edibon

Engineering and Technical Teaching Equipment

Basic Mechanics Integrated Laboratory

LIMEBA

Laboratory structure

② Modules

MECA/1

MECA/2

MECA/3

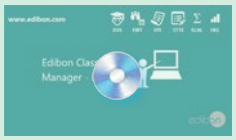
① MECA/EC

Panel and Common Elements Case for LIMEBA

Teaching Technique used

③ICAI. Interactive Computer Aided Instruction Software System

PC required for



Instruction Software

Student Software

② Modules

MECA/4

MECA/5

MECA/6

The complete laboratory includes parts 1 to 3 but any part can be supplied individually or additionally to others. (MECA/EC + Module/s is the minimum supply).

www.edibon.com
PRODUCTS
7.- MECHANICS AND 14.-BIOMEDICAL ENGINEERING

Some Available Modules

-MECA1.	Statics Experiments.	-MECA4.	Dynamics Experiments.
-MECA2.	Load Elevation Mechanisms Experiments.	-MECA5.	Friction Experiments.
-MECA3.	Transmissions Experiments.	-MECA6.	Special Mechanisms Experiments.

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

LIMEBA consists on a complete set of exercises and practical experiments belonging to the area of Applied Mechanics in its two main subareas:

Statics: the analysis of structures in balance.

Dynamics: analysis of the motion of mechanisms.

LIMEBA is divided into various experimental modules, each one presenting a subject of Statics or Dynamics.

GENERAL DESCRIPTION

Students are expected to build the experiments on the base panel, where distance measurements are possible due to equidistant spacings between holes on the base panel.

Thanks to the Manuals and the necessary theoretical knowledge imparted by the teacher, students shall be able to do all the measurements.

The MECA series is split up into six parts, named Modules, each of which contains the elements needed for completing a specific group of related exercises and experiments.

What are the parts included in the laboratory?

① MECA/EC. Panel and Common Elements Case for LIMEBA:

It is the supporting structure where the modules's elements are mounted in order to undertake the experiments and hence, the base panel is necessary along with any module.
The panel is pierced with equidistant holes that help students to take measurements.

② Modules:

Each module is formed by different experiment components and is packed in a high quality case.

The experimental elements of each module are made out of special anodized aluminium, a high quality material to achieve total precision and to obtain 100 % accuracy in carried out practices.

Manuals include laboratory sheets for every experiment, listing the elements needed in every experiment and giving the correct position of each element on the base panel. These sheets also give valuable guidance on how to conduct the experiments and recording the results.

There is a particular manual for each Module.

There are six different modules:

MECA1. Statics Experiments.
MECA2. Load Elevation Mechanisms Experiments.
MECA3. Transmissions Experiments.
MECA4. Dynamics Experiments.
MECA5. Friction Experiments.
MECA6. Special Mechanisms Experiments.

③ ICAI. Interactive Computer Aided Instruction Software System:

The best help in classroom for both teacher and students.

It includes:

3.1) 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.

3.2) 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.

Each "MECA" type module has its own software.

Complete LIMEBA/ LABORATORY includes: ① + ② + ③

Minimum supply: ① MECA/EC + ② Module/s (at least one required).

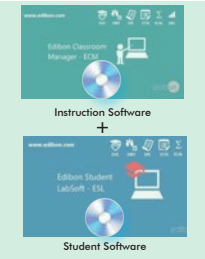
A) ICAI working possibility (complete EDIBON system)

MECA/EC.
Panel and Common Elements Case for LIMEBA

+

Module/s
(at least one required).

+



ICAI.
Interactive Computer Aided Instruction Software System

B) Simplest working possibility

MECA/EC.
Panel and Common Elements Case for LIMEBA

+

Module/s
(at least one required).

① Base Panel

MECA/EC. **Panel and Common Elements Case for LIMEBA**

SPECIFICATIONS

Bench-top unit.

Anodized aluminum frame and panels made of painted steel.

The holes on the base panel are accurately spaced at 25 mm centres.

Supports, brackets and elements needed to work with any of the modules in the base panel.

DIMENSIONS AND WEIGHTS

Dimensions: 950 x 400 x 550 mm approx.
(37.40 x 15.74 x 21.65 inches approx.)

Weight: 15 kg approx.
(33 pounds approx.)

MECA1. Statics Experiments

GENERAL DESCRIPTION

Statics is the part of Mechanics that studies any kind of structure or element in balance-equilibrium. Basically the module consist on experiments in which the student shall learn to deduce the main principles of Statics and its most important applications.

PRACTICAL POSSIBILITIES

1.-Centres of gravity (Centres of gravity (I) and Centres of gravity (II)): Specification of the centre of gravity of plates of different shapes using the simple pendulum and graphical methods.
2.-Triangle of forces. To test that three non-parallel forces in equilibrium acting in the same plane can be represented by a Triangle of forces.
3.-Parallelogram of forces. When three non-parallel forces in the same plane are in equilibrium, their lines of action meet at a point, and hence to show that the resultant of two forces can be found using the Parallelogram of forces.
4.-Polygon of forces. Verification of the fact that four or more forces in equilibrium acting on the same point, can be represented by a Polygon of forces.
5.-Principle of moments. Verification of the principle of moments for parallel and non parallel forces.
6.-The Pivot or beam balance. To demonstrate that the action of weighing with a beam balance or slide balance is based upon the principle of moments.
7.-Levers: To determine the mechanical advantage of various types of levers using the ratio resistance/power (W/P) and to verify that this is the same as the ratio between distances.
8.-Beam reaction forces. Verification of the fact that a distributed load applied over a beam may be considered as an equivalent concentrated load applied at the centre of gravity of the distributed load. Reactions located at supports due to the load acting on the simply supported beam may be calculated using the momentum principle, independent of the position of these beam supports.

SPECIFICATIONS

All experiment elements are made in special anodized aluminum.
Centres of gravity of various shaped plates:
- Rectangle.
- Circle.
- Triangle.
- T.
- Kite.
- Irregular.

Drawing panel.
Three and five cords and ring.
Beam balance.
Beam.
Two forces equality divided.
The simple pendulum.
Pivot screw.
Adjustable hooks.
Set of weights:
- 10 weights of 0.01 N.
- 4 weights of 0.05 N.
- 10 weights of 0.1 N.
- 2 weights of 0.5 N.
- 4 weights of 1 N.
- 2 weights of 2 N.
- 1 weight of 5 N.

Weight hooks.
Pulleys.
Screws and Knurled nuts.
Large ext. spring and small ext. spring.
Dynamometer.
Spare rope.

MECA1 detail

DIMENSIONS AND WEIGHTS

Dimensions: 500 x 360 x 120 mm approx. (19.68 x 14.70 x 4.72 inches approx.)
Weight: 5 kg approx. (11 pounds approx.)

REQUIRED SERVICES

- MECA/EC. Panel and Common Elements Case for LIMEBA.

MECA2. Load Elevation Mechanisms Experiments

GENERAL DESCRIPTION

Experimenting with the main mechanisms used for load elevation. Analysis of their work and efficiency.

PRACTICAL POSSIBILITIES

1.-Simple pulleys. Verification of the variation of cable tension in a pulley with the cable's direction as it passes over the pulley. To determine the mechanical advantages of a simple combination of fixed and movable pulleys.
2.-Pulley blocks. Analysis of the mechanical features of a set of pulley blocks, which has three sheaves in the upper block and two pulleys in the lower block.
3.-Single axle and wheel. Determine the law of the Machine for a simple axle and wheel, and the variation of mechanical advantage and efficiency with load.
4.-Differential axle and wheel. Determine the law of the Machine for differential axle and wheel. Verification that the mechanical advantage and efficiency increases with load up to a limiting maximum.
5.-Weston differential chain blocks. Analysis of the specific characteristics of these chains.
6.-Screw Jack. To measure the effort required to raise various loads using a simple form of screw jack and to determine how the mechanical advantage and efficiency varies with load.

SPECIFICATIONS

All experiment elements are made in special anodized aluminum.
Three pulley block.
Two pulley block.
Wheel and axle set.
Weston differential chain block.
Screw jack.
Support screw.
Adjustable hooks.
Set of weights:
- 10 weights of 0.01 N.
- 4 weights of 0.05 N.
- 10 weights of 0.1 N.
- 2 weights of 0.5 N.
- 4 weights of 1 N.
- 2 weights of 2 N.
- 1 weight of 5 N.

Weight hooks.
Pulleys.
Adjustable pulley.
Single pulley block.
Knurled nuts.
Dynamometer.
Spare rope.
Screws.

MECA2 detail

DIMENSIONS AND WEIGHTS

Dimensions: 500 x 360 x 120 mm approx. (19.68 x 14.17 x 4.72 inches approx.)
Weight: 9 kg approx. (19.84 pounds approx.)

REQUIRED SERVICES

- MECA/EC. Panel and Common Elements Case for LIMEBA.

MECA3. **Transmissions Experiments**

GENERAL DESCRIPTION

Most recent machines require the transmission of motion between elements to obtain the desired mechanical result. The mechanisms studied in this module are those that transmit motion between two axles.

PRACTICAL POSSIBILITIES

1.-Belt drive (Belt drive (I) and Belt drive (II): Verification of the direction of rotation of open and crossed belt drives. Verification of the speed of rotation of the two pulleys is inversely proportional to their diameters. To measure the difference in tension between the two sides of a belt drive and to determine the efficiency of drive transmission.
2.-Chain drive. Verification of the speed ratio of a chain drive. Measurement of the efficiency of drive transmission.
3.-The Geared winch (two parallel axles). Comparison of the velocity ratios of a system of single-stage and doublestage geared winch. Specification of their corresponding mechanical advantages and efficiencies under varying loads.
4.-Bevel gears (two intersecting axles). Verification of the efficiency velocity-ratio and mechanical advantages of the Bevel gear unit under different loads.
5.-Worm gear (two crossed axles). Verification of the speed ratio of a worm and specification of the transmission efficiency under different loads.
6.-Universal coupling. To investigate the effect of introducing universal coupling to a simple drive shaft.

SPECIFICATIONS

All experiment elements are made in special anodized aluminum.
System of belt drive (includes: flat belt, round belt and leather strip).
Chain drive.
Simple gear train.
Bevel gears.
Worm gear.
Universal coupling.
Support screw.
Adjustable screws.
Set of weights:
- 10 weights of 0.01 N.
- 4 weights of 0.05 N.
- 10 weights of 0.1 N.
- 2 weights of 0.5 N.
- 4 weights of 1 N.
- 2 weights of 2 N.
- 1 weight of 5 N.

Weight hooks.
Pulley.
Screws and knurled nuts.
Dynamometers.
Spare rope.

MECA3 detail

DIMENSIONS AND WEIGHTS

Dimensions: 500 x 360 x 120 mm approx. (19.68 x 14.17 x 4.72 inches approx.)
Weight: 7 kg approx. (15.43 pounds approx.)

REQUIRED SERVICES

- MECA/EC. Panel and Common Elements Case for LIMEBA.

MECA4. **Dynamics Experiments**

GENERAL DESCRIPTION

Dynamics is the part of Mechanics that analyzes the motion of an element or mechanism caused by a force. Thus the study is concentrated on the basic laws of Dynamics.

PRACTICAL POSSIBILITIES

1.-Spring balance. To verify that the extension of a coiled spring is proportional to the load applied, to show the principle of a spring balance.
2.-Simple pendulum. To show that the time of a simple pendulum depends only on the length of the pendulum, and to determine the value of the force of gravity using a simple pendulum.
3.-Kinetic and potential energy. Analysis of some features of kinetic and potential energy and to show that energy exists, that is may be transformed, and that it may be "stored" and "given back".
4.-Inertia. The wheel. To find the energy stores in a wheel by supplying a known quantity of energy.
5.-Centrifugal force. Demonstration of the laws of the centrifugal force.

SPECIFICATIONS

All experiment elements are made in special anodized aluminum.
The spring balance.
Wheel.
Centrifugal force system.
The simple pendulum.
Adjustable screw.
Set of weights:
- 10 weights of 0.01 N.
- 4 weights of 0.05 N.
- 10 weights of 0.1 N.
- 2 weights of 0.5 N.
- 4 weights of 1 N.
- 2 weights of 2 N.
- 1 weight of 5 N.

Weight hooks.
Adjustable pulley.
Screws and knurled nuts.
Small ext. spring and large ext. spring.
Dynamometer.
Spare rope.

MECA4 detail

DIMENSIONS AND WEIGHTS

Dimensions: 500 x 360 x 120 mm approx. (19.68 x 14.17 x 4.72 inches approx.)
Weight: 7 kg approx. (15.43 pounds approx.)

REQUIRED SERVICES

- MECA/EC. Panel and Common Elements Case for LIMEBA.

MECA5. **Friction Experiments**

GENERAL DESCRIPTION

This module considers the most important phenomenon of Dynamics: Friction. It is a manifestation of the energy loss due to contact, effect that happens in every real-world mechanism.

PRACTICAL POSSIBILITIES

1.- Sliding friction. Verification of the laws of friction and to measure the coefficient of friction for different materials.
2.- Inclined plane (Inclined plane (I) and Inclined plane (II)). Analysis of the forces acting on an inclined plane due to a weighted of a roller supported on the plane. Calculation of the starting force needed for dragging a block on the plane.
3.- Angle of friction. Measurement of the angle of friction and from it find the coefficient of friction. To show that the coefficient of friction is equal to tangent of the angle of friction.
4.- Friction. To show the extent to which friction is reduced by using wheels and rollers and to compare the effects of different bearing surfaces.
5.- The wedge. Determine mechanical advantage and efficiency obtained using two different wedges, and to show that overhauling may be prevented if the angle of inclination of a wedge is small.
6.- Bearings. Comparison of the resistance to turning due to friction of four bearings made of different materials, and to show something of the progress made in bearing development.

SPECIFICATIONS

All experiment elements are made in special and anodized aluminum.
Friction equipment.
Friction with roar.
Foils of friction.
Roller.
Block of wheels with roar.
Set of rollers in a marc.
Principle of wedge.
Bearings.
The simple pendulum.
Set of weights:
- 10 weights of 0.01 N.
- 4 weights of 0.05 N.
- 10 weights of 0.1 N.
- 2 weights of 0.5 N.
- 4 weights of 1 N.
- 2 weights of 2 N.
- 1 weight of 5 N.

Weight hooks.
Pulley.
Adjustable pulley.
Single pulley block.
Screws and knurled nuts.
Dynamometer.
Spare rope.

MECA5 detail

DIMENSIONS AND WEIGHTS

Dimensions: 500 x 360 x 120 mm approx. (19.68 x 14.17 x 4.72 inches approx.)
Weight: 6 kg approx. (13.22 pounds approx.)

REQUIRED SERVICES

- MECA/EC. Panel and Common Elements Case for LIMEBA.

MECA6. **Special Mechanisms Experiments**

GENERAL DESCRIPTION

This module considers various mechanisms frequently used in industrial processes; without them some operations would not be possible with the same efficiency. Here these mechanisms are shown and their function analyzed.

PRACTICAL POSSIBILITIES

1.-Cam and roller. To study the difference aspects of cam design.
2.-Geneva motion. Verification of how the circular motion of the drive unit is transformed into the intermittent motion of the Geneva motion, and of how this mechanism accelerates and decelerates during the transmission process.
3.-Ratchet mechanisms. Examination of the parts of the Ratchet assembly supplied in which a swinging lever is fitted with two pawls.
4.-Scotch yoke. Analysis and verification of the motion of a driving crank and its relation to the reciprocal element of motion.
5.-Crank mechanism. Analysis of the features of a crank mechanism, drawing a rotation torque diagram and deducing the relation between the crank rotation and the slide platform movement.
6.-Quick return mechanism. To show a quick return mechanism at work and to record the relationship between the rotation of the crank and the movement of the slide.

SPECIFICATIONS

All experiment elements are made in special and anodized aluminum.
The cam and roller mechanisms (included two cams).
Geneva mechanism.
The ratchet mechanisms.
Scotch yoke.
Crank mechanism.
Quick return mechanism.
Adjustable hooks.
Set of weights:
- 10 weights of 0.01 N.
- 4 weights of 0.05 N.
- 10 weights of 0.1 N.
- 2 weights of 0.5 N.
- 4 weights of 1 N.
- 2 weights of 2 N.
- 1 weight of 5 N.

Weight hooks.
Adjustable pulley.
Screws and knurled nuts.
Dynamometer.

MECA6 detail

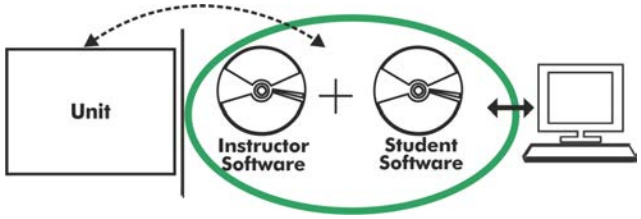
DIMENSIONS AND WEIGHTS

Dimensions: 500 x 360 x 120 mm approx. (19.68 x 14.17 x 4.72 inches approx.)
Weight: 7 kg approx. (15.43 pounds approx.)

REQUIRED SERVICES

- MECA/EC. Panel and Common Elements Case for LIMEBA.

③ ICAI. Interactive Computer Aided Instruction Software System



With no physical connection between unit and computer (PC), **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.

Instructor Software

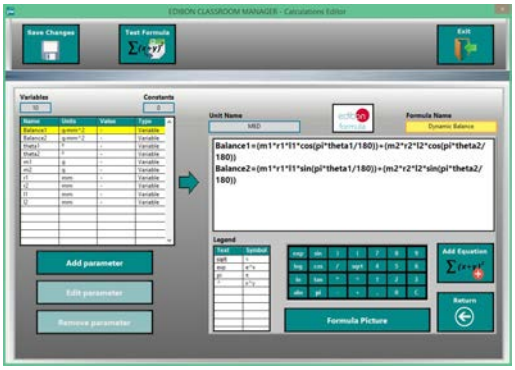
- ECM-SOF. EDIBON Classroom Manager (Instructor Software).

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.

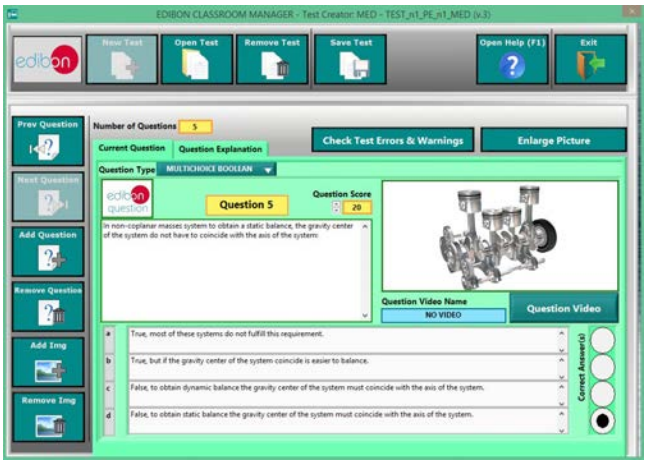
Innovative features:

- **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.**

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



ECAL. EDIBON Calculations Program Package - Formula Editor Screen



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

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

Student Software

- 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.

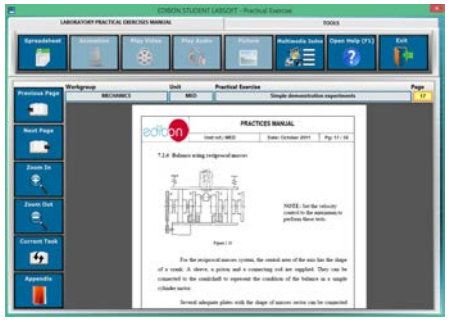
Innovative features:

- **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.**

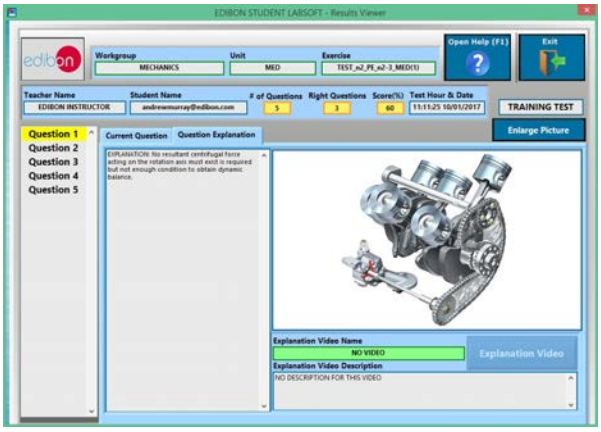
For more information see **ICAI** catalogue. Click on the following link:

www.edibon.com/en/files/expansion/ICAI/catalog

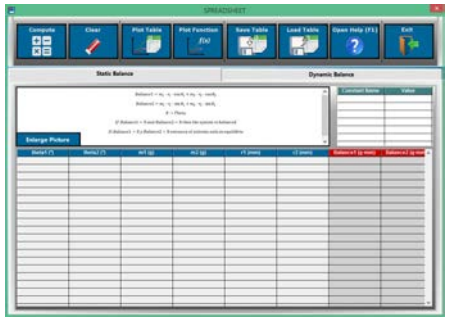
ESL-SOF. EDIBON Student LabSoft (Student Software) Application Main Screen



EPE. EDIBON Practical Exercise Program Package Main Screen



ERS. EDIBON Results & Statistics Program Package - Question Explanation



ECAL. EDIBON Calculations Program Package Main Screen

Available Student/Module Softwares

-ESL-MECA1-SOF. Statics.

-ESL-MECA2-SOF. Load Elevation Mechanisms.

-ESL-MECA3-SOF. Transmissions.

-ESL-MECA4-SOF. Dynamics.

-ESL-MECA5-SOF. Friction.

-ESL-MECA6-SOF. Special Mechanisms.

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

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REPRESENTATIVE: