Brushless Motor Industrial Application

Engineering and Technical
Teaching Equipment

Example of "AE-BMI" configuration with required element BMI-K1

INTRODUCTION

Motion technology plays an important role in the industry, representing one of the main branches of automation. This technology has applications from the most basic industrial processes, such as simple positioning systems, to the most complex systems, such as those related to robotics or aerospace engineering.

One of the common systems in the motion technology is the brushless motor control system. The brushless motor control systems are designed to control the position of an automatic system with motion. This functionality allows the fully automatic operation of tools, machinery, transport systems, handling systems etc., obtaining precise and efficient operations.

The Brushless Motor Industrial Application, "AE-BMI", has been designed by EDIBON to study the brushless motor control system with a real application. The "AE-BMI" application has available applications that contain real industrial systems, such as a linear axis system or a motor with a braking system.

The Brushless Motor Industrial Application, "AE-BMI", is designed to perform the most common control used in the industry: the position control. The "AE-BMI" application allows the student to configure up to four positions with all the parameters involved when the system has to reach each of these positions: relative or absolute positioning, speed value, acceleration and deceleration of the system when it approaches the desired position, digital input signal to activate every position, setting the home position, etc.

The configuration is done through the software of the driver which controls the motor. Since "AE-BMI" is a computerized system, appart from using the computer to configure the movement parameters, it allows to visualize the state of the digital input and output signals, the speed response of the motor, the alarms state, the torque value, etc.

The "BMI-UB" is the base unit of the "AE-BMI". To work with the "BMI-UB" other required elements are necessary. The required elements available are real examples of motion control systems: a servomotor with adjustable brake and a servomotor with linear axis system. The base unit includes the driver, control system, to control the motor included in the additional application.

The "AE-BMI" also allows the student to work with a programmable logic controller, PLC. The PLC receives the signals of the different sensors installed in each additional application and controls the brushless motor system through digital and pulsed signals, allowing the addition of a PLC control to a brushless motor system.

The "BMI-UB" is the base unit of the "AE-BMI" application.

The elements included in the "BMI-UB" unit:

- N-ALI02. Domestic Main Power Supply Module.

- N-BMI-DRV. Brushless Motor Driver Module.

- N-MD-MT. Motor Driver Test Module.

Required elements (at least one required) (Not included):

- BMI-K1. Brushless Motor with Adjustable Brake.

- BMI-K2. Brushless Motor with Linear Axis.

Recommended additional elements (Not included):

- AE-PLC-PAN-UB. PANASONIC PLC Base Unit.

- AE-PLC-SIE-UB. SIEMENS PLC Base Unit.

- AE-PLC-OMR-UB. OMRON PLC Base Unit.

- AE-PLC-MIT-UB. MITSUBISHI PLC Base Unit.

- AE-PLC-AB-UB. ALLEN BRADLEY PLC Base Unit.

The application "AE-BMI" can be mounted on rack (option A) or on rail (option B):

Option A:

This application need the following rack:

- N-RACK-M.

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.

The elements included in the "BMI-UB" unit:

- **N-ALI02. Domestic Main Power Supply Module.**

    Supply voltage (single-phase): 230 VAC, 1PH + N.

    ON/OFF removable key.

    Output voltage connections:

    Two single-phase: 230 VAC.

    Single-phase supply hose with connecting plug.

    Differential magnetothermal 2 poles, 25 A, 30 mA AC 6 KA.

    Emergency stop push button.

N-ALI02

- **N-BMI-DRV. Brushless Motor Driver Module.**

    Supply voltage (single-phase): 220 VAC.

    Output power: 100 W.

    USB connector to PC.

    Position control through pulse width modulated signal (PWM).

    Encoder with a resolution of 288 pulses per revolution.

    Digital signals:

    Six digital inputs: the signal association and the position parameters are configured with the software. Each digital input channel has a green LED that indicates its state. Includes a ground terminal.

    Two digital outputs: the signal association and the functions are configured with the software. Each digital output channel has a green LED that indicates its state. Includes a ground terminal.

    Brushless motor control:

    Position control.

    Position control with defined speed value.

    Reset button for the driver. It has a LED that indicates its state.

    5 A fuse.

N-BMI-DRV

- **N-MD-MT. Motor Driver Test Module.**

    Supply voltage (single-phase): 220 VAC.

    Twenty digital signal generators:

    Ten switches.

    Ten push buttons.

    Each output has a green LED.

    Output voltage levels of 0 VDC and 24 VDC.

    Two pulse signal generators:

    Two encoders to generate a pulsed signal.

    Two analog signal generators:

    Two potentiometers.

    Output voltage range from 0 V to + 5 V.

    2 A fuse.

N-MD-MT

BMI-UB/CCSOF. Computer Control+Data Acquisition+Data Management Software.

    Compatible with actual Windows operating systems.

    The servomotor driver is connected to the PC by USB port.

    It allows two types of functions:

    Brushless motor driver setting and commissioning. Setting up to four position with all related parameters:

    Relative or absolute positioning.

    Speed value.

    Acceleration time.

    Deceleration time.

    Digital input signal.

    Set the home position.

    Torque limit value

    Etc.

    Monitoring and analysis:

    The software displays a time-dependent chart with all relevant signals related to the brushless motor to perform a complete analysis of the entire system: current position, current motor speed, setpoint position, setpoint speed, torque limit value, etc. The software also saves data for a later analysis.

    It also shows the configured alarms status, the digital input and output status, the configured parameters value, etc.
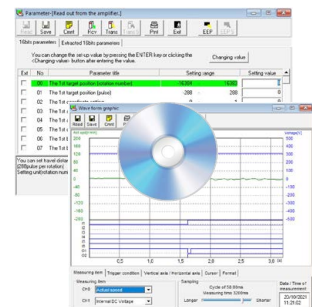
BMI-UB/CCSOF

Required elements (at least one) (Not included):

- BMI-K1. **Brushless Motor with Adjustable Brake.**

  The Brushless Motor with Adjustable Brake, "BMI-K1", contains the brushless motor with an adjustable brake system to configure different loads which can be controlled with the brake and the values set with the software and perform the position control under different circumstances. The servomotor also includes a position indicator to show the current position of the shaft.

  Specifications:

    Brushless motor:

      Nominal power: 100 W.

      Starting torque: 0.70 Nm.

      Nominal torque: 0.32 Nm.

      Nominal speed: 3000 rpm.

      Number of poles: 8.

      Encoder: 288 pulses per revolution used as absolute or incremental encoder.
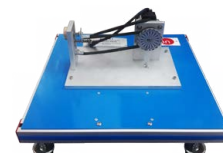
      Holding brake.

    Position indicator disc attached to the motor shaft.

    Adjustable brake: Prony Brake.

  Dimensions: 300 x 300 x 200 mm approx (11.81 x 11.81 x 7.87 inches approx.).

  Weight: 10 kg approx (22 pounds approx.).

BMI-K1

- BMI-K2. **Brushless Motor with Linear Axis.**

  The Brushless Motor with Linear Axis, "BMI-K2", contains the brushless motor attached to a linear axis system. The "BMI-K2" unit contains different loads to be attached to the carriage plate of the linear axis to perform the position control of a linear axis system under different circumstances. The linear axis also contains different position sensors to detect the current position of the linear axis system.

  Specifications:

    Brushless motor:

      Nominal power: 100 W.

      Starting torque: 0.70 Nm.

      Nominal torque: 0.32 Nm.

      Nominal speed: 3000 rpm.

      Number of poles: 8.

      Encoder: 288 pulses per revolution used as absolute or incremental encoder.

    Linear axis:

      Linear axis length: 600 mm.
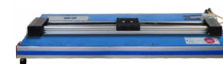
      Conveyor plate length: 100 mm.

      Four position sensors with 24 VDC power supply.

      Transmission system: toothed belt.

  Dimensions: 700 x 300 x 200 mm approx. (27.55 x 11.81 x 7.87 inches approx.).

  Weight: 16 kg approx. (35 pounds approx.).

BMI-K2

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

Exercises and practical possibilities to be done with the Brushless Motor with Adjustable Brake, "BMI-K1":

1.- Angular position control.

2.- Configuration of reference position (homing).

3.- Configuration of a position and activation through a digital input.

4.- Configuration of four positions and activation through digital inputs.

5.- Movement of the shaft associated to absolute positions.

6.- Movement of the shaft associated to relative positions.

7.- Configuration of movement sequences using different configurations modes.

8.- Graphs analysis of torque, position and velocity of the motor.

9.- Analysis of the torque limit.

Exercises and practical possibilities to be done with the Brushless Motor with Linear Axis, "BMI-K2":

10.- Angular position control of a linear axis system.

11.- Configuration of reference position (homing).

12.- Configure of a position and activate through a digital input.

13.- Configuration the acceleration and deceleration when the conveyor plate is close to the configured position.

14.- Configuration of the four positions and activate them through the digital inputs.

15.- Movement of a conveyor plate associated to absolute positions.

16.- Movement of a conveyor plate associated to relative positions.

17.- Configuration of movement sequences using different configuration modes.

18.- Graphs analysis of torque, position and velocity of the motor.

19.- Analysis of the torque limit.

- Several other exercises can be done and designed by the user.

REQUIRED SERVICES

- Electrical supply: single-phase 200 VAC – 240 VAC/50 Hz or 110 VAC – 127 VAC/60 Hz.
- Computer.

DIMENSIONS AND WEIGHTS

BMI-UB:
  - Dimensions: 640 x 320 x 670 mm approx.
                (25.19 x 12.59 x 26.37 inches approx.)
  - Weight: 20 kg approx.
                (44 pounds approx.)

REQUIRED ELEMENTS (Not Included)

Required (at least one):
  - BMI-K1. Brushless Motor with Adjustable Brake.
  - BMI-K2. Brushless Motor with Linear Axis.

RECOMMENDED ADDITIONAL ELEMENTS (Not included)

- AE-PLC-PAN-UB. PANASONIC PLC Base Unit.

- AE-PLC-SIE-UB. SIEMENS PLC Base Unit.

- AE-PLC-OMR-UB. OMRON PLC Base Unit.

- AE-PLC-MIT-UB. MITSUBISHI PLC Base Unit.

- AE-PLC-AB-UB. ALLEN BRADLEY PLC Base Unit.


SIMILAR UNITS AVAILABLE

Offered in this catalog:

- AE-BMI. Brushless Motors Industrial Application.

Offered in other catalogs:

- AE-SMI. Servomotors Industrial Application.

- AEL-SERIN/CA-1KW. 1 kW AC Industrial Servomotor Application.

- SERIN/CC. Computer Controlled Advanced Industrial Servosystem Unit (for DC Motors).

- SERIN/CCB. Servosystems Basic Unit for DC Motors.

- SERIN/CA. Computer Controlled Advanced Industrial Servosystems Unit (for AC Motors).

AE-BMI/ICAI. Interactive Computer Aided Instruction Software System:
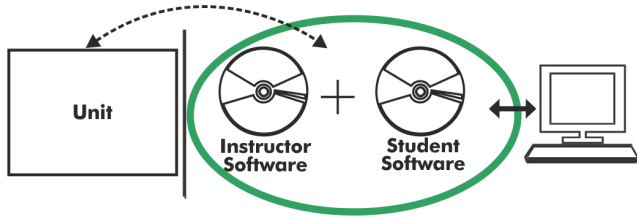
With no physical connection between unit and computer, **this complete software package consists of an Instructor Software (EDIBON Classroom Manager -ECM-SOF) totally integrated with the Student Software (EDIBON Student Labsoft -ESL-SOF).** Both are interconnected so that the teacher knows at any moment what is the theoretical and practical knowledge of the students.
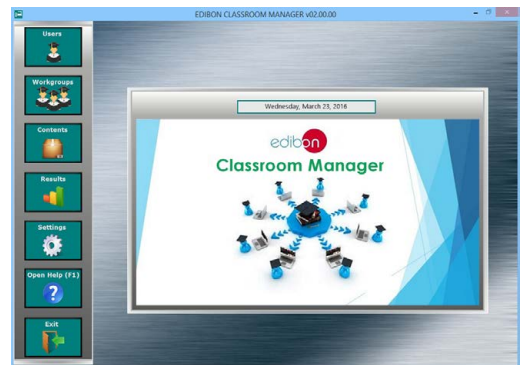
Instructor Software

- 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.
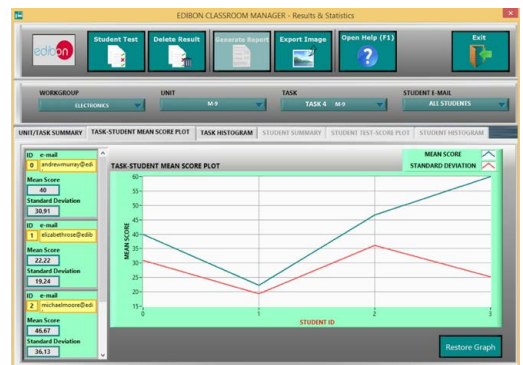- Report generation, User Progression Monitoring and Statistics.

ECM-SOF. EDIBON Classroom Manager (Instructor Software) Application Main Screen
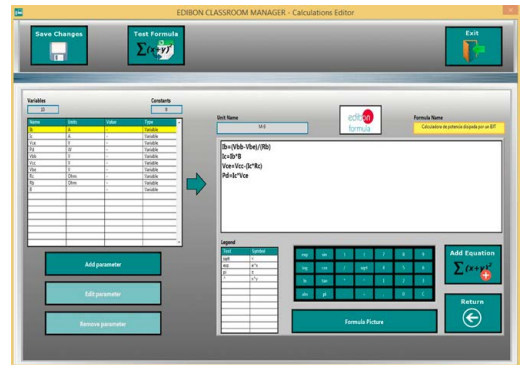
ECAL. EDIBON Calculations Program Package - Formula Editor Screen
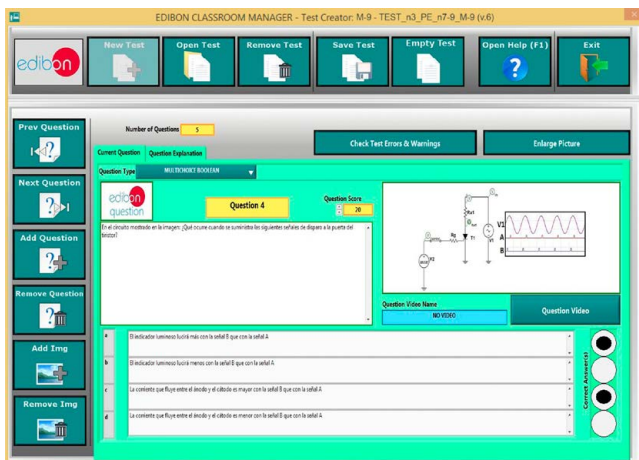
ETTE. EDIBON Training Test & Exam Program Package - Main Screen with Numeric Result Question

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

- 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.

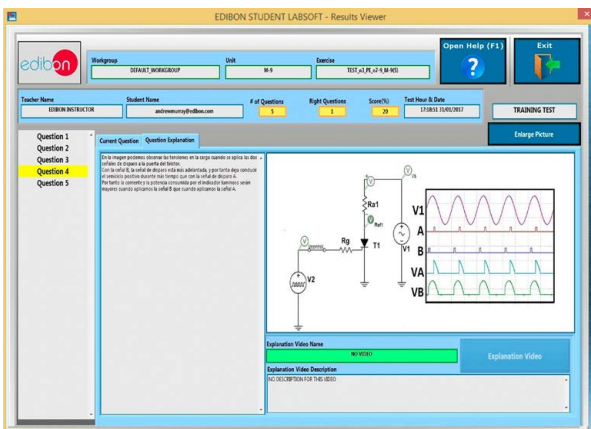- Multimedia-Supported auxiliary resources.

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

www.edibon.com/en/interactive-computer-aided-instruction-software
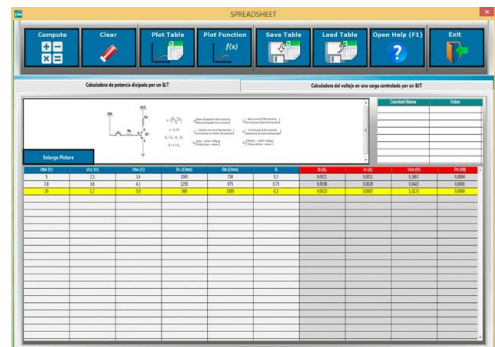

ESL-SOF. EDIBON Student LabSoft (Student Software)
Application Main Screen
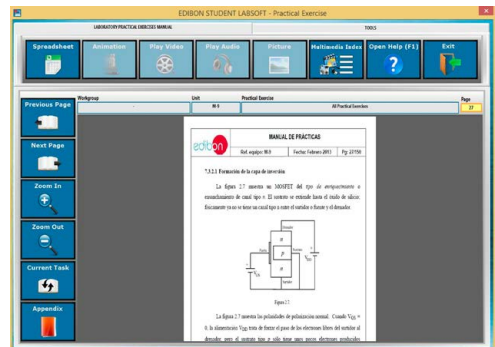
EPE. EDIBON Practical Exercise Program Package Main Screen

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.

REPRESENTATIVE:

C/ Julio Cervera, 10-12-14. Móstoles Tecnológico.
28935 MÓSTOLES. (Madrid). ESPAÑA - SPAIN.
Tel.: 34-91-6199363   Fax: 34-91-6198647
E-mail: edibon@edibon.com   Web: **www.edibon.com**

Edition: ED01/22
Date: December/2022