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 ↳ PRODUCTS  
 ↳ 40.- ELECTRICITY

## INTRODUCTION

The starting up of electrical motors is an important issue to study if we want to extend the life and improve the reliability of the machine. When a motor starts up switching directly to the grid, it consumes several times the nominal current, which produces a lot of heat and damages the isolation of the motor, this eventually causes internal shortcircuits and the destruction of the windings. Thus it is not recommended to do it a lot of times. For this reason, there are other kinds of starters that allow a softer increase of current, but also slower, however, we avoid damages in the motor. In addition, there are other kinds of devices that allow to change the working of the machine, such as the direction of rotation or the commutation of the poles of the machine.



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

## GENERAL DESCRIPTION

The Application of Manual Starters and Velocity Commutators with Asynchronous Motors, "AEL-CM2 ", has been designed by Edibon to study how Dahlander and Three-Phase Induction Motor with Wound Rotor are wired and controlled. Besides, this application shows the most important methods of motor operations used in the industry, such as changing the rotation direction, manual star-delta starter, direct starter, direct starter with inversion, manual Dahlander commutator, starting with resistors, etc.

This application includes a series of modules and motors which allow study in depth all issues mentioned before.

In addition, this application has a flywheel with the purpose of simulate a dynamic load in the motors and to check how they work in this situation.

The AEL-CM2 includes the following modules:

- N-ALI01. Industrial Main Power Supply.
- N-ARR01. Manual Star-Delta Starter.
- N-ARR05. Manual Star-Delta Starter with Inversion.
- N-ARR07. Manual Dahlander Commutator, 2 Speeds.
- N-ARR12. Direct Starter Module.
- N-ARR13. Direct starter with inversion.
- EMT8. Asynchronous Three-Phase Motor with Wound Rotor.
- EMT9. Dahlander Three-Phase Motor (two speeds).
- N-TRANS03. Three-Phase Autotransformer 400/230 VAC, 1kVA.
- FLYW. Flywheel.
- N-REFT1. Three-Phase Independent Resistor Module.

Additional and recommended applications:

- AEL-CM1. Logical Control Operations Application.
- AEL-CM3. Automatic Control Operations II.
- AEL-CM4. Automatic Control Operations with Contactors and Sensors IV.

Expansion learning software:

In addition, Edibon provides expansion learning software (AEL-CM2/ICAI) to reinforce knowledge about this field.

This software is formed by:

- ECM-SOF. EDIBON Classroom Manager (Instructor Software).
- ESL-SOF. EDIBON Student Labsoft (Student Software).

The application AEL-CM2 can be mounted on rack (option A) or on rail (option B):

Option A:

This application needs the following rack:

- N-RACK-A.

Optionally the AEL-WBR. Electrical Workbench (Rack) can be supplied to place the rack/s.

Option B:

This application can be mounted on rail.

Optionally the AEL-WBC. Electrical Workbench (Rail) can be supplied to mount the modules.

## SPECIFICATIONS

The application includes the following modules:

- **N-ALI01. Industrial Main Power Supply.**

Supply voltage: 400 VAC, 3 PH+N+G.

ON-OFF removable key.

Output voltage connections:

Three-Phase + Neutral: 400 VAC.

Single-Phase: 230 VAC.

Three-Phase supply hose with IP44 3PN+E 32A 400V connecting plug.

Differential magnetothermal, 4 poles, 25 A, 300 mA AC 6 KA.



N-ALI01

- **N-ARR01. Manual Star-Delta Starter.**

Nominal voltage: 400 VAC.

Maximum contacts current: 10 A

Star-Delta three positions commutator:

0: Open circuit.

Y: Star connection.

Δ: Delta connection.



N-ARR01

- **N-ARR05. Manual Star-Delta Starter with Inversion.**

Nominal voltage: 400 VAC.

Maximum contacts current: 10 A.

Star-Delta three positions commutator I:

0: Open circuit.

Y: Star connection.

Δ: Delta connection.

Three positions commutator II:

0: Open circuit.

1: Direct connection.

2: Reverse connection.



N-ARR05

- **N-ARR07. Manual Dahlander Commutator, 2 Speeds.**

Nominal voltage: 400 VAC.

Maximum contacts current: 10 A.

Three positions commutator:

0: Open circuit.

1: Low speed.

2: High speed.



N-ARR07

- **N-ARR12. Direct Starter Module.**

Nominal voltage: 400 VAC.

Maximum contacts current: 10 A.

Two positions commutator (ON-OFF):

0: Open circuit.

1: Closed circuit.



N-ARR12

- **N-ARR13. Direct starter with inversion.**

Nominal voltage: 400 VAC.

Maximum contacts current: 10 A.

Three positions commutator:

0: Open circuit.

1: Direct connection.

2: Reverse connection.



N-ARR13

## Specifications

- **EMT8. Asynchronous Three-Phase Motor with Wound Rotor.**

Nominal power: 300 W.

Nominal voltage: 3x 230/400 VAC  $\Delta$ /Y.

Frequency: 50/60 Hz.

Number of poles: 2.

RPM: 2870 r.p.m

Nominal current: 1/ 0,5 A.



EMT8

- **EMT9. Dahlander Three-Phase Motor (two speeds).**

Nominal power: 370 W.

Nominal voltage: 3x 400 VAC.

Frequency: 50/60 Hz.

Number of poles: 4.

RPM: 1400/2800 r.p.m.

Nominal current: 1,2 / 1,55 A.



EMT9

- **N-TRANS03. Three-Phase Autotransformer 400/230 VAC, 1 kVA.**

Three-phase autotransformer.

Nominal supply voltage: 400 VAC (3PH).

Nominal output voltage: 3 x 230 VAC (3PH+N).

Nominal power: 1 kVA.

Free configuration (delta, star and zig-zag).

Start/stop commutator for instantaneous connection/disconnection of the grid transformer.

Fuses: 3 x 5 A.



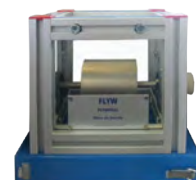
N-TRANS03

- **FLYW. Flywheel.**

Weight: 2 Kg.

Maximum recommended speed: 4000 r.p.m.

Moment of inertia: 0,0025 Km<sup>2</sup>.



FLYW

- **N-REFTI. Three-Phase Independent Resistor Module.**

Nominal voltage: 400 VAC.

Resistor value: 3 x 150 Ohms.

Nominal power: 3 x 352 W.

Manual commutator to switch on/off the resistors.

Fuses: 3 x 5 A.

Terminals:

Three input terminals (3PH).

Three output terminals (3PH).

Ground terminal.



N-REFTI

- **All necessary cables to realize the practical exercises are included.**

**Cables and Accessories**, for normal operation.

**Manuals:**

This unit is **supplied with the following manuals**: Required Services, Assembly and Installation, Starting-up, Safety, Maintenance & Practices Manuals.

## EXERCISES AND PRACTICAL POSSIBILITIES

- 1.- Checking the working of the main power supply.
- 2.- Manual Star-Delta starter of asynchronous three-phase induction motor with wound rotor.
- 3.- Manual start and reverse operation of asynchronous three-phase induction motor with wound rotor.
- 4.- Manual Star-Delta with inversion circuit of asynchronous three-phase induction motor with wound rotor.
- 5.- Manual soft starter with resistors of asynchronous three-phase induction motor with wound rotor.
- 6.- Manual start and reverse operation of Dahlander motor.
- 7.- Manual speed variation of a Dahlander motor.
- 8.- Manual speed variation of a Dahlander motor with inversion.

### REQUIRED SERVICES

- Electrical supply: three-phase, 380V/50 Hz or 208V/60 Hz, 20 Kw.

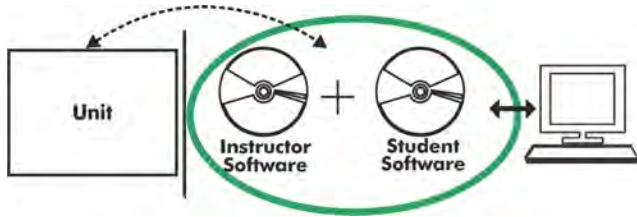
### DIMENSIONS AND WEIGHTS

AEL-CM2:

- Dimensions: 640 x 320 x 920 mm approx.  
(25.19 x 12.59 x 36.22 inches approx.)
- Weight: 60 Kg approx.  
(132 pounds approx.)

## Optional

### AEL-CM2/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.

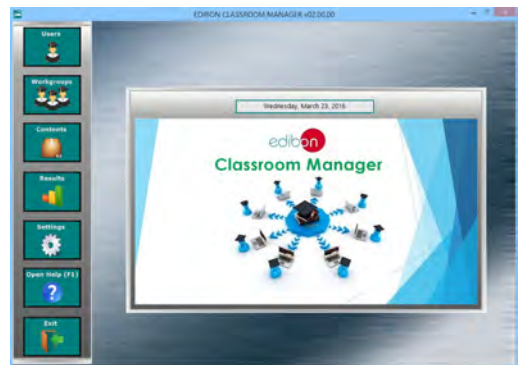
### Instructor Software

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

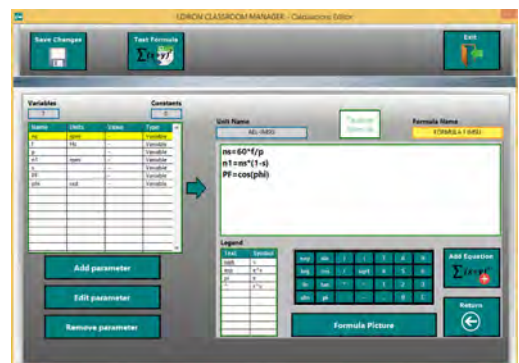
ECM-SOF is the application that allows the Instructor to register students, manage and assign tasks for workgroups, create own content to carry out Practical Exercises, choose one of the evaluation methods to check the Student knowledge and monitor the progression related to the planned tasks for individual students, workgroups, units, etc... so the teacher can know in real time the level of understanding of any student in the classroom.

Innovative features:

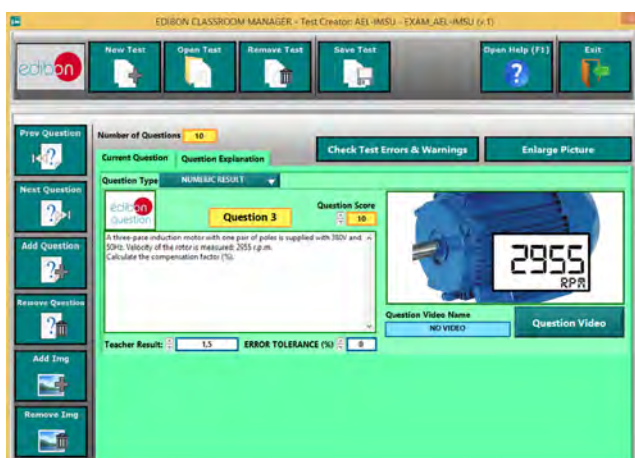
- User Data Base Management.
- Administration and assignment of Workgroup, Task and Training sessions.
- Creation and Integration of Practical Exercises and Multimedia Resources.
- Custom Design of Evaluation Methods.
- Creation and assignment of Formulas & Equations.
- Equation System Solver Engine.
- 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

Optional  
**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](http://www.edibon.com/en/files/expansion/ICAI/catalog)



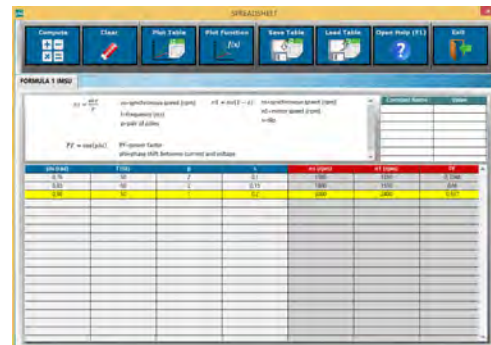
ESL-SOF. EDIBON Student LabSoft (Student Software)  
Application Main Screen



EPE. EDIBON Practical Exercise Program Package Main Screen



ERS. EDIBON Results & Statistics Program Package - Question Explanation



ECAL. EDIBON Calculations Program Package Main Screen

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



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REPRESENTATIVE:

