Brushless Motor Industrial Application

AE-BMI

① Unit: BMI-UB. Brushless Motor Base Unit

② **Additional** applications for working with the BMI-UB unit:

BMI-K1.
Motor sin Escobillas con Freno Ajustable

BMI-K2.
Brushless Motor with Linear Axis

Key features:

➢ **Open Control + Multicontrol + Real-Time Control.**

➢ **Projector and/or electronic whiteboard compatibility allows the unit to be explained and demonstrated to an entire class at one time.**

➢ **Capable of doing applied research, real industrial simulation, training courses, etc.**

➢ **Remote operation and control by the user and remote control for EDIBON technical support, are always included.**

➢ **Totally safe, utilizing 4 safety systems (Mechanical, Electrical, Electronic & Software).**

➢ **Designed and manufactured under several quality standards.**

➢ **Optional ICAI software to create, edit and carry out practical exercises, tests, exams, calculations, etc. Apart from monitoring user's knowledge and progress reached.**

➢ **This unit has been designed for future expansion and integration. A common expansion is the EDIBON Scada-Net (ESN) System which enables multiple students to simultaneously operate many units in a network.**

**OPEN CONTROL
+
MULTICONTROL
+
REAL TIME CONTROL**

For more information about Key Features, click here

www.edibon.com
➥PRODUCTS
➥6.- MECHATRONICS, AUTOMATION & COMPUMECHATRONICS

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 DC motor control system. The brushless DC 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 DC motor control system with a real application. The AE-BMI unit has available applications that contain real industrial systems, such as a linear axis system or a DC motor with a braking system.

GENERAL DESCRIPTION

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" unit 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 "AE-BMI" is a computerized system. The computer is used to configure and monitor the response and state of the brushless DC motor control system, allowing the visualization of the current position and speed in a customizable time-dependent chart, the state of the digital input and output signals, the current position setting, the alarms state, the torque limit value, etc.

The "BMI-UB" is the base unit of the "AE-BMI", and there is a wide range of additional applications available, being at least one of them required to work with the "BMI-UB". The additional applications available are real examples of motion control systems: a servomotor with adjustable brake and a servomotor with linear axis system.

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 DC motor system through digital and pulsed signals, allowing the addition of a PLC control to a brushless DC motor system.

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

- N-ALI02. Domestic Main Power Supply.

- N-BMI-DRV. Brushless Motor Driver.

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

Required element to operate with the "BMI-UB" unit:

- AEL-PC. Touch screen and computer or PC. PC to work with the equipment.

At least one of the following elements is required to work with the "BMI-UB" unit:

- BMI-K1. Brushless Motor with Adjustable Brake.

- BMI-K2. Brushless Motor with Linear Axis.

Recommended elements to increase the functionality of the "BMI-UB" unit:

- 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.

With this unit there are several options and possibilities:
- Main items: 1, 2, 3 and 4.
- Optional items: 5, 6 and 7.

Let us describe first the main items (1 to 4):

① **BMI-UB. Unit.**

BMI-UB. **Brushless Motor Base Unit,** is composed by the following modules:

• N-ALI02. **Domestic Power Supply.**

Supply voltage (single-phase): 220 VAC, PH+N+G.

ON-OFF removable key.

Output Voltage Connections:

Two Single-Phase: 220 VAC.

Single-Phase supply wire connecting plug.

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

N-ALI02

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

Supply voltage (single-phase): 220 VAC PH+N+G.

Output power: 50 W.

USB connector to PC.

Low electromagnetic interference.

Position control through PWM signal.

Encoder with a resolution of 288 pulses per revolution.

Digital signals:

Four 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.

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.

Brushless DC motor control:

Position control.

Position control with defined speed value.

N-BMI-DRV

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

Supply voltage (single-phase): 220 VAC PH+N+G.

Ten Digital Signal Generators:

Five Switches.

Five Push buttons.

Every output has a green LED.

Output voltage levels of 0 VDC and 24 VDC.

One pulse signal generator:

One Encoder to generate a pulsed signal.

Three Analog Signal Generators:

Three potentiometers.

Output Voltage range from 0 V to +10 V.
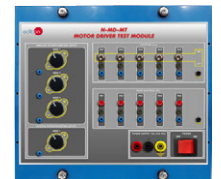
N-MD-MT

①.₁ **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 DC 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 DC 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.
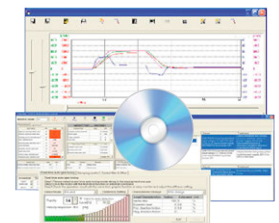
BMI-UB/CCSOF

② **Additional applications for working with the BMI-UB unit:**

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

The Brushless Motor with Adjustable Brake, "BMI-K1", contains the brushless DC motor with an adjustable brake system to configure different loads (measuring the braking force with a dynamometer) 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 DC motor:

   Nominal power: 50 W.

   Starting torque: 0.24 Nm.

   Nominal torque: 0.16 Nm.

   Nominal speed: 3000 r.p.m.

   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:

   Different configurable braking values.

   Analog dynamometer.

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 DC 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 DC motor:

   Nominal power: 50 W.

   Starting torque: 0.24 Nm.

   Nominal torque: 0.16 Nm.

   Nominal speed: 3000 r.p.m.

   Number of poles: 8.

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

  Linear axis:

   Linear axis length: 600 mm.

   Linear axis carriage: 100 mm.

   4 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

The complete unit includes as well:

Open Control + Multicontrol + Real-Time Control.

Projector and/or electronic whiteboard compatibility allows the unit to be explained and demonstrated to an entire class at one time.

Capable of doing applied research, real industrial simulation, training courses, etc.

Remote operation and control by the user and remote control for EDIBON technical support, are always included.

Totally safe, utilizing 4 safety systems (Mechanical, Electrical, Electronic & Software).

Designed and manufactured under several quality standards.

Optional ICAI software to create, edit and carry out practical exercises, tests, exams, calculations, etc. Apart from monitoring user's knowledge and progress reached.

This unit has been designed for future expansion and integration. A common expansion is the EDIBON Scada-Net (ESN) System which enables multiple students to simultaneously operate many units in a network.

③ **Cables and Accessories**, for normal operation.

④ **Manuals:**

This unit is **supplied with 7 manuals:** Required Services, Assembly and Installation, Control Software, Starting-up, Safety, Maintenance & Practices Manuals.

∗References 1 to 4 are the main items: BMI-UB + BMI-UB/CCSOF + Additional applications for working with the BMI-UB unit + Cables and Accessories + Manuals are included in the minimum supply for enabling normal and full operation.

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

1.-Brushless DC motor start/stop operation.
2.-Angular position control of a free shaft.
3.-Configuration of reference position. Homing.
4.-Configuration of a position and activation through a digital input.
5.-Configuration of four positions and activation through digital inputs.
6.-Move the shaft to absolute positions.
7.-Move the shaft to relative positions.
8.-Configuration of a sequence of movements.
9.-Analysis of the position and speed graphs.
10.-Analysis of the torque limit.

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

11.-Brushless DC motor start/stop operation.
12.-Angular position control of a linear axis system.
13.-Configuration of reference position. Homing.
14.-Configure of a position and activate through a digital input.
15.-Configure the acceleration and deceleration when the carriage is approaching to the configured position.
16.-Configure the four positions and activate them through the digital inputs.

17.-Move the carriage to an absolute position.
18.-Move the carriage to a relative positions.
19.-Configuration of a sequence of movements.
20.-Analysis of the position and speed graphs.
21.-Analysis of the torque limit.

Other possibilities to be done with this Unit:

22.- Many students view results simultaneously.
   To view all results in real time in the classroom by means of a projector or an electronic whiteboard.
23.-Open Control, Multicontrol and Real Time Control.
   This unit allows intrinsically and/or extrinsically to change the span, gains; proportional, integral, derivative parameters; etc, in real time.
24.-The Computer Control System allows a real industrial simulation.
25.-This unit is totally safe as uses mechanical, electrical/electronic, and software safety devices.
26.-This unit can be used for doing applied research.
27.-This unit can be used for giving training courses to Industries even to other Technical Education Institutions.
- Several other exercises can be done and designed by the user.

REQUIRED SERVICES

- Electrical supply: single phase, 220V/50 Hz or 110V/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.)

ADDITIONAL APPLICATIONS (Not included)

- BMI-K1. Brushless Motor with Adjustable Brake.

- BMI-K2. Brushless Motor with Linear Axis.

- AE-PLC-PAN. PANASONIC PLC Application.

- AE-PLC-SIE. SIEMENS PLC Application.

- AE-PLC-OMR. OMRON PLC Application.

- AE-PLC-MIT. MITSUBISHI PLC Application.

- AE-PLC-AB. ALLEN BRADLEY PLC Application.

AVAILABLE VERSIONS

Offered in this catalogue:

- AE-BMI. Brushless Motor Industrial Application.

Offered in other catalogue:

- AE-SMI. Servomotors Industrial Application.

Additionally to the main items (1 to 4) described, we can offer, as optional, other items from 5 to 7.

All these items try to give more possibilities for:

    a) Technical and Vocational Education configuration. (ICAI)

    b) Multipost Expansions options. (MINI ESN and ESN)

a) Technical and Vocational Education configuration

⑤ AE-BMI/ICAI. Interactive Computer Aided Instruction Software System.

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.

This software is optional and can be used additionally to items (1 to 4).

- 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.**

- 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.**

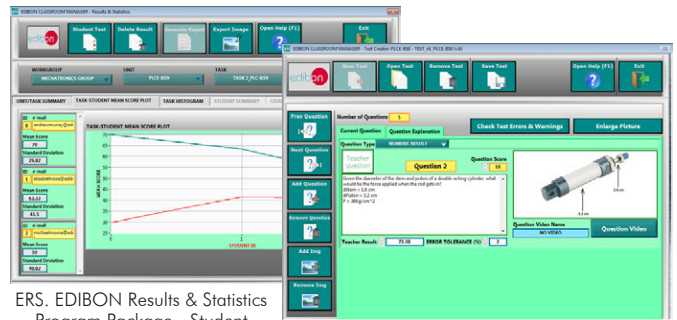For more information see **ICAI** catalogue. Click on the following link:

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

Instructor Software
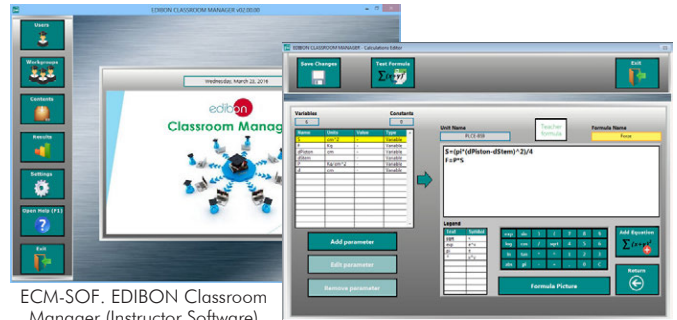
ECM-SOF. EDIBON Classroom Manager (Instructor Software) Application Main Screen
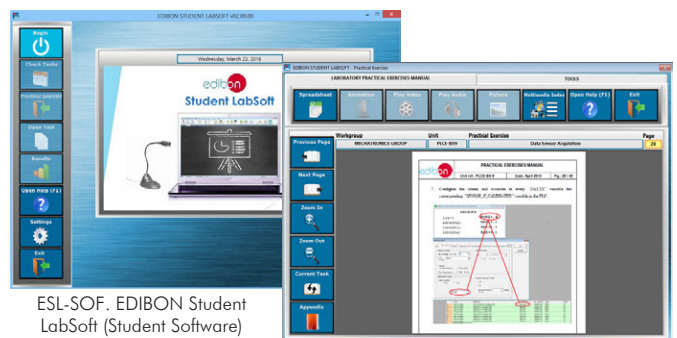
ECAL. EDIBON Calculations Program Package - Formula Editor Screen

ERS. EDIBON Results & Statistics Program Package - Student Scores Histogram
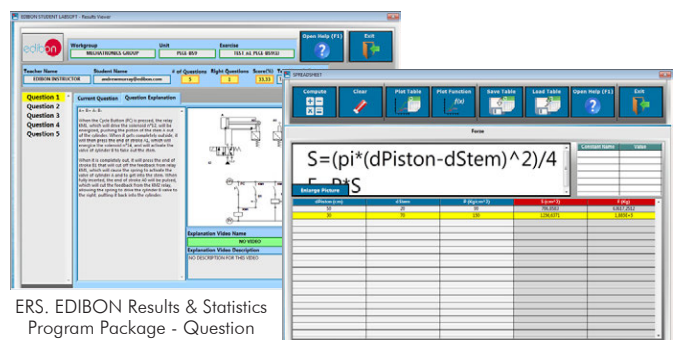
ETTE. EDIBON Training Test & Exam Program Package - Main Screen with Numeric Result Question

Student 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

Complete Technical Specifications (for optional items)

<u>b) Multipost Expansions options</u>

⑥ **MINI ESN. EDIBON Mini Scada-Net System for being used with EDIBON Teaching Units.**

MINI ESN. EDIBON Mini Scada-Net System allows up to 30 students to work with a Teaching Unit in any laboratory, simultaneously. It is useful for both, Higher Education and/or Technical and Vocational Education.

The MINI ESN system consists of the adaptation of any EDIBON Computer Controlled Unit with SCADA integrated in a local network.

This system allows to view/control the unit remotely, from any computer integrated in the local net (in the classroom), through the main computer connected to the unit. Then, the number of possible users who can work with the same unit is higher than in an usual way of working (usually only one).

<u>Main characteristics:</u>

- It allows up to 30 students to work simultaneously with the EDIBON Computer Controlled Unit with SCADA, connected in a local net.
- Open Control + Multicontrol + Real Time Control + Multi Student Post.
- Instructor controls and explains to all students at the same time.
- Any user/student can work doing "real time" control/multicontrol and visualisation.
- Instructor can see in the computer what any user/student is doing in the unit.
- Continuous communication between the instructor and all the users/students connected.

<u>Main advantages:</u>

- It allows an easier and quicker understanding.
- This system allows you can save time and cost.
- Future expansions with more EDIBON Units.

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

www.edibon.com/en/files/expansion/MINI-ESN/catalog

MINI ESN.
EDIBON Mini Scada-Net System

Brushless Motor Industrial Application (AE-BMI)

1 UNIT= up to 30 STUDENTS can work simultaneously

Software for:
- Computer Control
- Data Acquisition
- Data Management

Instructors' Central Computer

Mini Scada-Net Software

LOCAL NET FOR 30 STUDENTS

OPEN CONTROL
+
MULTICONTROL
+
REAL TIME CONTROL
+
MULTI STUDENT POST

Note: The MINI ESN system can be used with any EDIBON computer controlled unit

⑦ **ESN. EDIBON Scada-Net Systems.**

This unit can be integrated, in the future, into a Complete Laboratory with many Units and many Students.

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

www.edibon.com/en/files/expansion/ESN/catalog
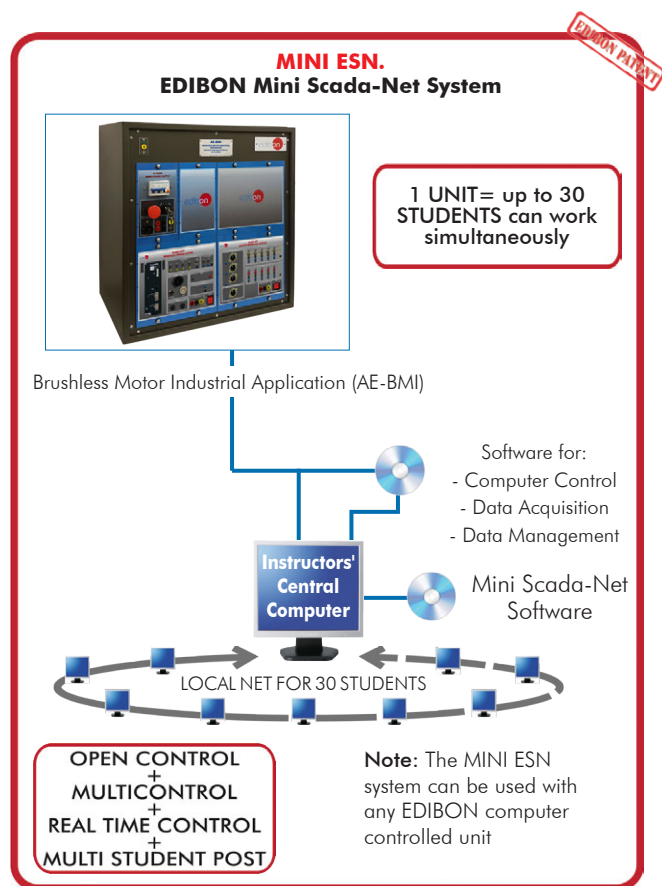
Main items (always included in the supply)

Minimum supply always includes:

① Unit: BMI-UB. Brushless Motor Base Unit.

  ①.¹ BMI-UB/CCSOF. Computer Control + Data Acquisition + Data Management Software.

② Additional applications for working with the BMI-UB unit:

  ②.¹ BMI-K1. **Brushless Motor with Adjustable Brake.**

  ②.² BMI-K2. **Brushless Motor with Linear Axis.**

③ Cables and Accessories, for normal operation.

④ Manuals.

*IMPORTANT: Under AE-BMI we always supply all the elements for immediate running as 1, 2, 3 and 4.

Optional items (supplied under specific order)

a) Technical and Vocational Education configuration

⑤ AE-BMI/ICAI. Interactive Computer Aided Instruction Software System.

b) Multipost Expansions options

⑥ MINI ESN. EDIBON Mini Scada-Net System for being used with EDIBON Teaching Units.

⑦ ESN. EDIBON Scada-Net Systems.

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

REPRESENTATIVE: