AUPRO
Continuous Process Control

exxer Skills for the Future

THE UNION OF EXPERTISE AND SKILLS A NEW LEVEL OF EXCELLENCE IN EDUCATION!

EXXER was born from the merger of two companies passionate **about technology, innovation, and education.**

With the purpose of offering more and more excellence tools to assist in technological education, we believe the union of practical and theoretical learning is what makes the difference in accelerating human and world develop–ment!

TECHNOLOGY ● **INNOVATION** ● **EDUCATION**

AUPRO
Continuous Process Control

⚙ **Control systems are divided into two main areas: continuous process control and discrete process control. Continuous processes has predominance of analog information from sensors and actuators and are present in important industries such as oil and gas, petrochemi–cals, pharmaceutics, sanitation, food and beverages, sugar and alcohol, among others. The AUPRO series is designed to create experiences that allow developing continuous process control skills, applying the most diverse control methods in practice.**

Continuous process plants are complete equipment, consisting of the process itself (with tank, piping, valves and pumps), sensors and instruments for monitoring process variables, and controllers capable of handling these signals and implementing the control strategies to be studied.

The AUPRO series equipment was developed for a multi–disciplinary and practical approach to the topics addres–sed, allowing the experience of problem situations found in the industry.

Equipped with modern PLCs that allow the implemen–tation of PID controls and other more modern ones, the plants also have SCADA software licenses for exploring the topics of control systems supervision.

The development tools with included licenses are professional and their use is facilitated by learning material and tutorials.

Software and applications complement the learning solution, ensuring greater effectiveness through more dynamic and modern learning.

All kits in this series have a comprehensive cour–seware, focused on teaching by skills and easy to use by instructors.

We have complete solutions for training and updating teachers, ensuring the best use of the kit's resources.

Ask our experts for more information and the detailed technical features of each equipment in the series.

MAIN SKILLS AND COMPETENCIE

– Understand P&ID diagrams and identify their elements;

– Configure and use analog variable sensors and instruments (level, flow, temperature and pressure);

– Control flow through electric and pneumatic valves;

– Control flow through inverters and motor pumps;

– Read and process analog variables in PLCs;

– Implement on–off control loops;

– Implement on–off control loops with hysteresis;

– Collect data and define 1st and 2nd order processes;

– Implement and tune P, PI and PID control loops;

– Implement and tune level, flow, temperature and pressure loops;

– Implement and tune cascade loops;

– Create supervisors for control systems.

PROJECTS

– Kits perfect for project–based learning, as they present real and increasingly complex challenges;

– PLC programming using the continuous process plant simulator for level, flow, temperature and pressure variables.

TECHNOLOGY HIGHLIGHTS

The sensors and instruments used are industrial ones, allowing the student to become familiar and learn to use equipment they will certainly find in the field.

The control of inverters through networks and the use of PLCs that support MQTT protocol allow Industrial IoT practices and connectivity with cloud systems.

Siemens is one of the most well–known and used brands in the world, presenting a development platform for all its Automation solutions, the TIA Portal.

Altus is a Brazilian automation company that operates in important markets such as oil and sanitation.

The included supervisory licenses allow to explore the development of SCADA systems that are typically created for supervisory control systems.

Through the simulator (digital twin) it is possible to carry out control practices and tuning of control loops. The simulator can be controlled both by physical and simulated PLCs, or even through MATLAB or Labview. In addition, the simulator displays only the devices relevant to each control loop, facilitating the understanding of the process and the P&ID

PRODUCT

KEY BENEFIT

- – Industrial devices
- – Full system
- – Multidisciplinary

KEY DIFFERENTIALS

- – Safety
- – Simulator
- – Augmented Reality
- – Courseware

The usability and learning process of each student are extremely impor–tant, so we developed learning solutions to provide benefits and differentials for users.

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⚙ DEVICE SETTINGS

PRODUCT	DESCRIPTION	OPTIONS	DEVELOPMENT TOOLS	APPLICATIONS
AUPRO2000–Lxx–001 AUPRO2000–Lxx–002	Planta de control NVPT (Nivel, caudal, presión y temperatura)	Siemens Altus	TIA Portal + WinCC Mastetools + Blueplant	Gemelo digital Exxer App
AUPRO3000–Lxx–001 AUPRO3000–Lxx–002 AUPRO3000–Lxx–003	Planta de Instrumentación y control de procesos	Siemens, 4 a 20mA Altus, 4 a 20mA Siemens, Hart Siemens, Profibus PA	TIA Portal + WinCC Mastetools + Blueplant TIA Portal + WinCC TIA Portal + WinCC	Gemelo digital Exxer App

* AUPRO2000 uses conventional sensors while AUPRO3000 uses field instruments.

⚙ FEATURES

With modular configuration, Safety with NR–12, development software included, protection of main components and courseware included.

AUPRO2000

NVPT control plant
(Level, flow, pressure and temperature

Settings

– Steel structure with electrostatic coating and aluminum;
– Integrated command panel;
– Mobile structure, equipped with wheels and locks.

DIMENSIONS	
Height	900mm
Width	1700mm
Profundidad	400mm
Weight	100Kg

ELECTRICAL FEATURES	
Energy	Monofásico 220Vav – 50/60Hz
Compressed air	There's no need

⚙ FEATURES

With modular configuration, Safety with NR–12, development software included, protection of main components and courseware included.

AUPRO3000

Instrumentation and process control plant

Settings

– Steel structure with electrostatic coating and aluminum;
– Integrated command panel;
– Mobile structure, equipped with wheels and locks;
– Industrial instruments.

DIMENSIONS	
Height	1600mm
Width	2000mm
Profundidad	690mm
Weight	330Kg

ELECTRICAL FEATURES	
Energy	Monofásico 220Vav – 50/60Hz
Compressed air	min pressure from 6 BAR

Continuous Processes
v01_mar/2023

MAIN DEVICE

The different models are equipped with the devices below, according to each configuration (part number):

	Siemens S7–1200 CPU 1215	Altus Nexto Xpress CPU XP340
Interfaces	2 puertas Ethernet RJ45	1 puerta Ethernet RJ45 1 puerta USB 2.0 host 1 puerta serial RS–485 1 puerta CAN
Redes industriais	PROFINET IOγ CBA, MODBUS/TCP ISO on TCP;	PROFINET, MODBUS/TCP,EtherCAT EtherNet/IP,Modbus/RTU (mestre e escravo) γ CANOpen;
Protolocos Internet	TCP/ IP, SNMP, DCP, LLDP, UDP WEB Server ;	TCP/ IP,DHCP, SNMP, DCP, LLDP UDP, WEB Server
IoT	OPC–UA Server γ MQTT.	OPC–UA Server γ MQTT
Entradas Digitais	14 (24 VCC) 6 siendo cuenta rapida	16 (24 V CC) 4 siendo cuenta rapida
Salidas Digitais	10 (24 V CC, transistor) 4 salidas rápidas (PWM)	10 (24 V CC, transistor) 4 salidas rápidas (PWM)
Entradas Analógicas	2 (0..10Vcc)	5 (0..10Vcc / 4..20mA) 2 RTD
Salidas Analógicas	2 (0..10Vcc / 4..20mA)	4 (0..10Vcc / 4..20mA)
Lenguaje de Programación	LD – Diagrama de escalera, FBD – Diagrama de bloques de funciones ST – Texto estructurado	LD – Diagrama de escalera, FBD – Diagrama de bloques de funciones ST – Texto estructurado IL – Lista de instrucciones SFC – Secuenciación gráfica de funciones

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DEVELOPMENT TOOLS

Our learning solutions are complemented with the development tools and professional software necessary for student training.

For Siemens controllers

Included licenses

TIA Portal:
– Development and simulation tool for PLC programming;
– Platform: Windows;
– Licensing: 1 license per kit

Included licenses

WinCC Basic:
– Development tool for HMI;
– Platform: Windows;
– Licensing: 1 license per kit.

Supervisory System

Blue Plant Academic Edition
– Engineering licenses and supervisory software run–time (SCADA);
  ▪ Platform: Windows
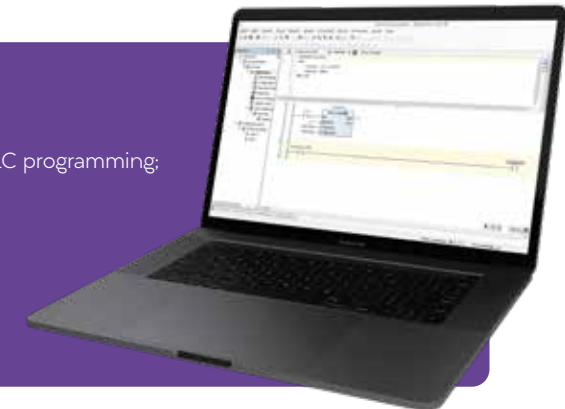 ▪ Licensing: 50 academic licenses per kit.

For Altus controllers

Free licenses

MasterTools:
– Development and simulation tool for PLC programming;
  ▪ Platform: Windows;
  ▪ Licensing: freeware (free delivery).

Free licenses

FVDesing:
– Development tool for HMI;
  ▪ Platform: Windows;
  ▪ Licensing: freeware (free delivery).

USE

Guidelines on the recommended use of the Kit!

We suggest this configuration for better use in class. Kits and activities are designed according to the team sizes listed on the side.

The minimum necessary infrastructure is a prerequisite to fully use all functionalities of the training kits.

We recommend the computing and connectivity requirements below for using the software and applications provided with the kit.

INDUSTRIAL LABORATORY

Partnumber	Description	Team(student/kit)	Use
AUPRO2000	planta de control NVPT (Nivel, caudal, presión y temperatura)	3 a 4	Eventual 1 kit para 3 equipes
AUPRO3000	Plano de Instrumentación y control de procesos	3 a 4	Eventual 1 kit para 3 equipes

Infrastructure		
	AUPRO2000	AUPRO3000
Elétrica	1 enchufe monofásico para cada kit	1 enchufe monofásico para cada kit
Pneumática	–	1 punto por kit, Presión min. de 6 BAR, caudal min. en 30 l/min
Hidráulica	1 punto de agua 1 punto de agotamiento	1 punto de agua 1 punto de agotamiento

Connectivity	
Conexiones Ethernet por temporada trabajar	1 porta Ethernet para o kit
Rede WiFi	–
Acceso a Internet	Recomendado
Computadora	Necesario; de acuerdo con los requisitos mínimos de software
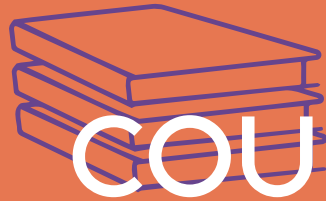
COURSEWARE

The training kits have a rich courseware with a pratical focus, containing pratical proposals aimed at training skills and competencies.

In addition to the **User Manual,** wich contains information on operation and maintenance, the **Student Guide** is also provided, with proposals for pratical activities to be carried out using the kit, and the **Facilitator Guide,** with answers to the proposed activities and guidelines to use the kit in a didactic way. In addition, **Video tutorials** are available to help you easily master the development tools and use the kit.

All of this content is available on our website at the **Facilitator Portal.**

SKILLS AND COMPETENCIE

Continuous processes and instruments
– Understand P&ID diagrams and identify their elements;
– Know level, flow, temperature and pressure sensor technologies;
– Configure and use sensors and instruments with analog variables (level, flow, temperature and pressure);
– Control flow through electric and pneumatic valves;
– Control flow through inverters and motor pumps.

Programmable logic controllers in continuous processes
– Understand the internal structure of a PLC;
– Use different programming languages;
– Know how to use different variables;
– Read and process analog variables in PLCs.

Basic control methods
– Implement on–off control loops;
– Implement on–off control loops with hysteresis.

SKILLS AND COMPETENCIE

PID-based control methods

– Collect data and define 1st and 2nd order processes;
– Implement and tune P, PI and PID control loops;
– Implement and tune level, flow, temperature and pressure loops;
– Implement and tune cascade loops;
– Create supervisory systems for control systems.

Supervisory

– Create supervisory screens;
– Work with analog and digital variables;
– Integrate supervisory systems to PLCs

MOBILE APPLICATIONS

A current learning solution is not complete without software and applications. Along with the kits of this series, exclusive licenses are provided for applications on computer and mobile devices that complement and enhance the use of the kits.

Exxer App

AUGMENTED REALITY KITS
The solutions can be visualized in 3D through augmented reality, allowing the student to have a first contact with such technology and identify their main characteristics.

Exxer App

DATA ACQUISITION AND CONTROL
Communication between the Exxer App and the kit's data acquisition and control boards allows for measurements and interaction across the apps.

DESKTOP APPLICATION

A current learning solution is not complete without software and applications. Along with the kits of this series, exclusive licenses are provided for applications on computer and mobile devices that complement and enhance the use of the kits.

CONTINUOUS PROCESS PLANT SIMULATOR

– Continuous process plant simulator
– Digital twin of the AUPRO3000 plant that allows the simulation of level, flow, pressure and temperature control loops.
– Emulating a modbus device (virtual), it can be controlled by both physical and simulated PLCs, or any software that supports Modbus (Matlab, Scilab, Labvirew, etc.).
– Allows working with manual valves and viewing the variables on the instrument indicators.
– By selecting the control loop, it is possible to view only the devices and pipes that are part of this loop, leaving the others invisible.
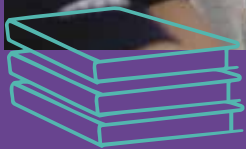
TRAINING

As important as teaching resources and tools is teacher training. We have a complete package of solutions for your training and upgrading needs.

Quick Start and Tutorials

Quick start is a quick video guide to learn, test and put the product into operation. Tutorials are videos that teach common procedures needed in classes using the kit.

Technical Delivery

In the technical delivery, our experts present the product, its features, as well as maintenance and safety precautions, and put it into operation together with the customers.

Operational Training

The purpose of operational training is to teach facilitators on how to use the kit. The kit courseware is presented and some proposed practices are carried out. It also includes all technical delivery activities.

Technological Training

Technological training is a deeper learning of technology and applied concepts. These courses are not focused on kits but on topics and technical skills to update trainers.

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Skills for
the Future

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