

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

① Unit:VPMC. Multipurpose Processing Vessel

Key features:

- **Advanced Real-Time SCADA and PID Control.**
- **Open Control + Multicontrol + Real-Time Control.**
- **Specialized EDIBON Control Software based on Labview.**
- **National Instruments Data Acquisition board (250 KS/s , kilo samples per second).**
- **Calibration exercises, which are included, teach the user how to calibrate a sensor and the importance of checking the accuracy of the sensors before taking measurements.**
- **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 4 safety systems (Mechanical, Electrical, Electronic & Software).**
- **Designed and manufactured under several quality standards.**
- **Optional CAL software helps the user perform calculations and comprehend the results.**
- **This unit has been designed for future expansion and integration. A common expansion is the EDIBON Scada-Net (ESN) System which enables multiple students to simultaneously operate many units in a network.**

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

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For more information about Key Features, click here:



DESCRIPTION

The VPMC unit developed by EDIBON is a type batch equipment, suitable to demonstrate the different mixing processes in the alimentary industry. As it is a multiprocess vessel, several mixing tasks will be able to be carried out. Furthermore, it has a temperature control necessary to make easier the mixing tasks which require it, such as the help to carry out the complex emulsion tasks.

A vital importance stage in the preparation of a food product is the accurate addition and the correct mixing of the different ingredients. It is usual that heat can be required and, later, cooling and chilling to preserve and conserve it. This multi-purpose processing unit can carry out all these actions with small quantities of ingredients.

The VPMC unit has all the necessary to:

- Mix.
- Emulsify.
- Heat.
- Pasteurise.
- Incubate.
- Cool.
- Chill.
- Cure.

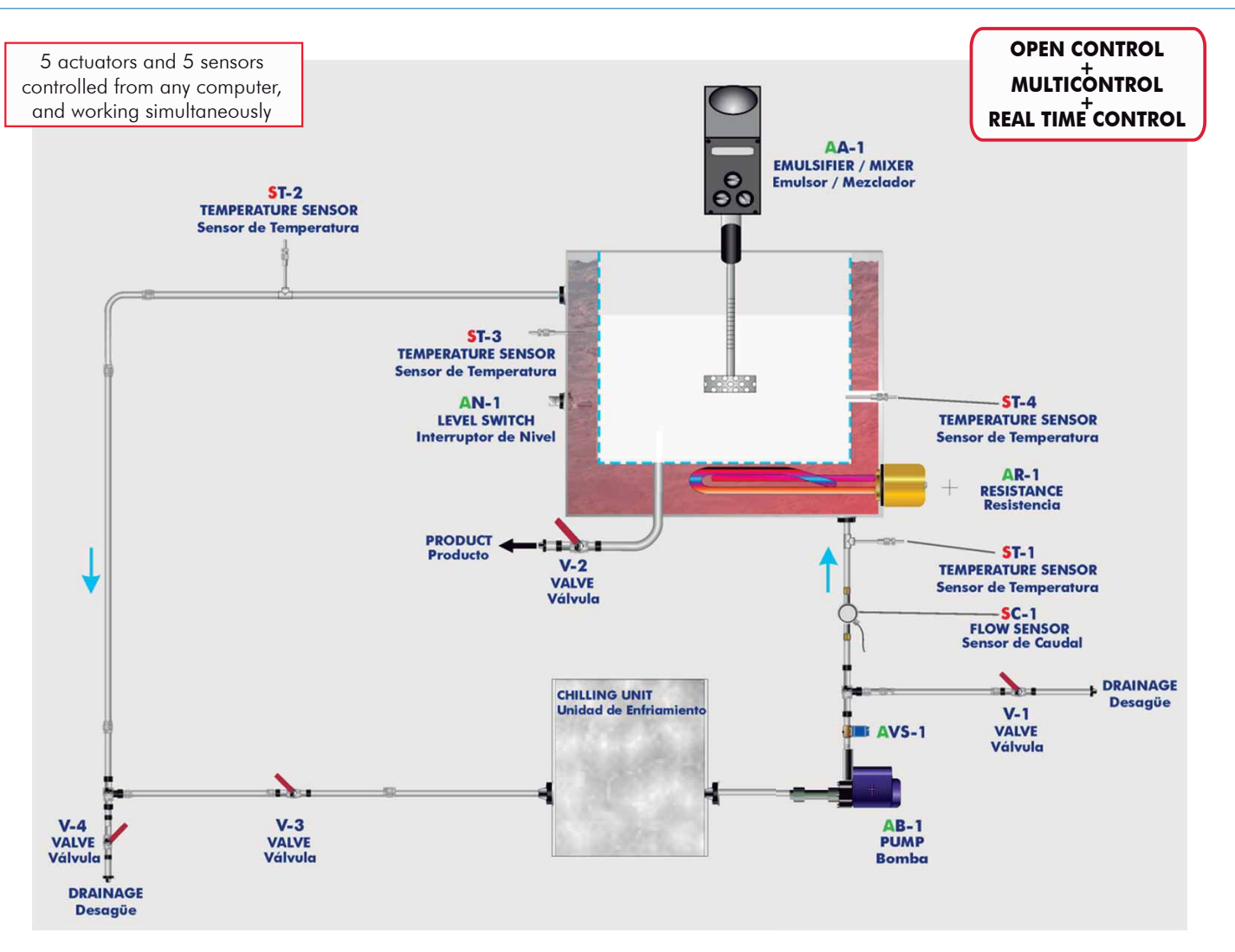
As well as the preparation of food products for further processing, it allows to produce finished products in batch sizes from 5 up to 30 liters maximum.

This unit consists of a cylindrical-shaped jacketed vessel where different tests are carried out. By the exterior of the tank there is a water bath whose temperature is controlled. To heat the vessel content, an electric resistance is mounted into it. When a chilling of the products in the vessel is required, there is a chilling unit which supplies water in a continuous way to the vessel jacket.

The mixing stage is carried out by a high shearing mixer which has a high speed motor and with a emulsifier head adjustable in height. Four different type of heads, suitable for different elaboration processes, are supplied.

This Computer Controlled Unit is supplied with the EDIBON Computer Control System (SCADA), including: Control interface Box + Data Acquisition Board + Computer Control and Data Acquisition Software, for controlling the process and the parameters involved.

PROCESS DIAGRAM AND UNIT ELEMENTS ALLOCATION



Items supplied as standard

① **VPMC. Unit:**

- Anodized aluminium structure and panels in painted steel.
- Main metallic elements in stainless steel.
- Diagram in the front panel with similar distribution to the elements in the real unit.
- Stainless steel jacketed process vessel, capacity: 30 litres.
- Batch sizes: from 5 up to 30 litres (depending on the mixture being processed).
- Maximum vessel contents temperature: 85° C.
- Minimum vessel contents temperature: 1° C.
- Heating resistance, computer controlled, of 3000 W.
- Emulsifier/Mixer unit of high speed with DC motor (250 W). This emulsifier is Computer controlled. Speed range: 0-8000 rpm.
- Emulsifier head adjustable in height.
- 4 Different emulsifier heads are supplied:
 - General purpose.
 - Disintegrating and emulsifying.
 - High shear.
 - Axial flow.
- Chilled water circulation system: chilling unit with 500 W compressor motor and water recirculating centrifugal pump, computer controlled.
- Surfaces which may come into contact with the process fluid are constructed from food grade materials.
- PID control of the temperature of the product into the process vessel.
- 4 Temperature sensors "K" type, range up to 600° C, to measure:
 - Products temperature in the vessel.
 - Temperatures for controlling the water temperature.
- Flow rate of cold or chilled water is controlled. Flow sensor: 0 -6 l./min.
- Level switch in the process vessel to protect the heating resistance.
- The unit incorporates wheels for its mobility.



VPMC. Unit

② **VPMC/CIB. Control Interface Box:**

- Control interface box with process diagram in the front panel and with the same distribution that the different elements located in the unit, for an easy understanding by the student.
- All sensors, with their respective signals, are properly manipulated from -10V. to +10V. computer output.
- Sensors connectors in the interface have different pines numbers (from 2 to 16), to avoid connection errors.
- Single cable between the control interface box and computer.
- The unit control elements are permanently computer controlled, without necessity of changes or connections during the whole process test procedure.
- Simultaneous visualization in the computer of all parameters involved in the process.
- Calibration of all sensors involved in the process.
- Real time curves representation about system responses.
- Storage of all the process data and results in a file.
- Graphic representation, in real time, of all the process/system responses.
- All the actuators' values can be changed at any time from the keyboard allowing the analysis about curves and responses of the whole process.
- All actuators and sensors values and their responses are displayed on only one screen in the computer.
- Shield and filtered signals to avoid external interferences.
- Real time PID control with flexibility of modifications from the computer keyboard of the PID parameters, at any moment during the process.
- Real time PID and on/off control for pumps, compressors, resistances, control valves, etc.
- Real time PID control for parameters involved in the process simultaneously.
- Proportional control, integral control and derivative control, based on the real PID mathematical formula, by changing the values, at any time, of the three control constants (proportional, integral and derivative constants).
- Open control allowing modifications, at any moment and in real time, of parameters involved in the process simultaneously.
- Possibility of automatization of the actuators involved in the process.
- Three safety levels, one mechanical in the unit, other electronic in the control interface and the third one in the control software.



VPMC/CIB

Items supplied as standard (continuation)

③ DAB. Data Acquisition Board:

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

Analog input:

- Number of **Channels= 16** single-ended or 8 differential.
- Resolution= 16 bits**, 1 in 65536.
- Sampling rate up to: 250 KS/s (Kilo samples per second).**
- Input range (V)= ± 10 V.
- Data transfers=DMA, interrupts, programmed I/O.
- Number of DMA channels=6.

Analog output:

- Number of **Channels=2**.
- Resolution= 16 bits**, 1 in 65536.
- Maximum output rate up to: 833 KS/s.
- Output range (V)= ± 10 V.
- Data transfers=DMA, interrupts, programmed I/O.

Digital Input/Output:

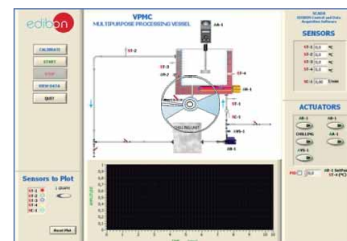
- Number of **channels=24 inputs/outputs**.
- DO or DI Sample Clock frequency: 0 to 1 MHz.
- Timing: **Counter/timers=2**.
- Resolution: Counter/timers: 32 bits.



DAB

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

- Compatible with actual Windows operating systems.
- Graphic and intuitive simulation of the process in screen.
- Compatible with the industry standards.**
- Registration and visualization of all process variables in an automatic and simultaneous way.
- Flexible, open and multicontrol software**, developed with actual windows graphic systems, acting simultaneously on all process parameters.
- Analog and digital PID control. Menu for PID and set point selection required in the whole work range.
- Management, processing, comparison and storage of data.**
- Sampling velocity up to 250,000 data per second.**
- Calibration system for the sensors involved in the process.**
- It allows the registration of the alarms state and the graphic representation in real time.**
- Comparative analysis of the obtained data, after the process and modification of the conditions during the process.
- Open software, allowing to the teacher to modify texts, instructions. Teacher's and student's passwords** to facilitate the teacher's control on the student, and allowing the access to different work levels.
- This unit allows the 30 students of the classroom to visualize simultaneously all results and manipulation of the unit, during the process, by using a projector or an electronic whiteboard.**



VPMC/CCSOF

⑤ Cables and Accessories, for normal operation.

⑥ Manuals:

This unit is **supplied with 8 manuals**: Required Services, Assembly and Installation, Interface and Control Software, Starting-up, Safety, Maintenance, Calibration & Practices Manuals.

*** References 1 to 6: VPMC + VPMC/CIB + DAB + VPMC/CCSOF + Cables and Accessories + Manuals are included in the minimum supply, enabling a normal operation.**

Additional and optional items to the standard supply

PLC. Industrial Control using PLC (7 and 8):

⑦ PLC-PI. PLC Module:

Circuit diagram in the front panel.

Front panel:

Digital inputs(X) and Digital outputs (Y) block:

16 Digital inputs, activated by switches and 16 LEDs for confirmation (red).

14 Digital outputs (through SCSI connector) with 14 LEDs for message (green).

Analog inputs block:

16 Analog inputs (-10V. to + 10V.)(through SCSI connector).

Analog outputs block:

4 Analog outputs (-10V. to + 10V.)(through SCSI connector).

Touch screen:

High visibility and multiple functions.

Display of a highly visible status.

Recipe function.

Bar graph function.

Flow display function.

Alarm list.

Multi language function.

True type fonts.

Back panel:

Power supply connector.

Fuse 2A.

RS-232 connector to PC.

USB 2.0 connector to PC.

Inside:

Power supply outputs: 24 Vdc, 12 Vdc, -12 Vdc, 12 Vdc variable.

Panasonic PLC:

High-speed scan of 0.32 μsec. for a basic instruction.

Program capacity of 32 Ksteps, with a sufficient comment area.

Power supply input (100 to 240 V AC).

DC input: 16 (24 V DC).

Relay output: 14.

High-speed counter.

Multi-point PID control.

Digital inputs/outputs and analog inputs/outputs Panasonic modules.

Communication RS232 wire, to computer (PC).

⑧ VPMC/PLC-SOF. PLC Control Software:

For this particular unit, always included with PLC supply.



PLC-PI

Items available on request

⑨ VPMC/CAL. Computer Aided Learning Software (Results Calculation and Analysis).

⑩ VPMC/FSS. Faults Simulation System.

Software Main Screens

Main screen

The main screen displays the VPMC (Multipurpose Processing Vessel) control interface. It includes a process diagram with components like AA-1 (Mixer), ST-1 to ST-4 (Temperature sensors), SC-1 (Flow sensor), AR-1 (Heating resistance), AVS-1 (Solenoid valve), and AB-1 (Pump). A 'CHILLING UNIT' is also shown. On the left, there are control buttons: CALIBRATE, START, STOP, VIEW DATA, and QUIT. Below these are 'Sensors to Plot' options for ST-1, ST-2, ST-3, ST-4, and SC-1. A plot area shows 'AMPLITUDE' vs 'TIME (secs)'. On the right, 'SENSORS' and 'ACTUATORS' panels show real-time values and control status for various components. A PID control section is also visible.

Note: ST=Temperature sensor. SC=Flow sensor. AR=Heating resistance. AB=Pump. AA=Mixer. AVS=Solenoid valve. Chilling=Chilling device.
 - PID control over the product temperature in the vessel.

Examples of Sensors Calibration screens

The CALIBRATION screen shows settings for an analog input channel (ST-8) with fields for Sensor Name, Calibration units (°C), Full Scale (150), Gain (95,4198), and Offset (1,67443). It includes a Least Squares Fit button and a PTA (Process Time Adjustment) of 10. The MULTICALIBRATE screen displays a table of sensor calibration data:

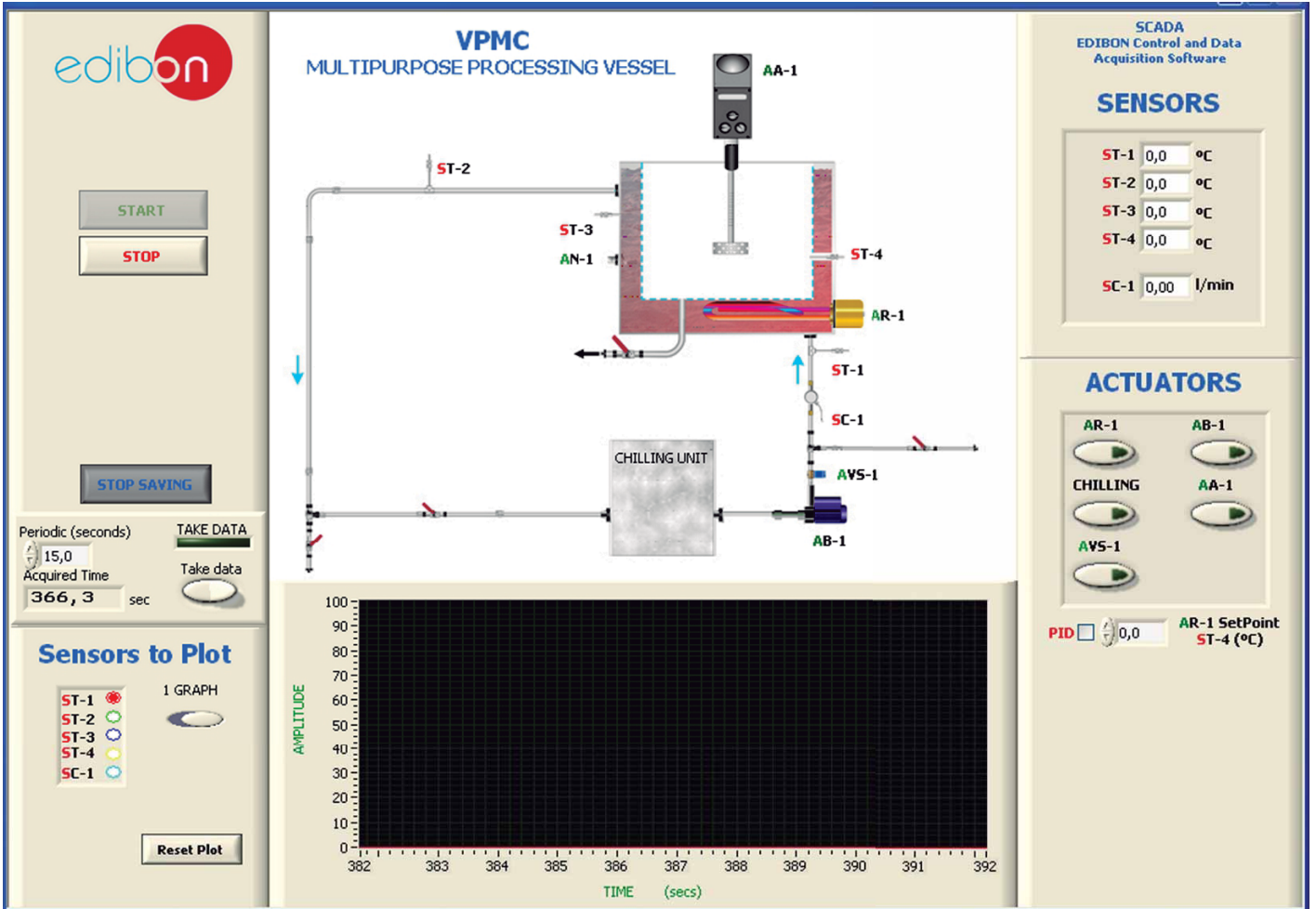
Reference Select	Sensors	Volts	Calibrated	Err (%)
<input checked="" type="checkbox"/>	ST-1	0,2046	22,3821	0,82
<input checked="" type="checkbox"/>	ST-2	0,2292	23,483	0,28
<input checked="" type="checkbox"/>	ST-3	0,2353	23,1522	0,05
<input checked="" type="checkbox"/>	ST-4	0,2301	23,2113	0,01
<input type="checkbox"/>	ST-1	0,1527	13,1629	10,04
<input type="checkbox"/>	SCC-1	-5,2792	172,5164	149,31
<input type="checkbox"/>	SCC-1	-0,2362	-22,6609	45,87
<input type="checkbox"/>	SC-1	-0,1774	0,0319629	23,17
<input type="checkbox"/>		-0,2681	-60,4623	83,67
<input type="checkbox"/>		-0,2251	0,4208	22,78
<input type="checkbox"/>		-0,2529	-0,2529	23,46
<input type="checkbox"/>		-0,2063	-0,1178	23,32
<input type="checkbox"/>		-0,2581	-226,9384	250,14
<input type="checkbox"/>		-0,3634	-0,3634	23,57
<input type="checkbox"/>		-0,275	-0,275	23,48
<input type="checkbox"/>		-0,2005	-0,2005	23,41

The MULTICALIBRATE screen also features a table for GAIN, OFFSET, and p values for various sensors and actuators.

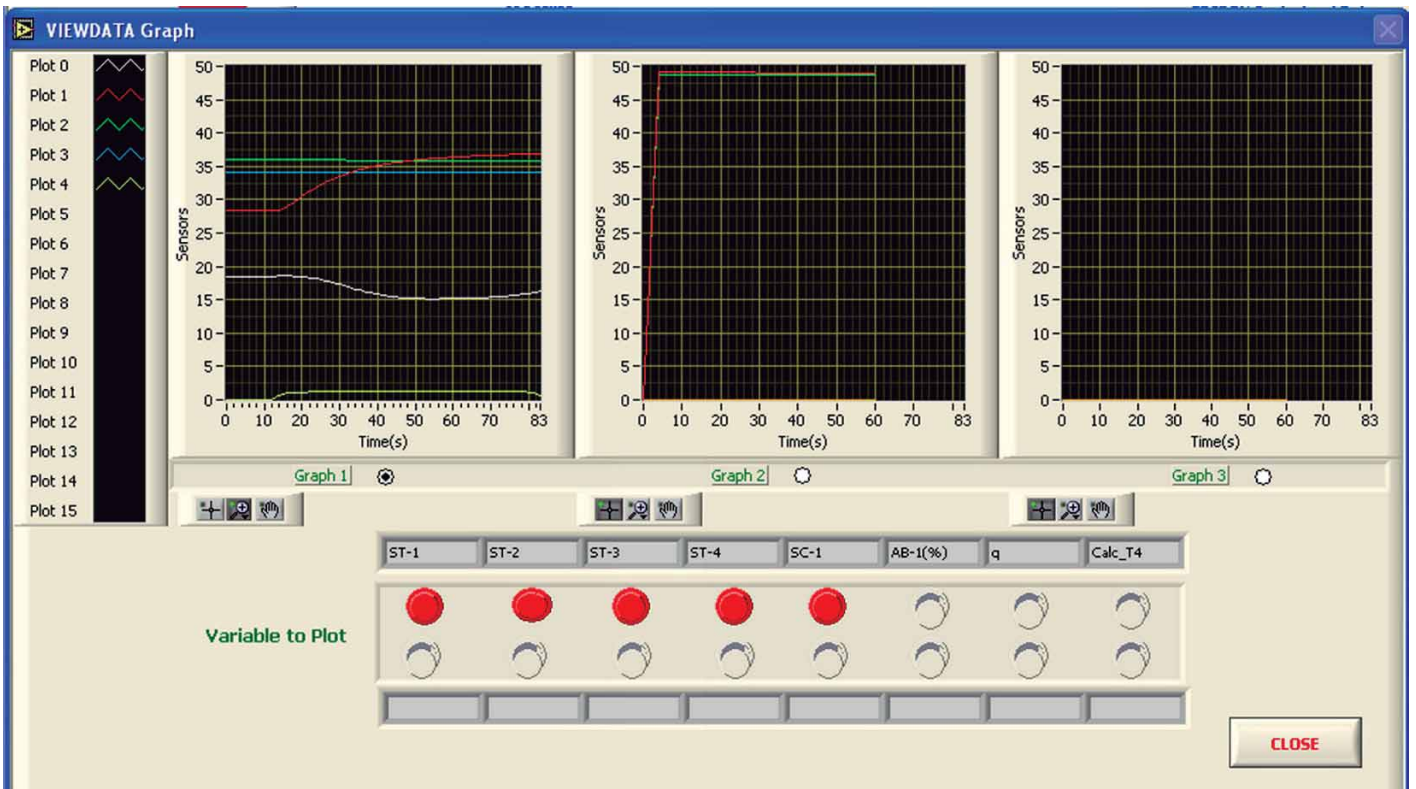
Continue...

Some typical exercises results

Example of control and data acquisition, in real time, by selecting the sampling rate.



Graphic representation, in real time, of the different parameters.



REQUIRED SERVICES

- Electrical supply: three-phase, 380V./50Hz or 220V./60Hz.
- Water supply and drainage.
- Computer (PC).

DIMENSIONS & WEIGHTS

- | | |
|------------------------|---|
| VPMC Unit: | -Dimensions: 800 x 800 x 1250 mm. approx.
-Weight: 150 Kg. approx. |
| Control Interface Box: | -Dimensions: 490 x 330 x 310 mm. approx.
-Weight: 10 Kg. approx. |
| PLC Module (PLC-PI): | -Dimensions: 490 x 330 x 310 mm. approx.
-Weight: 30 Kg. approx. |

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



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