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 PRODUCTS
 4.- ELECTRICITY

INTRODUCTION

An electrical motor is such an electromechanical device which converts electrical energy into a mechanical energy. There are a wide variety of motors, within which the most used motor in industry is the Squirrel Cage Induction Motor. It is due to its low cost, low maintenance and robustness.

Other advantages of these electrical machines are the possibility of control the speed, using frequency controllers, and the high starting torques. For this reason, the utilization of these electrical machines is extended in water pumps, fans, compressors, and household appliances, washing machines, etc.



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)



"Worlddidac Quality Charter" and Platinum Member of Worlddidac

GENERAL DESCRIPTION

The 4 Dissectible Induction Motors Application, "AEL-DIM-KIT", has been designed by EDIBON to demonstrate the students the assembly, dissectible and starting-up of several types of induction motors: the Three-Phase Induction Motor of Squirrel Cage, the Three-phase Wound Rotor Induction Motor, the Single-phase Asynchronous Motor with a start and a running capacitor and Single-phase Split Phase Induction Motor.

This application will provide the students the main principles of assembly and operation of electric induction motors. For this purpose, this application includes a specific manual including the relative aspects of induction machines explaining, step by step, the assembly process of each electrical motor.

In addition, this application includes a toolbox to realize the assembly of electric machines and a digital multimeter for electrical measurement.

The AEL-DIM-KIT application includes the following elements:

- N-ALI01. Industrial Main Power Supply.
- EMT7-D. Dissectible 3PH Squirrel-cage Induction Motor.
- EMT8-D. Dissectible 3PH Wound Induction Motor.
- EMT16-D. Dissectible Single-phase Squirrel-cage Induction Motor with Starting Capacitor.
- EMT20-D. Dissectible Single-phase Squirrel-cage Induction Motor with Split Phase.
- MED65. Digital Multimeter.
- C-TB01. Toolbox 1.

Recommended elements:

- N-EALD. Network Analyzer Unit with Data Acquisition.
- FRE-FE. Electronic Brake.

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

Option A:

This application needs the following rack:

- N-RACK-B.

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 AEL-DIM-KIT application includes the following elements:

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

Supply voltage: 400 VAC, 3PH+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 32 A 400 V connecting plug.

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



N-ALI01

- **EMT7-D. Dissectible 3PH Squirrel-cage Induction Motor.**

Nominal power: 370 W.

Nominal voltage: 3x 230/400 VAC.

Frequency: 50/60 Hz

Number of poles: 2.

RPM: 2730 r.p.m.

Nominal current: 1,67/ 0,97 A.



EMT7-D

- **EMT8-D. Dissectible 3PH Wound Induction Motor.**

Nominal power: 370 W.

Nominal voltage: 3x 230/400 VAC.

Frequency: 50/60 Hz.

RPM: 3000 r.p.m.

Nominal current: 1/ 0,5 A.



EMT8-D

- **EMT16-D. Dissectible Single-phase Squirrel-cage Induction Motor with Starting Capacitor.**

Nominal power: 370 W.

Nominal voltage: 230V.

RPM: 2780 r.p.m.

Frequency: 50/60 Hz.

Armature current: 2,53 A.



EMT16-D

- **EMT20-D. Dissectible Single-phase Squirrel-cage Induction Motor with Split Phase.**

Nominal power: 370 W.

Nominal voltage: 230 V.

RPM: 2780 r.p.m.

Frequency: 50 Hz.

Armature current: 2,53 A.



EMT20-D

- **MED65. Digital Multimeter.**

Digital multimeter of about 3 1/2 digits, with double-jack ending cables of about 4 mm to facilitate interconnections.

With this digital multimeter we will be able to measure:

Voltage.

Current.

Resistance.

Capacitors capacity.

Temperature.



MED65

- **C-TB01. Toolbox 1.**

Set of allen keys of nine pieces.

Nylon hammer.

Set of flat screwdriver.

Set of phillips screwdriver.



C-TB01

Recommended elements:

- N-EALD. **Network Analyzer Unit with Computer Data Acquisition.**

ON-OFF switch.

Supply voltage: 230 VAC+N+GND.

Input terminals: Input connection with the measurement point.

Output terminals: Output connection with the measurement point.

RS-485 Communication port.

Fuses: 3x10 A.

Network Analyzer Display. It shows:

- Voltages (phase-phase, phase-neutral, angles, frequency, unbalance, THD)

- Currents (max. demand, unbalance, TDD, THD)

- Active, reactive and apparent power

- Power factor (inductive and capacitive load)

- Maximum demand (import, export, voltages, currents, PF).

- MAX/MIN values.

- V and I individual harmonics and their spectrums.

- Voltages and currents phasors diagrams.

- Waveforms of voltages and currents and THD values.

- State of digital signals, external pulse counters or installation point counters

- Relay output status.

- Load bar graph displays the amount, in percent with respect of the nominal defined by the user.



N-EALD

- FRE-FE. **Electronic Brake.**

The electronic brake FRE-FE is an unit that allows to regulate the braking torque of a motor.

The FRE-FE is constituted as a set of two elements:

Control module:

Front panel:

- Braking torque control.

- ON/OFF switch.

- Electrical parameters indicator.

- Display manipulation: Key "FUNC/DATA". Keys "RUN" / "STOP".

- Forward / Reverse switch.

Braking motor mounted on a bench-support.

Cable to connect the two elements.

Power: 370 W.

V. Armature: 220/240 V.

The control of the braking torque is carried out by means of a control potentiometer placed on the front side of the control module.

The direction of the braking motor is controlled by a switch placed on the front panel of the control module.

Furthermore, the user will be able to visualize in a display different electrical parameters (as for example: current, frequency, active power...).



FRE-FE

- **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.- Assembly and disassembly, step-by-step, of a three-phase asynchronous squirrel cage induction motor.
 - 2.- Assembly and disassembly, step-by-step, of a three-phase wound rotor induction motor.
 - 3.- Assembly and disassembly, step-by-step, of a single-phase asynchronous motor with a start capacitor and a run capacitor.
 - 4.- Assembly and disassembly, step-by-step, of a single-phase split phase induction motor.
 - 5.- Start-up of a three-phase asynchronous squirrel cage induction motor.
 - 6.- Start-up of a three-phase wound rotor induction motor.
 - 7.- Start-up of a single-phase asynchronous motor with a start capacitor and a run capacitor.
 - 8.- Start-up of a single-phase split phase induction motor.
- Additional practical exercises:
- 9.- Measurement and data view of the electrical parameters of the electrical machines with the power meter.
 - 10.- Braking tests with the electronic brake.
- Several other exercises can be done and designed by the user.

REQUIRED SERVICES

- Electrical supply: three-phase, 380V/50 Hz or 208V/60 Hz., 1 kW.

DIMENSIONS AND WEIGHTS

EMT7-D:

- Dimensions: 330 x 400 x 300 mm approx.
(12.99 x 15.74 x 11.81 inches approx.)
- Weight: 5 Kg approx.
(11 pounds approx.)

EMT8-D:

- Dimensions: 330 x 400 x 300 mm approx.
(12.99 x 15.74 x 11.81 inches approx.)
- Weight: 5 Kg approx.
(11 pounds approx.)

EMT16-D:

- Dimensions: 330 x 400 x 300 mm approx.
(12.99 x 15.74 x 11.81 inches approx.)
- Weight: 5 Kg. approx.
(11 pounds approx.)

EMT20-D:

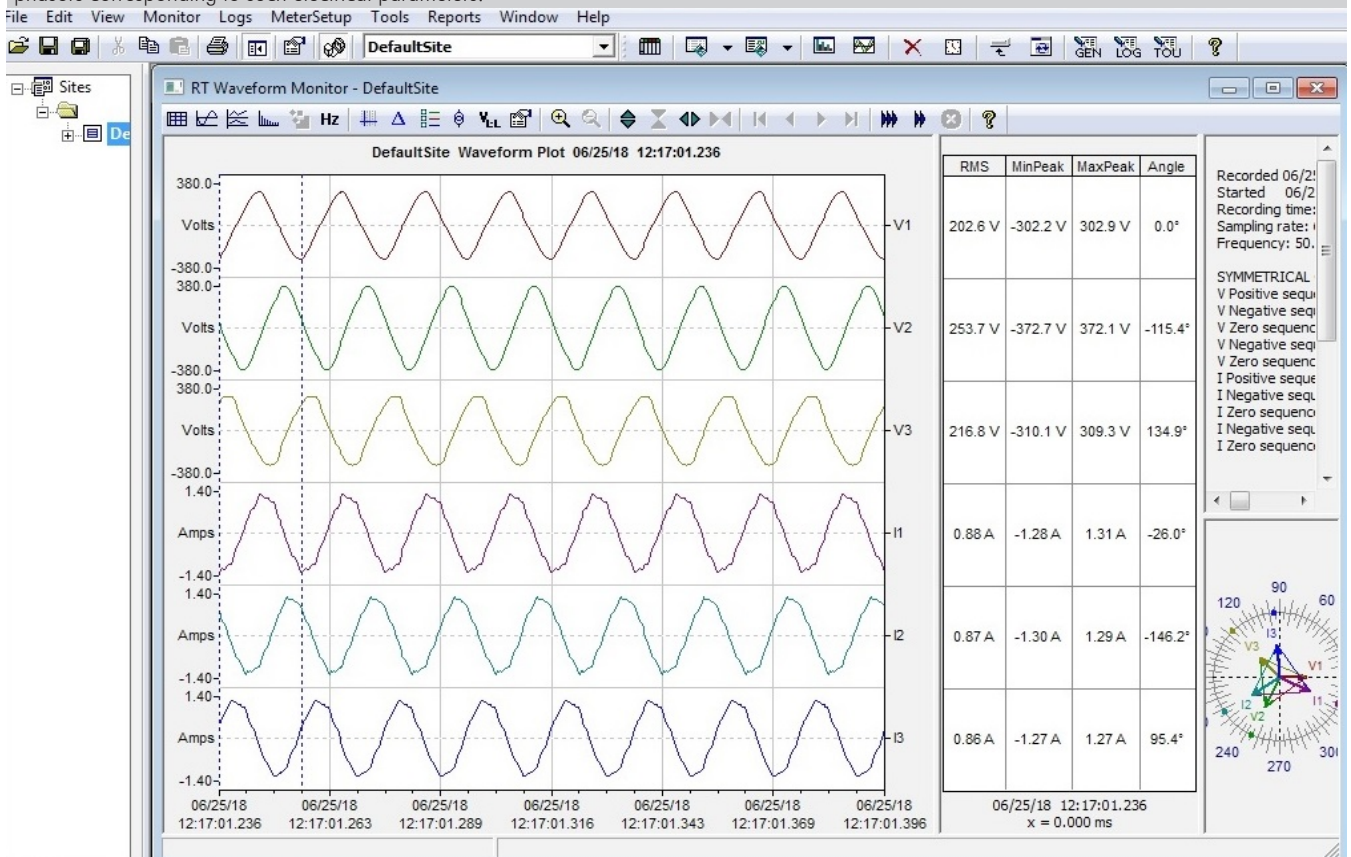
- Dimensions: 330 x 400 x 300 mm approx.
(12.99 x 15.74 x 11.81 inches approx.)
- Weight: 5 Kg approx.
(11 pounds approx.)

C-TB01:

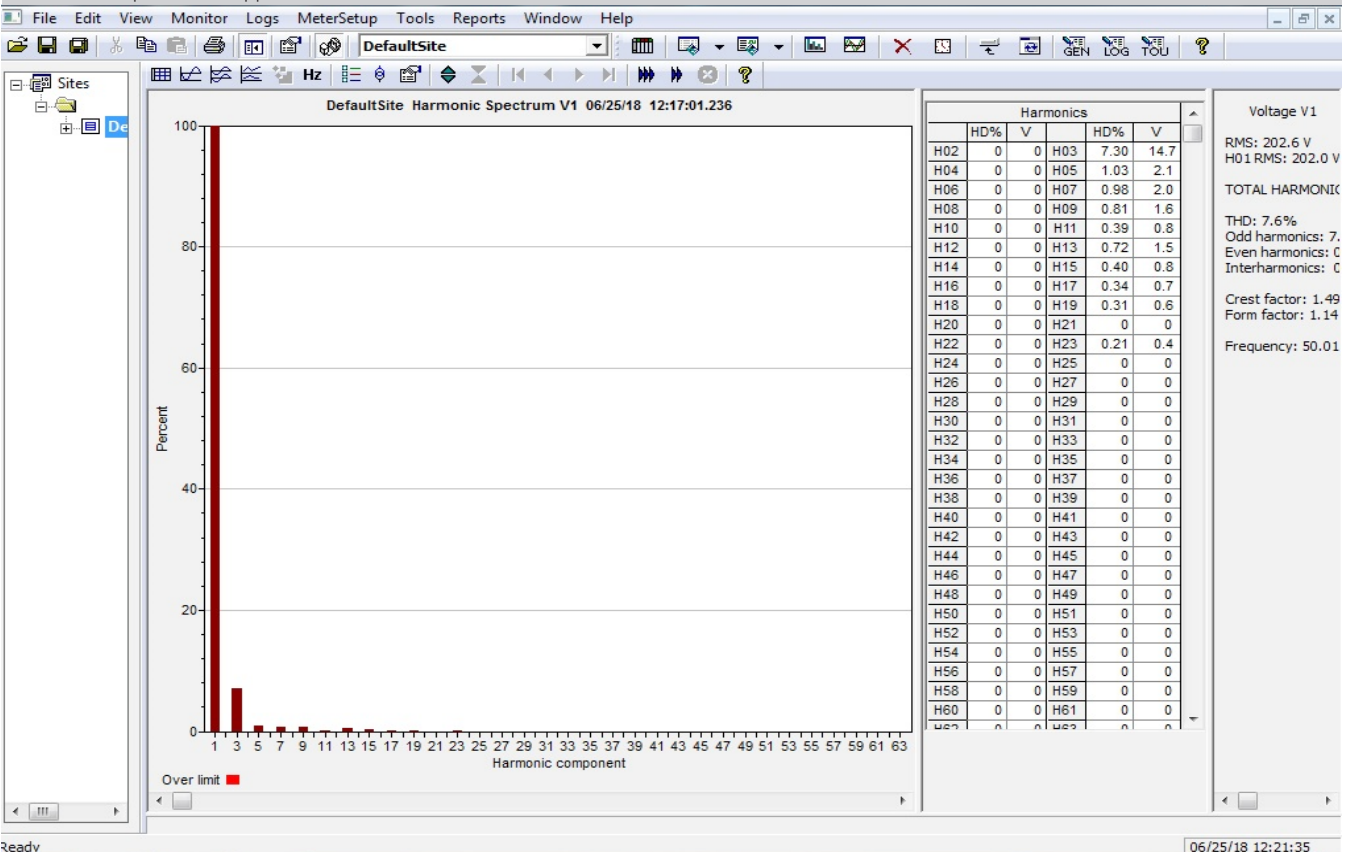
- Dimensions: 311 x 168 x 130 mm approx.
(12.24 x 6.61 x 5.11 inches approx.)
- Weight: 5 Kg approx.
(11 pounds approx.)

SOME REAL RESULTS OBTAINED WITH THE NETWORK ANALYSER

Waveform plot of the real time currents and voltages measured by the analyzer, showing the angular, maximum, minimum and RMS values, and the phasors corresponding to such electrical parameters.

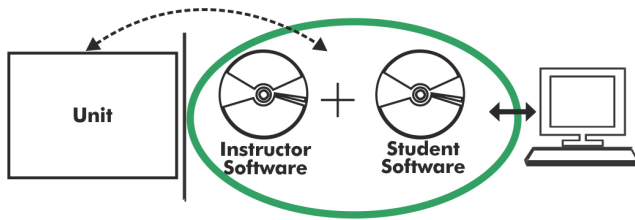


Representation of the torque-speed curve for the Three-Phase Asynchronous Squirrel Cage Motor. Notice that the motor nominal speed and the maximum torque can be appreciated.



Optional

AEL-DIM-KIT/ICAI. Interactive Computer Aided Instruction Software System:



With no physical connection between unit and computer, 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.

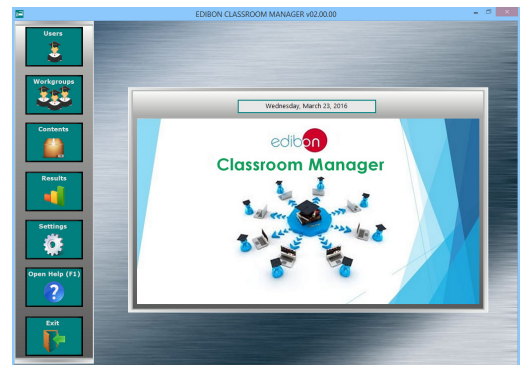
Instructor Software

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

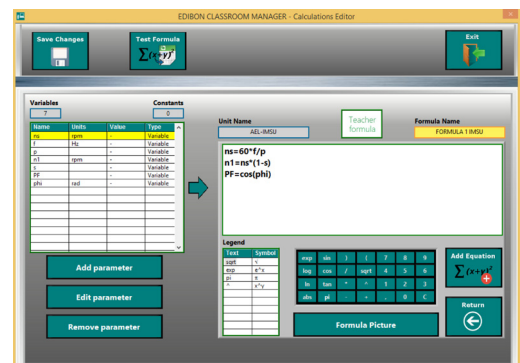
ECM-SOF is the application that allows the Instructor to register students, manage and assign tasks for workgroups, create own content to carry out Practical Exercises, choose one of the evaluation methods to check the Student knowledge and monitor the progression related to the planned tasks for individual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

Innovative features:

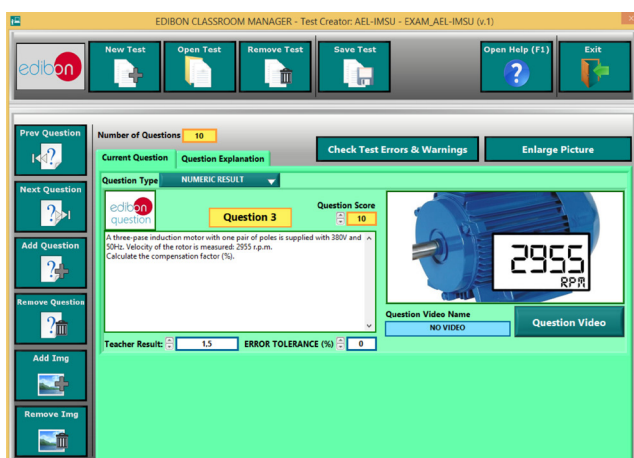
- User Data Base Management.
- Administration and assignment of Workgroup, Task and Training sessions.
- Creation and Integration of Practical Exercises and Multimedia Resources.
- Custom Design of Evaluation Methods.
- Creation and assignment of Formulas & Equations.
- Equation System Solver Engine.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



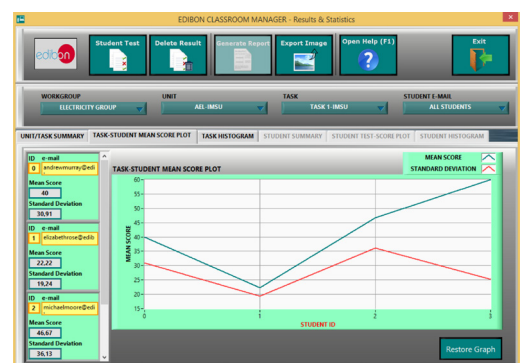
ECM-SOF. EDIBON Classroom Manager (Instructor Software) Application Main Screen



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:

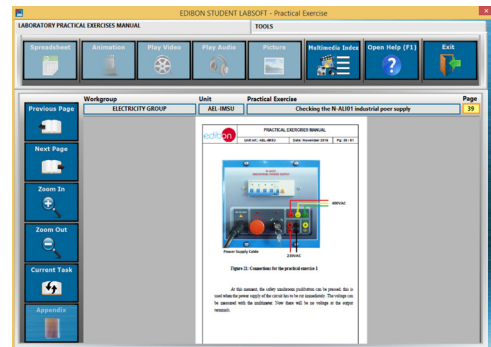
- Student Log-In & Self-Registration.
- Existing Tasks checking & Monitoring.
- Default contents & scheduled tasks available to be used from the first session.
- Practical Exercises accomplishment by following the Manual provided by EDIBON.
- Evaluation Methods to prove your knowledge and progression.
- 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:

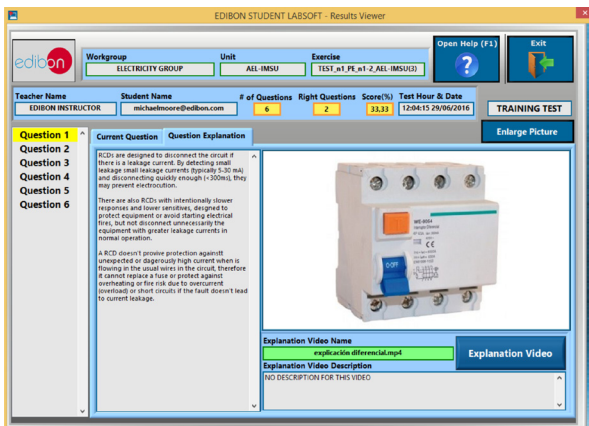
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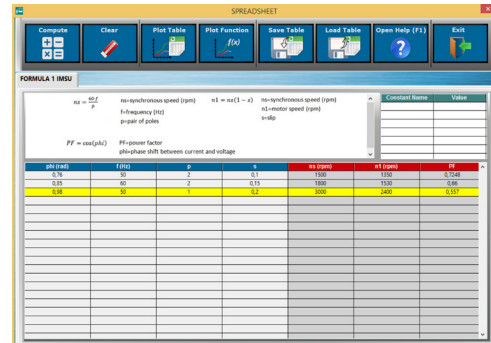
ESL-SOF. EDIBON Student LabSoft (Student Software)
Application Main Screen



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:

