



**MECAN**  
Mechanics



**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 excellent 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 development!**




TECHNOLOGY ● INNOVATION ● EDUCATION



# MECAN


## Mechanics

 Mechanics is the area of physics that studies the movements of macroscopic bodies, the forces applied to objects resulting in displacements, and changes in position with respect to the environment. This field of study is divided into three areas: classical mechanics, which studies everyday movements; relativistic mechanics, which analyzes bodies with speeds close to the speed of light; and quantum mechanics, which is dedicated to studying movements within the atom.


The MECAN series was developed to meet the training needs in this important area of study. The models in the series allow the study of applications in thermodynamics, assembly of machine elements, vibrations, and even pumping systems.

The MECAN series offers kits that allow the exploration of this technology in a practical and safe manner, promoting broad education with tangible results.

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

 All kits in this series come with comprehensive educational materials, focused on competency-based teaching and easy utilization by educators.

We provide complete solutions for the training and updating of educators, ensuring the maximum use of the kit's resources.

 Consult our experts for more information and detailed technical specifications of each equipment in the series.



# MAIN SKILLS AND COMPETENCIES

## PUMP ASSOCIATION TEST BENCH

- Analyze and evaluate specific curves of centrifugal pumps;
- Analyze and understand pumping systems in series and in parallel;
- Understand the cavitation effect;
- Understand and apply PID control on pressure and flow variables;

## VIBRATION ANALYSIS

- Perform shaft alignments with a dial indicator;
- Understand and analyze the various types of vibrations that can occur in the system;
- Understand and be familiar with coupling systems and flexible transmission elements;

## MACHINE ELEMENTS

- Understand the types of transmissions based on the types of gears used (cylindrical, conical);
- Calculate transmission ratios;
- Assemble and compare different couplings;

## THERMODYNAMIC ANALYSIS

- Understand the differences between real and ideal refrigeration processes;
- Analyze temperature, pressure, and flow variables in a refrigeration system;
- Conduct thermodynamic process analysis through graphs;



## TECHNOLOGICAL HIGHLIGHTS


The pump association stations are equipped with flow and pressure transducers at each relevant point in the circuit, allowing a detailed analysis of behavior and efficiency under different operating conditions. It includes a tablet with LabView application that allows the modification of operation parameters, as well as the visualization of graphics related to pump curves and the system.

The thermodynamics stations feature controllers, already equipped with programming licenses, and a pre-recorded program for application tests. It includes a tablet with supervisory system for analysis through graphics.

The machine elements stations are composed of high-quality, non-oxidizing mechanical components. They have a robust structure with a unique design. Tools for assembly and disassembly are included, as well as an organizer box with components for assembly.

The vibration stations are equipped with electric motors, controlled by a frequency inverter stored in a protected electrical panel and controlled according to safety standards. They are equipped with sensors, meters, and a comparator clock to aid in the analysis and assembly of practices.



 Considering the usability and learning process of each student, educational solutions have been developed and designed with benefits and distinctive features for users.

## MAIN BENEFITS

- Protected components;
- Industrial-grade and quality devices;
- Complete system with functional software and programs;
- Flexible assembly of components;
- Tools for assembly and disassembly;

## KEY DISTINCTIVE FEATURES

- Safety/Safety;
- No tools required;
- Educational material;

## DEVICE SETTINGS

PARTNUMBER	DESCRIPTION	POWER SUPPLY
MECAN2000-L21-001	Thermodynamic Analysis Bench	Single-phase/Two-phase 220V 50/60Hz
MECAN3000-L31-001 MECAN3000-L41-001	Pump Association Bench	Three-phase 220V 50/60Hz Three-phase 380V 50/60Hz
MECAN4000-L-001	Machine Elements Bench	–
MECAN5000-L21-001	Vibration Analysis Lite Bench	Single-phase/Two-phase 220V 50/60Hz
MECAN5000-L21-002	Full Vibration Analysis Bench	Single-phase/Two-phase 220V 50/60Hz



## FEATURES

With safety according to NR-12, it includes development software, protection of main components, and educational material.

## MECAN2000

Thermodynamic Analysis Bench



## Configurations

- Carbon steel structure with electrostatic paint;
- Lockable wheels;
- Process tanks with pipes and devices such as valves;
- Homogenization system;
- Compliance with safety standards;
- Data acquisition system;

### DIMENSIONS

Height	1400mm
Width	1400mm
Depth	690mm
Weight	250Kg

### ELECTRICAL CHARACTERISTICS

Power supply	220 VAC 50/60 Hz
Protection	Against short circuits, overloads, and electrical shocks



## FEATURES

With safety according to NR-12, it includes development software, protection of main components, and educational material.

## MECAN3000

Pump Association Bench



### Configurations

- Carbon steel structure with electrostatic paint;
- Lockable wheels;
- Pressure and flow measurement points;
- Supervision system via tablet, with included software;
- Compliance with safety standards;
- Electrical control panel;

### DIMENSIONS

Height	1700mm
Width	1500mm
Depth	700mm
Weight	250Kg

### ELECTRICAL CHARACTERISTICS

• Power supply:	220VAC 50/60Hz 380VAC 50/60Hz
• Protection:	Against short circuits, overloads, and electrical shocks

## FEATURES

Safety compliant with NR-12, includes development software, protection of main components, and educational material.

## MECAN4000

Machine Elements Bench



## Configurations

- Carbon steel structure with electrostatic paint;
- Lockable wheels;
- Flexible assembly of components on aluminum profile;
- Stainless steel shafts;
- Compliance with safety standards;
- Tools for assembly and disassembly of assemblies;

### DIMENSIONS

Height	1050mm
Width	1100mm
Depth	750mm
Weight	165Kg

## FEATURES

Safety compliant with NR-12, includes development software, protection of main components, and educational material.

## MECAN5000

Vibration Analysis Bench



## Configurations

- Carbon steel structure with electrostatic paint;
- Lockable wheels;
- Flexible assembly of components on aluminum profile;
- Quick bearing replacement with tool provided with the equipment;
- Compliance with safety standards;

### DIMENSIONS

Height	1300mm
Width	1090mm
Depth	750mm
Weight	280Kg

### ELECTRICAL CHARACTERISTICS

Power Supply	220V AC 50/60Hz
Protection	Against short circuits, overloads, and electrical discharges

## FEATURES

Safety compliant with NR-12, includes development software, protection of main components, and educational material.

## MECAN5000

Vibration Analysis Bench



## Configurations

- Carbon steel structure with electrostatic paint;
- Braked wheels;
- Flexible assembly of components on aluminum profile;
- Quick bearing replacement with tool provided with the equipment;
- Compliance with safety standards;
- Data acquisition system;
- Data supervision system with computer;

### DIMENSIONS

Height	1300mm
Width	1090mm
Depth	750mm
Weight	350Kg

### ELECTRICAL CHARACTERISTICS


Power Supply	220V AC 50/60Hz
Protection	Against short circuits, overloads, and electrical discharges



# USE

## Guidelines on the recommended use of the kit.

We suggest this configuration for better use in class.

 The kits and activities are designed considering the team sizes related on the side. The minimum necessary infrastructure is a prerequisite for the full use of the didactic kit functionalities.

We recommend the computer and connectivity requirements on the side for the use of the software and applications that come with the kit.

NUMBER	DESCRIPTION	TEAM (STUDENT/KIT)	USE
MECAN2000	Thermodynamic Analysis Bench	3 a 4	Occasionally, 1 kit for 3 teams.
MECAN3000	Pump Association Bench	3 a 4	Occasionally, 1 kit for 3 teams.
MECAN4000	Machine Elements Bench	3 a 4	Occasionally, 1 kit for 3 teams.
MECAN5000	Vibration Analysis Bench	3 a 4	Occasionally, 1 kit for 3 teams.

## INFRASTRUCTURE

	MECAN2000	MECAN3000	MECAN4000	MECAN5000
ELECTRICAL	1 electrical socket single phase	1 electrical socket three-phase	–	1 electrical socket single phase

## CONNECTIVITY

Ethernet connections per workstation	2 Ethernet ports (one for the computer, another for the kit)
WiFi network	Recommended
Internet access	Recommended
Computer	The kits that include software come with a computer/tablet as part of the product.

## DEVELOPMENT TOOLS

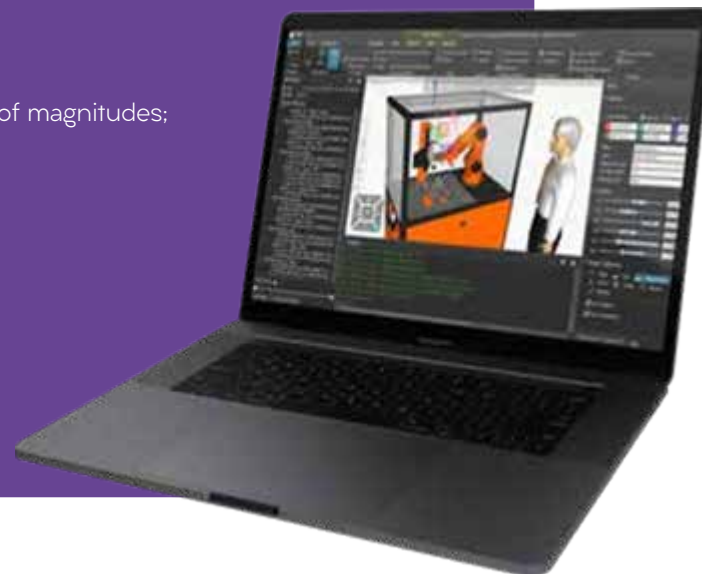
Our educational solutions are complemented by the necessary development tools and professional software for comprehensive student training.



For the pump association kit:

### LabVIEW

- Tool for the development and analysis of magnitudes;





# COURSEWARE

The didactic kits are accompanied by enriching educational material with a practical focus, offering practice proposals aimed at developing skills and competencies.

In addition to the User Manual, which contains information on operation and maintenance, the **Student Guide** is provided, with proposals for practical activities to be carried out with the kit, and the **Educator Guide**, with answers to the proposed activities and guidance on the didactic use of the kit. In addition, **video tutorials** are available to assist in the easy mastery of development tools and the use of the kit.

All this content is digitally accessible on our website through the **Educator Portal**.





## SKILLS AND COMPETENCIES

### Thermodynamics

- Analyze temperature, pressure, and flow variables;
- Analyze the thermodynamic process through a real-time animated pressure versus enthalpy graph;
- Understand the effectiveness of heat exchangers;
- Understand the overall heat transfer coefficient of heat exchangers;

### Pump Association

- Understand the system in the operation of simple pumping, in series, and in parallel;
- Determine the efficiency of pumps by relating the supplied electrical power to the delivered hydraulic power;
- Understand the variation in pressure measurements at the inlet and outlet of each pump under different speed conditions and system curve;
- Identify the cavitation point through the variation of the Net Positive Suction Head (NPSH) available at the pump inlet;

### Machine Elements

- Understand the transformation from rotary to linear motion;
- Understand the conservation of kinetic energy and the comparison of efficiency between transmissions;
- Understand the assembly of transmissions with flexible elements;

### Vibration Analysis

- Analyze the overall vibration of a mechanical system;
- Analyze vibration caused by imbalances;
- Analyze vibration in time-domain graphs and frequency spectra;
- Understand vibration attenuation with different couplings;

## APPLICATIONS

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

### Mobile

Exxer App

#### AUGMENTED REALITY KITS

Solutions can be visualized in 3D through augmented reality, allowing students to have a first contact and identify their main features.



### Exxer App

#### EDUCATIONAL ANIMATION

Augmented reality animations that present the main devices in cutaway and their assembly/disassembly process. Visualization of operating principles. Animations that aid in understanding the involved physical processes and the application of technology.





# TRAINING

As important as educational resources and tools is teacher training. We offer a comprehensive package of solutions to meet your training and updating needs.

## Quick Start and Quick Start Tutorials

Quick Start is a quick video guide to get acquainted, test, and put the product into operation. Tutorials are videos that teach common procedures necessary in classes using the kit.

## Technical Delivery

In technical delivery, our specialists present the product, its features, maintenance and safety precautions, and put it into operation with clients.

## Operational Training

The goal of operational training is to leave instructors trained to use the kit. The kit's instructional materials are presented, and some proposed practices are carried out. It also includes all activities from technical delivery.

## Technical Training

Technical training involves a deeper study of the applied technology and concepts. These courses do not focus on the kits but on technical topics and competencies to update teachers.



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