Control Software for Temperature Process Control:

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

④.2 UCPCV-C. Set for Flow Process Control:

Turbine type flow sensor.

Computer Control Software for Flow Process Control. **(#)**

④.3 UCPCV-N. Set for Level Process Control:

0-300mm level sensor (of capacitive immersion, 4-20mA).

Computer Control Software for Level Process Control. **(#)**

④.4 UCPCV-PA. Set for Pressure Process Control:

Pressure sensor.

Computer Control Software for Pressure Process Control. **(#)**

④.5 UCPCV-PH. Set for pH Process Control:

pH sensor. Helix agitator.

Computer Control Software for pH Process Control. **(#)**

④.6 UCPCV-CT. Set for Conductivity and TDS (Total Dissolved Solids) Process Control:

Conductivity and TDS (Total Dissolved Solids) sensor.

Computer Control Software for Conductivity and TDS Process Control.**(#)**

⑤ Cables and Accessories, for normal operation.

⑥ Manuals: This unit is supplied with 8 manuals.

Dimensions(approx.) = UCPCV-UB. Unit: 500 x 1000 x 1000 mm. Weight: 40 Kg.
Control Interface: 490 x 330 x 310 mm. Weight: 12 Kg.

More information in: www.edibon.com/products/catalogues/en/units/processcontrol/fundamentals/UCPCV.pdf

PRACTICAL POSSIBILITIES

Temperature Process Control:
1.- Temperature control loops (Manual).
2.- Temperature control loops (On/Off).
3.- Temperature control loops (Proportional).
4.- Temperature control loops (Proportional + Integral).
5.- Temperature control loops (Proportional + Derivative).
6.- Temperature control loops (Proportional + Derivative +Integral).
7.- Adjustment of the constant of a controller of temperature (Ziegler-Nichols).
8.- Adjustment of the constant of a controller of temperature (Reaction Curves).
9.- Temperature sensor calibration.

Flow Process Control:
10.- Flow control loops (Manual).
11.- Flow control loops (On/Off).
12.- Flow control loops (Proportional).
13.- Flow control loops (Proportional + Integral).
14.- Flow control loops (Proportional + Derivative).
15.- Flow control loops (Proportional + Derivative + Integral).
16.- Adjustment of the flow controller constants (Ziegler-Nichols).
17.- Adjustment of the flow controller constants (Reaction Curves).
18.- Flow sensor calibration.

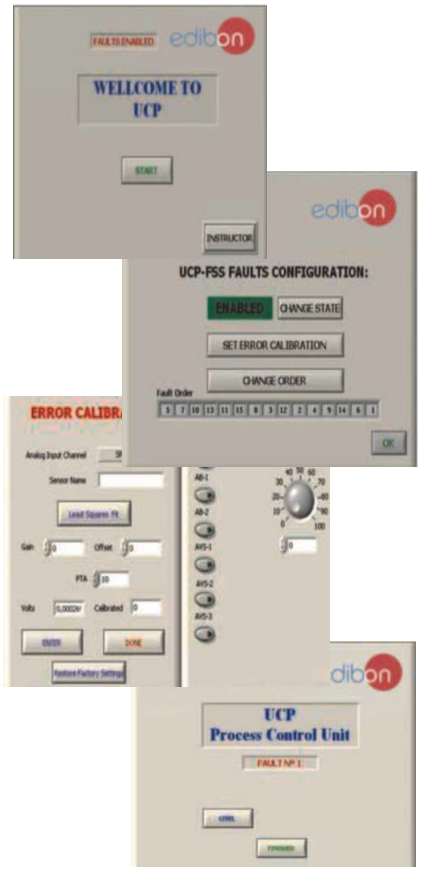
Level Process Control:
19.- Level control loops (Manual).
20.- Level control loops (On/Off).
21.- Level control loops (Proportional).
22.- Level control loops (Proportional + Integral).
23.- Level control loops (Proportional + Derivative).
24.- Level control loops (Proportional + Derivative + Integral).
25.- Adjustment of the constants of a flow controller (Ziegler-Nichols).
26.- Adjustment of the constants of a flow controller (Reaction Curves).
27.- Level sensor calibration.

Pressure Process Control:
28.- Pressure control loops (Manual).
29.- Pressure control loops (On/Off).
30.- Pressure control loops (Proportional).
31.- Pressure control loops (Proportional + Integral).
32.- Pressure control loops (Proportional + Derivative).
33.- Pressure control loops (Proportional + Derivative + Integral).
34.- Adjustment of the constant of a Pressure controller (Ziegler-Nichols).
35.- Adjustment of the constant of a Pressure controller (Reaction Curves).
36.- Pressure sensor calibration.

pH Process Control:
37.- pH control loops (Manual).
38.- pH control loops (On/Off).
39.- pH control loops (Proportional).
40.- pH control loops (Proportional + Integral).
41.- pH control loops (Proportional + Derivative).
42.- pH control loops (Proportional + Derivative + Integral).
43.- Adjustment of the constant of a pH controller (Ziegler-Nichols).
44.- Adjustment of the constant of a pH controller (Reaction Curves).
45.- pH sensor calibration.

Conductivity and TDS (Total Dissolved Solids) Process Control:
46.- Conductivity control loops (Manual).
47.- Conductivity control loops (On/Off).
48.- Conductivity control loops (Proportional).
49.- Conductivity control loops (Proportional + Integral).
50.- Conductivity control loops (Proportional + Derivative).
51.- Conductivity control loops (Proportional + Derivative + Integral).
52.- Adjustment of the constant of a Conductivity controller (Ziegler-Nichols).
53.- Adjustment of the constant of a Conductivity controller (Reaction Curves).
54.- TDS control loops (Manual).
55.- TDS control loops (On/Off).
56.- TDS control loops (Proportional).
57.- TDS control loops (Proportional + Integral).
58.- TDS control loops (Proportional + Derivative).
59.- TDS control loops (Proportional + Derivative + Integral).
60.- Adjustment of the constant of a TDS controller (Ziegler-Nichols).
61.- Adjustment of the constant of a TDS controller (Reaction Curves).
62.- Conductivity and TDS sensor calibration.
63-81.- Practices with PLC.

UCP/FSS. **Faults Simulation System** (Process Control Unit)



SPECIFICATIONS SUMMARY

The "FAULTS" mode consists on causing several faults in the unit normal operation. The student must find them and solve them.
There are several kinds of faults that can be grouped in the following sections:

Faults affecting the sensors measurement:
- An incorrect calibration is applied to them. In this case, the student should proceed to calibrate the affected sensor through the values collection.
- Non-linearity. When we have the measures taken by the sensor, a quadratic or inverse function is applied to them. Thus, the value measured will not be the real one, as in the case above mentioned, but when we calibrate again, the sensor will not operate linearly and we will not be able to calibrate it by lest squares fits.

Faults affecting the actuators:
- Actuators canals interchange at any time during the program execution. This error does not admit any solution.
- Response reduction of an actuator. By the reduction of the output voltage in analog outputs, we can get an response with a fraction of what it should be, either with a manual execution or with any control type (ON/OFF, PID...).

Faults in the controls execution:
- Inversion of the performance in ON/OFF controls. The state of some actuator is inverted, when it should be ON is OFF instead, and vice versa. The student should provide the correct operating logic.
- Reduction or increase of the calculated total response. We multiply by a factor the total response calculated by the PID, causing, thus, the reduction or increase of the action really applied to the actuator, and the consequent instability of the control. The student should notify it and try to calculate this factor.
- The action of some controls is annulled.

More information in: www.edibon.com/products/catalogues/en/units/processcontrol/fundamentals/UCP.pdf

PRACTICAL POSSIBILITIES

Incorrect Calibration:
1.- Load the calibration error of the PH sensor.
2.- Load the calibration error of the Level sensor.
3.- Load the calibration error of the Flow sensor.
4.- Load the calibration error of the Temperature sensor.

Non Linearity:
5.- Non inverse linearity of the pH sensor.
6.- Non quadratic linearity of the Level sensor.
7.- Non quadratic linearity of the Flow sensor.
8.- No inverse linearity of the Temperature sensor.

Interchange of actuators:
9.- Interchange the bombs AB-1 and AB-2 between them during the operations of the controls ON/OFF and PID. (Affected sensor: Level sensor).

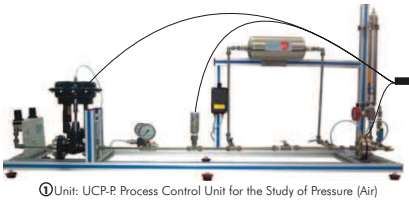
Reduction of an actuator response:
10.- In the PID, the real response of the proportional valve is half the amount calculated by the PID control. Thus, the maximum real opening that will be able to reach is 50%. (Affected sensor: Flow sensor).

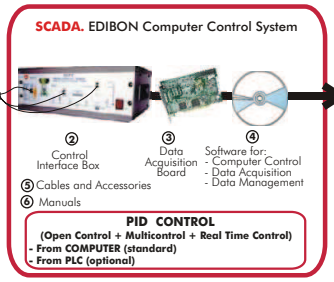
Inversion of the performance in ON/OFF controls:
11.- In the ON/OFF control, the actuation sensor of the AVS-1 is inverted, acting, thus, on the same way as the others 2 valves (for a good control, it should operate the other way around to how the others 2 do it). (Affected sensor: pH).

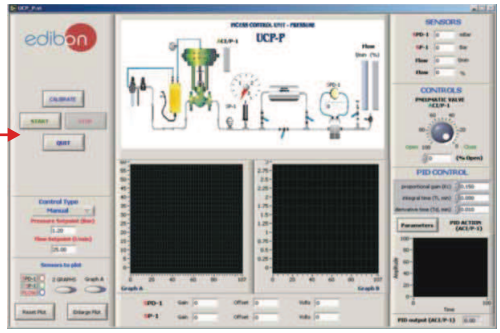
Reduction or increase of the calculated total response:
12.- In the PID, the real action in the resistance is half of the total calculated. (Affected sensor: Temperature sensor).

The action of some controls is annulled:
13.- The Integral control does not work. It is reduced to a PD control (Proportional-Derivative).
14.- The Derivative Control does not work. It is reduced to a PI Control (Proportional-Integral).
15.- The Integral and Derivative controls do not work. They are reduced to a Proportional Control.

UCP-P. Computer Controlled **Process Control Unit for the Study of Pressure (Air)**


①Unit: UCP-P. Process Control Unit for the Study of Pressure (Air)





SPECIFICATIONS SUMMARY

Items supplied as standard

①UCP-P. Unit:
This unit basically consist of the following elements:
Pneumatic circuit consisting of a tank, valves, pressure sensors, pressure regulators and pressure manometers.
For the pressure and flow control, a pneumatically operated control valve, an I/P converter and an absolute pressure sensor and a differential pressure sensor are used.
Anodized aluminium structure and panels in painted steel. Diagram in the front panel with similar distribution to the elements in the real unit.
2 Pressure regulators, one for controlling the pneumatically operated control valve and the second for suppling the necessary flow and/or pressure to the circuit that is to be adjusted.
I/P Converter.
On/off valves. Inlet/outlet valves.
Pneumatically operated control valve.
Storage (air) tank, capacity: 2 l.
Absolute pressure sensor. Differential pressure sensor.
Diaphragm. Flow meter. 3 pressure manometers.

② UCP-P/CIB. Control Interface Box :
With process diagram in the front panel. The unit control elements are permanently computer controlled. Simultaneous visualization in the PC of all parameters involved in the process. Calibration of all sensors involved in the process. Real time curves representation. All the actuators' values can be changed at any time from the keyboard. Shield and filtered signals to avoid external interferences. Real time PID control with flexibility of modifications from the PC keyboard of the PID parameters, at any moment during the process. Open control allowing modifications, at any moment and in real time, of parameters involved in the process. 3 safety levels: mechanical in the unit, other electronic in the control interface, and the third one in the control software.

③ DAB. Data Acquisition Board:
PCI Data acquisition National Instruments board to be placed in a computer slot. 16 Analog inputs. Sampling rate up to: 250 KS/s. 2 Analog outputs. 24 Digital Inputs/Outputs.

④ UCP-P/CCSOF. PID Computer Control+Data Acquisition+Data Management Software:
Flexible, open and multicontrol software. Management, processing, comparison and storage of data. Sampling velocity up to 250,000 data per second. It allows the registration of the alarms state and the graphic representation in real time.

⑤ Cables and Accessories, for normal operation.

⑥ Manuals: This unit is supplied with 8 manuals.

Dimensions (approx.)=Unit: 1000 x 500 x 600 mm. Weight: 20 Kg. Control Interface: 490 x 330 x 175 mm. Weight: 5 Kg.

More information in: www.edibon.com/products/catalogues/en/units/processcontrol/fundamentals/UCP-P.pdf

PRACTICAL POSSIBILITIES

1.- Calculating the fluid flow in function of different pressure sensor.
2.- Calibration processes.
3.- Pressure sensor calibration. Study of the hysteresis curve.
4.- I/P converter calibration.
5.- Identification of the pneumatic valve type.
6.- Determination of the influence of the flow rate of the conduction.
7.- Pressure control in conduction using a PID controller.
8.- Proportional control (P) characteristics.
9.- Characteristics of a proportional and integral control (P+I).
10.- Characteristics of a proportional and derivative control (P+D).
11.- Optimization of the variables of a PID controller.
12.- Optimization of the variables of the PID controller, flow control.
13.- Flow rate control in conduction with a PID controller.
14-32.- Practices with PLC.

CECI. **Industrial Controllers Trainer**

SPECIFICATIONS SUMMARY

Trainer for industrial process controllers. This trainer allows students the study and familiarisation with the function and operation of a industrial process controller.
Configurable digital controller:
2 inputs, 1 output. Configurable as P, PI or PID controller. Proportional gain X_p: 0 -999.9%. Integral action time T_n: 0-3600s. Derivative time T_v: 0-1200s. RS232 interface for configuration on computer (PC).
Digital voltmeter: 0 -20V.
Signal generator with potentiometer. Reference variables generator: 2 voltages selectable. Output voltage: 0-10V.
Controlled system simulator:
Controlled system type: First order lag. Time constant: 20s.
All variables accessible as analog signals at lab jacks .
Possibility of connection of external instruments via lab jacks (for example: line recorder, plotter, oscilloscope...).
Configuration software CD. Interface cable. Set of lab cables.
Manuals: This unit is supplied with 8 manuals.
Dimensions (approx.) = 490 x 330 x 310 mm. Weight: 8 Kg.

More information in: www.edibon.com/products/catalogues/en/units/processcontrol/fundamentals/CECI.pdf

PRACTICAL POSSIBILITIES

To study methods and terminology of process control:
1.- Closed loop control.
2.- Static and dynamic transfer function.
3.- To study the step response.
4.- Reference variable step.
To learn and to familiarise with a process controller:
5.- Configuration level.
6.- Parameter level.
7.- Operation control levels.
Control parameters:
8.- Setting input channels.
9.- Setting output channels.
10.- To use computer (PC)-based configuration tools.
11.- Scaling displays.

CRCI. **Industrial Controllers Networking**

SPECIFICATIONS SUMMARY

This trainer enables to take the first steps in process automation using field buses. This trainer demonstrates the operation of a process control system based on a simple application. This trainer allows student the familiarisation with the function and operation of an industrial process controller.
2 Digital process controllers, with field bus interface:
Configurable as P, PI or PID controller. Proportional gain X_p: 0-999.9%. Integral action time T_n: 0-3600s. Derivative time T_v: 0- 1200s. Controller parameter setting via field bus system.
2 Signal generators: 0-10V. Profibus DP interface card for computer (PC).
Process variables as analog signals: 0-10V. All variables accessible as analog signals at lab jacks.
Software CD with driver software, OPC server and process control software.
Possibility of connection of external instruments via lab jacks (for example: line recorder, oscilloscope, etc). Set of cables.
Manuals: This unit is supplied with 8 manuals.
Dimensions (approx.) = 490 x 330 x 310 mm. Weight: 12 Kg.

More information in: www.edibon.com/products/catalogues/en/units/processcontrol/fundamentals/CRCI.pdf

PRACTICAL POSSIBILITIES

1.- Function of a digital industrial controller.
2.- Layout of a field bus system.
To learn and to familiarise with the operation and structure of a process control system under Profibus DP:
3.- Controller parameter setting via field bus system.
4.- Profibus DP field bus system.
5.- OPC (OLE for Process Control) server function.
6.- Online controller parameters setting.
7.- Master / slave assignment.
8.- To configure and display alarms.
9.- Reading control variables and displaying them online.
10.- Scaling displays.
11.- Bus configuration.

CEAB. **Trainer for Field Bus Applications**

SPECIFICATIONS SUMMARY

This Trainer is used to teach the initial or first steps in field bus tecnology based on Profibus DP. The field bus permits networking terminal devices (controllers, actuators or sensors) in the plant system (field level) with the control room (control level).
Several devices (slaves) are activated and read by a computer (PC) with a Profibus DP interface (master).
Different subjects or topics can be covered and studied: bus topology, system configurator with Device Master File "DMF", communication protocols, tags, OPC server, output and input process data, etc.
Digital process controller, with Profibus DP interface:
Configurable as P, PI or PID controller. Proportional gain X_p:0-999.9%. Derivative time T_v:0-1200s. Integral action time T_n: 0-3600s.
Signal generators: 0-10V. Digital voltmeter: 0-20V.
Digital Profibus DP I module. Digital Profibus DP O module. Four digital inputs. Four digital outputs.
Analog Profibus DP I module. Analog Profibus DP O module. Four analog inputs: 0-10V. Two analog outputs: 0-10V.
Profibus DP interface card for computer (PC).
Process variables as analog signals at lab jacks: 0-10V.
Software CD with driver software, system configurator, OPC server and process control software.
Possibility of connection of external instruments via lab jacks (for example: chart recorder, oscilloscope, etc). Set of cables.
Manuals: This unit is supplied with 8 manuals.
Dimensions (approx.) = 490 x 330 x 310 mm. Weight: 12 Kg.

More information in: www.edibon.com/products/catalogues/en/units/processcontrol/fundamentals/CEAB.pdf

PRACTICAL POSSIBILITIES

1.- Operation and function of a digital industrial controller.
2.- Function of an analog input/outputs module.
3.- Function of a digital input/output module.
4.- Layout of a field bus system.
5.- Familiarisation with the field bus stations.
6.- Defining the bus technology with the stations.
7.- Reading out and in, and online displaying of analog and digital process variables.
8.- Communication protocols.
9.- To define tags.
10.- Familiarisation with the device master file "DMF".
11.- OPC server.
12.- Access to the OPC database from the process control program.

CEAC. **Controller Tuning Trainer**

SPECIFICATIONS SUMMARY

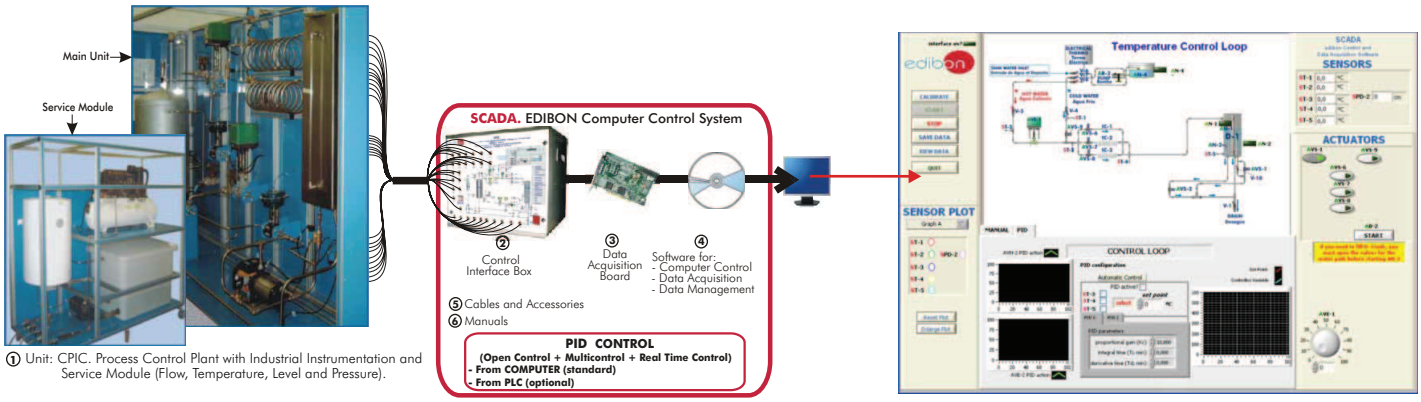
Trainer for controller tuning. This unit permits the interaction between controller and controlled system. The objective is that the closed control loop, formed by the controller and the controlled system, to show the desired optimum response.
With a simulation software the setting of controller parameters can be practised safely. Closed and open loop control, step response, stability, disturbance and control response are demonstrated.
This trainer no needs real controlled systems, the controlled system is simulated on a computer (PC) by the simulation program. In this program the most important types of controlled systems can be selected.
The process controller used can be easily configured from the computer (PC). The controller and the computer (PC) are connected by a data acquisition card with AD and DA converters.
Configurable digital process controller, with interface:
Configurable as P, PI or PID controller. Proportional gain X_p: 0-999.9%. Integral action time T_n: 0-3600s. Derivative time T_v: 0-1200s.
Interface for computer (PC). Data acquisition card for computer (PC).
Simulation Software for controlled system models, such as 1st and 2nd order lags, time-delayed systems etc. Controlled system simulation models with proportional, integral, 1st order lag, 2nd order lag, time-delayed response, non-linearity and limitation.
Configuration software for process controller. Recording and evaluation of time response on computer (PC). Set of cables.
Manuals: This unit is supplied with 8 manuals.
Dimensions (approx.) = 490 x 330 x 310 mm. Weight: 8 Kg.

More information in: www.edibon.com/products/catalogues/en/units/processcontrol/fundamentals/CEAC.pdf

PRACTICAL POSSIBILITIES

1.- To use commonly applied tuning rules, such as Ziegler-Nichols.
2.- To study the difference between open and closed loop control.
3.- Control loop comprising controller and controlled system.
4.- To determine the system parameters.
5.- Closed-loop control system response.
6.- Choice of optimum controller parameters.
7.- Stability, steady state and transient response.
8.- Study and investigation of control and disturbance response.
9.- Study of the stability of the closed control loop.
10.- Learning methods and terminology involved in process control.
11.- To adapt the process controller to different controlled systems.
12.- Use and practices with the simulation software.

CPIC. Computer Controlled **Process Control Plant with Industrial Instrumentation and Service Module** (Flow, Temperature, Level and Pressure)



① Unit: CPIC. Process Control Plant with Industrial Instrumentation and Service Module (Flow, Temperature, Level and Pressure).

SPECIFICATIONS SUMMARY

Items supplied as standard

① CPIC. Unit:

CPIC is a "Computerized Industrial Process Control Plant", that offers, on a reasonable laboratory scale, the different process and elements that are commonly used by any kind the industry. It also shows the complexity that can take place while controlling in processes the same variable.

Metallic structure. Panels and main metallic elements in stainless steel. Diagram in the front panel with similar distribution to the elements in the real unit.

Main Unit contains the following elements:

Two pneumatics valves with C_v: 0.25. Actuator (I/P) from 0.2 to 1.0 bar for electric signal from 4 to 20 mA.
Two electronic valves for electric signal from 4 to 20mA.
Twelve solenoid valves, normally closed.
Two solenoid valves, normally open, placed at the air loop and flow loop.
Three differential pressure sensors.
Five temperature sensors placed along the unit to control the temperature in different lines.
One level sensor (effective length: 300 mm.).
Four level switches.
Water pump: maximum water flow: 106 l./min. and maximum pressure: 7 bar.
Stainless steel water tank: maximum capacity: 100 l.
Stainless steel tank: maximum capacity: 200 l., maximum pressure:16 bar. It has eight takings, but only six are used in this unit. In the upper part, there is a safety valve that opens when the pressure exceeds 4 bar. Two takings are used to measure the water height by the means of a differential pressure sensor. Other differential pressure sensor gives us the inner pressure.

Service Module contains the following elements:

Heater unit: A tank with a maximum capacity of 80 litres and an electrical resistance of 1.2 kW as maximum electrical power, the temperature control is placed in the electrical resistance. It has a safety valve and purge valve. The lower part of the unit has an inlet pipe (cold water) and an outlet pipe (hot water).
Compressor unit: Maximum pressure: 10 bar. This unit has a regulating valve with a manometer to fix the outlet maximum pressure.
Water system: Water tank, capacity: 400 l. Water pump: 2500 l./h. The inlet pipe of the tank has an automatic filling system. Drain valve in the water tank.

② CPIC/CIB. Control Interface Box :

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

③ DAB. Data Acquisition Board:

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

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

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

⑤ Cables and Accessories, for normal operation.

⑥ Manuals: This unit is supplied with 8 manuals.

Dimensions (approx.) =

-Main Unit: 5000 x 1500 x 2500 mm. Weight: 1000 Kg.
-Service Module: 2000 x 1500 x 2000 mm. Weight: 200 Kg.
-Control Interface: 490 x 450 x 470 mm. Weight: 20 Kg.

More information in: www.edibon.com/products/catalogues/en/units/processcontrol/industrial/CPIC.pdf

PRACTICAL POSSIBILITIES

1.- Familiarisation with the different components of the system and their symbolic representation. Identification of components and description of their functions.
2.- The auxiliary systems: air and hot water supply.
3.- Flow sensors calibration.
4.- Temperature sensors calibration.
5.- Level sensor calibration.
6.- I/P converter calibration.
7.- Flow control loop (on/off).
8.- Flow control loop (proportional).
9.- Flow control loop (P+I).
10.- Flow control loop (P+D).
11.- Flow control loop (P+I+D).
12.- Adjust of the flow controller constants (Ziegler-Nichols).
13.- Adjust of the flow controller constants (reaction curves).
14.- Search of simple shortcomings in the loop of flow control.
15.- Temperature control loop (on/off).
16.- Temperature control loop (proportional).
17.- Temperature control loop (P+I).
18.- Temperature control loop (P+D).
19.- Temperature control loop (P+I+D).
20.- Adjust of the temperature controller constants (minimum area or reduction rate).
21.- Adjust of the temperature controller constants (minimum disturbance criterion).
22.- Adjust of the temperature controller constants (minimum width criterion).
23.- Study of the retards for speed/distance, exemplified through the temperature control loop.
24.- Study of the energy lost in the temperature control loop.
25.- Search of simple shortcomings in temperature control loop.
26.- Level control loop (on/off).
27.- Level control loop (proportional).
28.- Level control loop (P+I).
29.- Level control loop (P+D).
30.- Level control loop (P+I+D).
31.- Adjust of the level controller constants (minimum area or reduction rate).
32.- Adjust of the level controller constants (minimum disturbance criterion).
33.- Adjust of the level controller constants (minimum width criterion).
34.- Search of simple shortcomings in level control loop.
35.- Pressure control loop (on/off).
36.- Pressure control loop (proportional).
37.- Pressure control loop (P+I).
38.- Pressure control loop (P+D).
39.- Pressure control loop (P+I+D).
40.- Adjust of the pressure controller constants (minimum area or reduction rate).
41.- Adjust of the pressure controller constants (minimum disturbance criterion).
42.- Adjust of the pressure controller constants (minimum width criterion).
43.- Search of simple shortcomings in the pressure control loop.
44.- The use of the controllers in cascade, exemplified with the level/ flow control loop.
45.- Adjust of cascade control constants (minimum area or reduction rate).
46.- Adjust of cascade control constants (minimum disturbance criterion).
47.- Adjust of cascade control constants (minimum width criterion).
48.- Search of simple shortcomings in cascade control loop.
49.- Practical operation of the control plant to some wanted specific values: transfers without interferences.
50.- Calculation of the fluid flow in function of the differential pressure sensor.
51-69.- Practices with PLC.

Other available Units:

CPIC-C. Computer Controlled **Process Control Plant with Industrial Instrumentation and Service Module** (only Flow)

CPIC-T. Computer Controlled **Process Control Plant with Industrial Instrumentation and Service Module** (only Temperature)

CPIC-N. Computer Controlled **Process Control Plant with Industrial Instrumentation and Service Module** (only Level)

CPIC-P. Computer Controlled **Process Control Plant with Industrial Instrumentation and Service Module** (only Pressure)