ElettronicaVeneta

CATALOGUE No. 23-C

ELECTRICAL ENGINEERING

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CATALOGUE No. 23-C

ELECTRICAL ENGINEERING

Electrical Engineering

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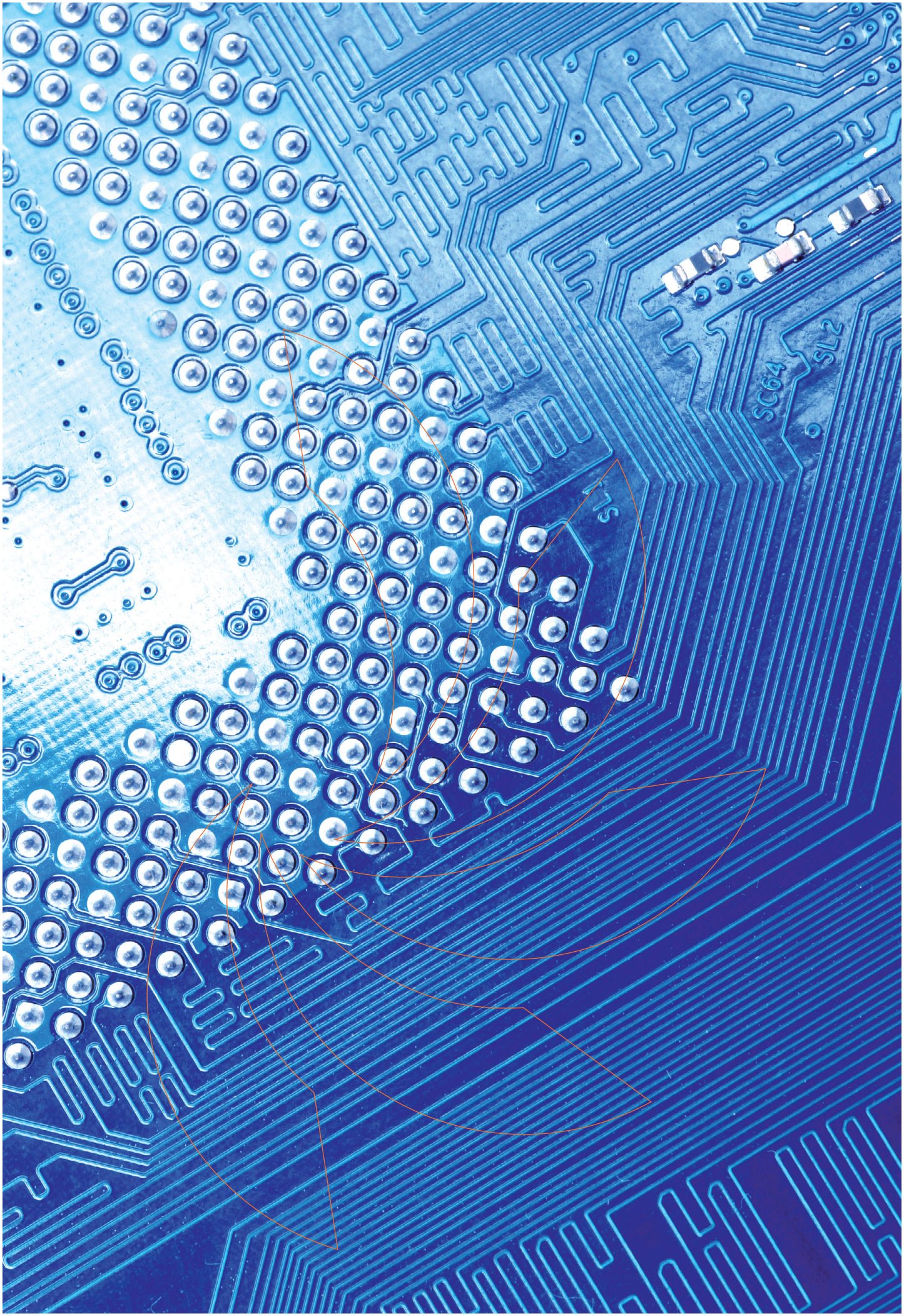
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ELECTRICAL ENGINEERING
CATALOGUE No. 23-C

INDEX

LABORATORY OF ELECTRIC MACHINES

INTRODUCTION TO ELECTRIC MACHINES

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The following topics:

- **Generation, Distribution and Consumption of Electric Power**
- **Protection, Control and Management of Electric Power**
- **Semiconductors and Power Electronics**
- **Electronic drives for AC/DC motors**
- **Advanced applications of Electric power**

are included in the Catalogue no. 44-A - Electric Power.

Note: The catalog is constantly updated. Please send any suggestion you have to export@elettronicaveneta.com. We would also like to remind you that, due to the continuous technological upgrades, the described products may be subjected to design and/or technical modifications. Nevertheless, we guarantee that the educational content of our equipment remains unchanged.

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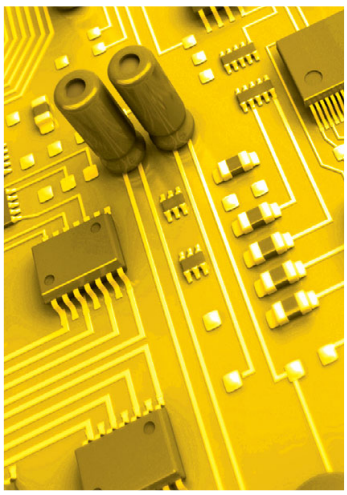
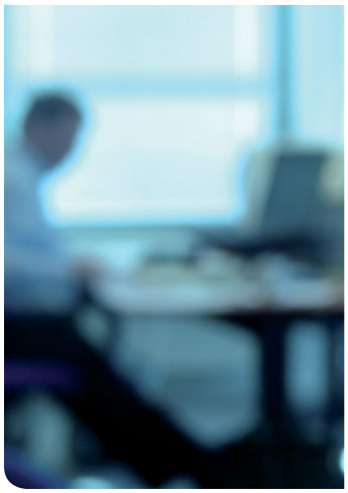
GENERAL INTRODUCTION

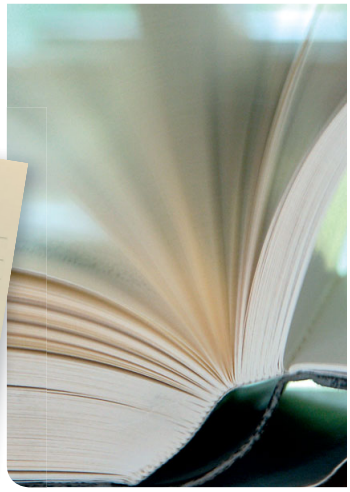




ELETTRONICA VENETA S.p.A. has been designing and manufacturing educational equipment since 1963. This equipment, covering the different fields of technology, fulfils two important educational objectives:

- to facilitate the learning process of the student by means of real systems which illustrate practically the important aspects of the theory learned in the classroom.
- to simplify the work of the teacher enabling the demonstration of the real, practical applications of the theory learned.

Increasing the efficiency of the didactic process improves and simplifies the integration of young students into the world of employment and justifies the material and human investments made in schools throughout the world.



ELETTRONICA VENETA S.p.A. operates on an international level and takes into consideration the training programmes and cultures of each specific country. In order to meet different requirements, we offer flexible systems which ensure maximum compliance with the latest technologies, technological advances and the professional profile requirements of local industry.

The proposed laboratories and training equipment are suitable for regular school education as well as ongoing post-diploma training courses and professional re-qualification.

Our training equipment covers most of the technological sectors included in the training programmes of vocational schools, technical institutes and universities, both national and international.

ELETTRONICA VENETA S.p.A. headquarters is located in the green fields of the Veneto region, not far from Venice, and constitute a centre for equipment design and development suited to the training needs of all professional and technical profiles. The modern premises integrates R&D laboratories, a production plant and a fully equipped teacher training centre.

The integration of these efficient training systems into local school structures ensures high-quality, state-of-the-art training programmes which meet the diverse professional expectations of the student and the technological requirements of industry and research within their specific local contexts.

The ISO 9001 (Quality System Certification) obtained in 1998 and updated in application of the latest edition of the International Standard, is further testament to the quality-driven organisation of **ELETTRONICA VENETA S.p.A.** aimed at providing top standard equipment, training and service.

PRESENTATION

This branch of technology had made use of electromechanical techniques since some decades ago; at present electronic technologies have deeply permeated electric systems, machine control and electric servomechanisms.

PLC applications, microprocessor control, management and supervision systems, BUS techniques for home automation and intelligent buildings are integral part of the new electric systems of distribution, control and use of electric power.

All that leads to the need of a new knowledge based on advanced technologies and components; consequently training demands flexible and modular training systems being able to adapt to diversified and varying requirements.

ELETTRONICA VENETA S.p.A. has developed systems and solutions for training and research answering this purpose perfectly: in fact the apparatuses produced enable educational institutions to plan the teaching of all the topics concerning electric technologies, from a practical/experimental point of view.

The solutions proposed in this catalogue range from basic electricity to practical wiring and electro-mechanical constructions, including civil and industrial installations and measurements on electrical machines.

The offer of equipment produced by ELETTRONICA VENETA S.p.A. for Laboratories of ELECTRICAL ENGINEERING consists of four product lines:

- **DEMONSTRATION PANELS FOR TEACHERS**
- **MODULAR SYSTEMS FOR LABORATORY ACTIVITIES**
  (DESIGN AND TESTING)
- **BENCHES AND KITS FOR PRACTICAL ACTIVITIES**
  (ASSEMBLING AND WIRING)
- **MULTIMEDIA SOFTWARE AND FURNISHINGS**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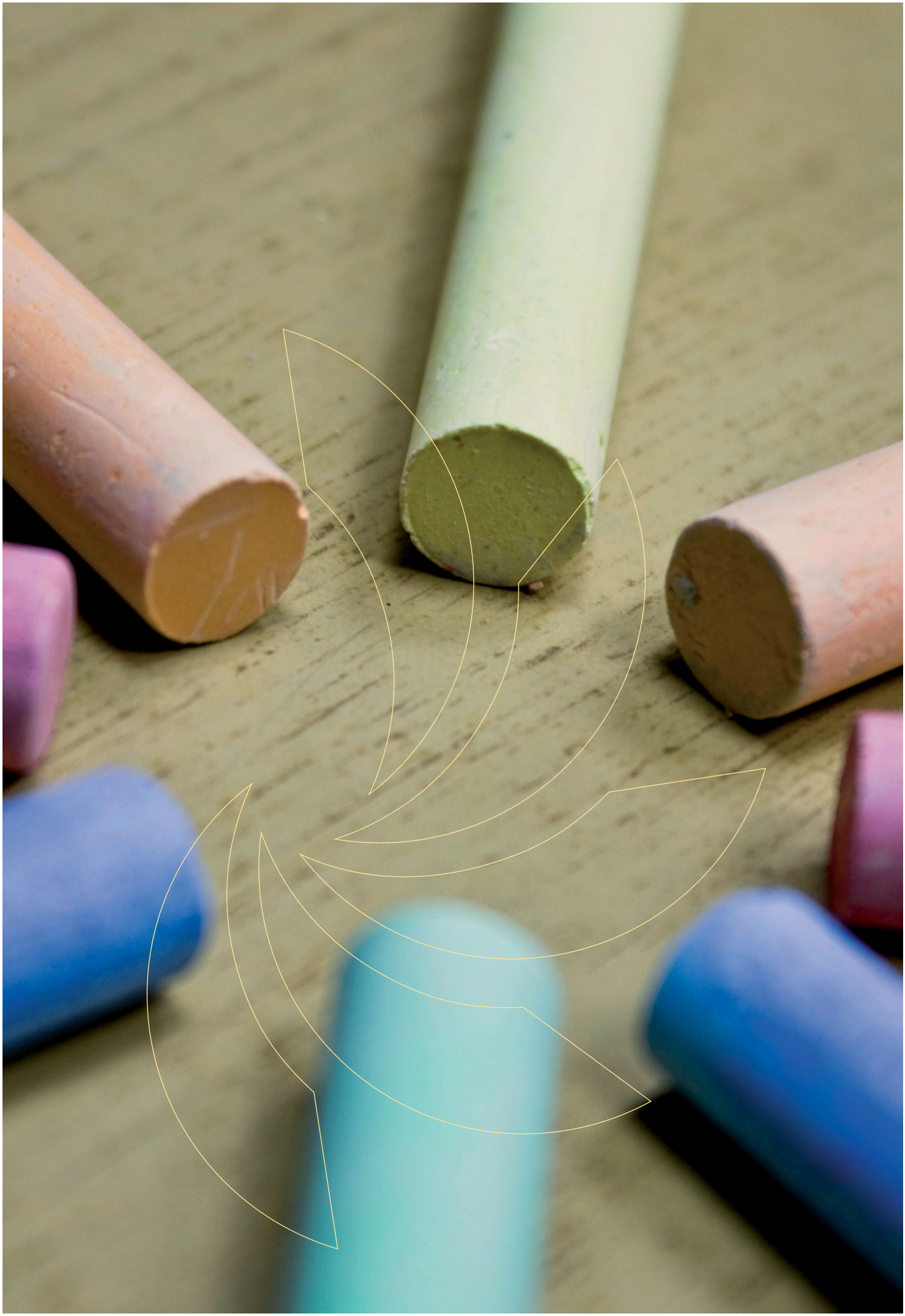

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DEMONSTRATION PANELS FOR TEACHERS

Aim:

- Aid for teachers' taught classes with clear schematic diagrams of installations and use of actual components assembling installations wired according to regulations
- Practical group activities of students

Equipment:

- Demonstration panels for electrical installations
- Demonstration panels for domestic installations
- Demonstration panels for industrial installations

SECTION INDEX

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DEMONSTRATION PANELS FOR TEACHERS

INTRODUCTION

Elettronica Veneta S.p.A. presents a wide range of Demonstration panels provided with actual components (thus perfectly operating) and manufactured according to the rule of art in compliance with the technical standards and with the acts in force in the various application sectors such as distribution and use of electric power.

The actual electric devices of each panel, installed and already connected with each other, enable to deal with various types of installation, with detailed descriptions.

These panels enable to check the operation referred to the type of installation under examination, to carry out and analyze the electrical connections for ensuring safety, to make visual checks and to apply the measuring techniques with conventional electric instruments.

Particular care has been reserved to silk-screen-printing for representing the used devices with standardized international symbols and the electric block diagrams with reference to topographic layout. If necessary, educational terminals with high protection degree against accidental contacts are marked with the test points for electric testing.

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DEMONSTRATION PANELS FOR ELECTRICAL INSTALLATIONS

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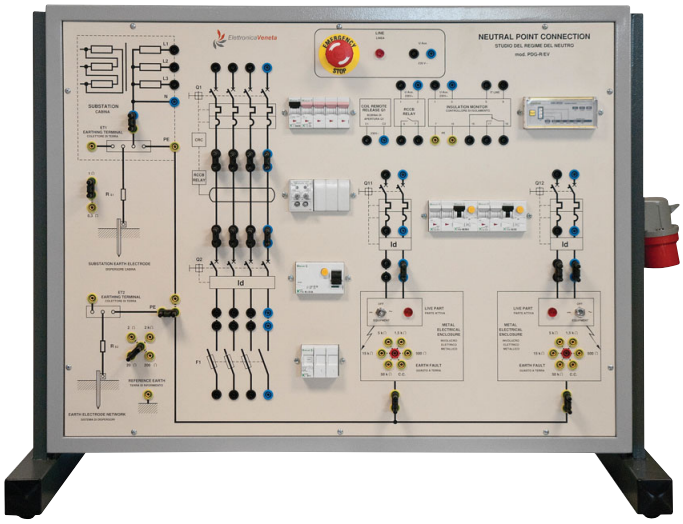
DEMONSTRATION PANEL FOR THE STUDY AND TESTING ON DISTRIBUTION SYSTEMS (position of neutral conductor)

Mod. PDG-R/EV

INTRODUCTION

This panel can be used by teachers for their lessons and by students for an easy learning and testing the connection position of neutral conductor in low-voltage distribution systems. The actual electrical components of the equipment connected with educational terminals of high protection level against accidental contacts allow to assemble the various configurations and to make a visual check of the operation, besides carrying out the tests with traditional instruments.

The fore panel is made of insulating material and it represents the support for the necessary devices for carrying out the testing programme. The apparatuses are represented on the panel with their standardized international symbols. The field of application of these devices includes both civil installations and those of business and/or production (craft-industrial) sectors.



TRAINING PROGRAM:

This panel is designed to study the distribution systems of electric power with reference to the main topics indicated here below:

- TT, TN and IT systems
- Protection against direct contacts by earthing, electric separation, differential circuit breaker
- Protection against overcurrents, selectivity in protection devices
- Earthing system and conductors
- Natural and artificial earth plates
- Supervision of insulation resistance in systems isolated from earth (IT)
- Suitability of materials and equipment
- Protection and breaking devices

Furthermore this panel enables to carry out the following testing and measurements with instruments:

- Identification of neutral and earth conductors
- Measurement of insulation resistance
- Measurement of earth resistance
- Continuity tests of protection conductors
- Analyzing the functionality of differential breakers
- Measurement of resistance/impedance of fault loop
- Measurement of first earth fault current in isolated systems

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TECHNICAL SPECIFICATIONS:

Framework is made of sheet steel chemically treated and painted with several coats of epoxy varnish; its base is provided with rubber feet and it can be positioned on a working top. All the necessary electric components for the correct power supply of circuits are included in the panel.

Here are the main components installed and accessible, electrically, via safety terminals for plugs with diameter of 4 mm:

- 1 three-phase insulation transformer – 230-400 V / 230-400 V; 1500 VA
- 1 differential circuit breaker – 4 x 6 A; curve C with minimum voltage releasing coil, stop/emergency button with mechanic holding and signalling LED on operation panel
- 1 power line of 230 Vac -1 A for powering auxiliary devices
- 1 three-pole lever selector for inserting two different values of capacitance to earth in IT line
- 1 simulation of substation earthing with resistances of 0.3 Ω, 1 Ω
- 1 simulation of earth plate with resistances of 2 Ω, 20 Ω, 200 Ω, 2 kΩ
- 2 simulators of power consuming devices with sinusoidal or unidirectional earth fault current; fault resistance of 50 kΩ, 15 kΩ, 5 kΩ, 1.5 kΩ, 500 Ω, bolted fault
- 1 monitor for checking the isolation in IT systems with adjustment of the value of tripping sensitivity, and scale for monitoring the instantaneous value of insulation resistance of the installation
- 1 differential circuit breaker 4 x 2 A, curve C, provided with remote opening current start-up coil
- 1 four-pole differential circuit breaker of 25 A / 0.3 A, class A, "S" selective
- 1 set of three fuse holders, with breakable neutral conductor and fuses 10.2 x 38 of 1 A and 2 A
- 1 automatic magnetothermal differential switch 2 x 1 A, curve C, class AC, with possibility of using the only magnetothermal switch without the differential part
- 1 automatic magnetothermal differential switch 2 x 1 A, curve C, class A, with possibility of using the only magnetothermal switch without the differential part
- 1 differential relay coupled to a toroidal transformer with adjustable current Idn and tripping time

Dimensions of demonstration panel: 800 x 600 mm
Dimensions of framework: 840 x 450 x 680 mm
Net weight: 45 kg

SUPPLIED ACCESSORIES:

- Three-phase power cord (of 5 m) with EEC socket and plug
- 20 jumpers with safety plugs (Ø 4 mm) for assembling the various installation configurations
- Mixed set of 20 cables with safety plugs with diameter of 4 mm

RECOMMENDED ACCESSORIES:

- Multi-function microprocessor instrument for electric testing
- Digital current probe for measuring rated and stray currents
- Digital autoranging multimeter

POWER SUPPLY:

3 x 400 V / N / PE 50-60 Hz
Max. absorption: 1500 VA

THEORETICAL-EXPERIMENTAL HANDBOOKS

Application handbook with exercises.

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DEMONSTRATION PANEL FOR THE STUDY OF THE PROTECTION DEVICES FOR SAFETY AND CONTINUITY OF ELECTRIC POWER SUPPLY

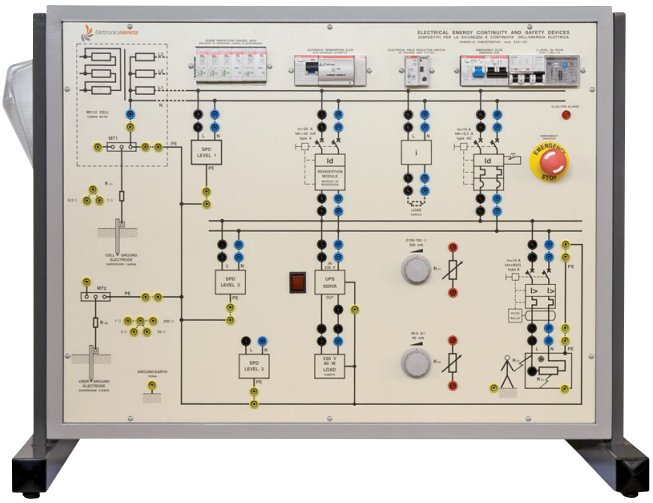
Mod. SCE-1/EV

INTRODUCTION

This panel can be used by teachers for their lessons and by students for an easy learning and testing on actual protection electric devices that ensure the safety of both people and system, besides the continuity and quality of electric power to power consuming devices. The panel supplies means for verifying the rule of art and the relevant technical standards.
The various electrical devices installed, connected partially with each other and with safety terminals, become operating with very simple and fast operations, offering the possibility of creating, modifying and checking the safety devices of the installation.

The panel is made of insulating material and it represents the support for the necessary devices for carrying out the testing programme.

The apparatuses are represented on the panel with their standardized international symbols and, when necessary, test points correspond to standardized educational terminals with high protection degree against accidental contacts.



TRAINING PROGRAM:

This panel includes some innovatory electric devices for the protection of people and of installations against the effects of electric current that ensure continuity of power availability, besides safety of people. The field of application of these devices includes both civil installations and those of business and/or production (craft-industrial) sectors.

Main topics dealt with:

- Protection by earthing
- Protection by differential circuit breaker, automatic reset
- Protection by differential circuit breaker, emergency stop in positive safety
- Protection by differential circuit breaker, double sensitivity
- Switch for reducing electric fields (bio switch)
- Coordination of antijamming protection devices (overvoltage limiter, SPD) at several levels
- Uninterruptible Power Supply (UPS) for single-phase lines

These devices can be used and studied one by one, or in coordination with each other.

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TECHNICAL SPECIFICATIONS:

Framework is made of sheet steel chemically treated and painted with several coats of epoxy varnish; its base is provided with rubber feet and it can be positioned on a working top.
All the necessary electric components for the correct power supply of circuits are included in the panel.

Main components installed:

- 1 differential circuit breaker; Idn = 30 mA; type A; with devices of automatic reset
- 1 magnetothermal differential circuit breaker; In = 1 A; curve [C]; Idn = 0.3 A; type AC; with emergency stop circuit in positive safety
- 1 power line of 230 Vac -1 A for powering auxiliary devices
- 1 magnetothermal differential circuit breaker of double sensitivity; In = 10 A; curve [C]; Idn = 30/200 mA; type AC
- 1 switch for reducing electric fields (bio switch)
- 3 antijamming protection devices (overvoltage limiters, SPD with current of 15 – 40 – 65 kA)
- 1 Uninterruptible Power Supply (UPS) for single-phase with output rated current of 500 VA at 230 V
- 1 single-phase isolation transformer of 230 / 230 V 500 VA
- 1 simulator of user earth resistance of 1, 2, 20, 200 Ω
- 1 simulator of earth fault adjustable between 5 and 35 mA
- 1 simulator of earth fault adjustable between 100 and 300 mA

Dimensions of demonstration panel: 800 x 600 mm
Dimensions of framework: 840 x 450 x 680 mm
Net weight: 40 kg

SUPPLIED ACCESSORIES:

- 1 single-phase power cord with UNEL plug
- 1 set of cables and jumpers with safety plugs (Ø 4 mm)

RECOMMENDED ACCESSORIES:

- Multi-function microprocessor instrument for statutory electric testing
- Digital current probe for measuring rated and stay currents
- Digital autoranging multimeter

POWER SUPPLY:

230 V / PE 50-60 Hz
Max. absorption: 500 VA

THEORETICAL-EXPERIMENTAL HANDBOOKS

Application handbook with exercises.

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23-C

ELECTRICAL ENGINEERING

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23C-E-DP

23-C

DEMONSTRATION PANELS FOR DOMESTIC ELECTRICAL INSTALLATIONS

DEMONSTRATION PANEL FOR THE ELECTRIC TESTING CARRIED OUT IN A BUILDING

Mod. PDG-1/EV

INTRODUCTION

This panel can be used by teachers for their lessons and by students for an easy learning and testing on electrical prevention systems supplying them with the means for verifying the rule of art and the relevant technical standards.
Actual electrical devices installed, already connected with each other, enable to check the operation, besides carrying out the measurements of all the electric parameters with conventional instruments.
The panel is made of insulating material and it represents the support of the necessary devices for carrying out the testing programme.
The apparatuses are represented on the panel with their standardized international symbols and electrical block diagram, for an easy reference with their lay-out.
Furthermore, when necessary, test points correspond to standardized educational terminals with high protection degree against accidental contacts.

TRAINING PROGRAM:

This panel can be used to define the electrical installations of a building (power distribution via TT system) with reference to the following topics:

- Design documents complying with CEI standard 0-2; predesign, definite project
- Electrical installation of the building complying with CEI guide 64-50 2nd edition
- Graphic symbols for installation plans
- Branch exchange for a flat
- Meter room and riser
- Earthing system for the block of flats

Furthermore, this panel is designed to deal with topics, visual checks, tests concerning:

- Protection systems against direct and indirect contacts
- Choice of conductors, current-carrying capacity and voltage drop
- Testing the paths of conductors and their suitability and duct diameter and removableness of conductors
- Suitability of materials and of equipment
- Protection and breaking devices
- Identification of neutral and earth conductors
- Suitability of the connections of conductors
- Continuity of protection and equipotential conductors
- Isolation resistance

TECHNICAL SPECIFICATIONS:

Framework is made of sheet steel chemically treated and painted with several coats of epoxy varnish; its base is provided with rubber feet and it can be positioned on a working top.
All the necessary electric components for the correct power supply of circuits are included in the panel.

Main components installed:

- 1 single-phase isolation transformer 230 V / 230 V 230 VA
- 2 simulators of earth plate with resistors of 2 Ω, 20Ω, 200 Ω, 2 kΩ
- 1 simulators of resistance of protection conductor with resistors of 0.1 Ω, 1 Ω
- 1 simulator of extraneous conducting part with resistances of 200 Ω, 1000 Ω, 5000 Ω
- 1 magnetothermal circuit breaker 2 x 2 A "C"
- 1 magnetothermal circuit breaker 2 x 1 A "C"
- 1 differential circuit breaker 2 x 1.6 A "C" / 30 mA "AC"
- 1 magnetothermal and differential circuit breaker 2x25 A/30 mA "A"
- 1 protection and control switch – 2P +Earth
- Two 2-pin sockets – 10/16 A, 2P + Earth
- 2 simulators of isolation earth fault in power consuming
- Device with resistors of 50 kΩ, 15 kΩ, 5 kΩ, 1500 Ω, 500 Ω, and bolted fault

Dimensions of demonstration panel: 800 x 600 mm
Dimensions of framework: 840 x 450 x 680 mm
Net weight: 33 kg

SUPPLIED ACCESSORIES:

- 1 single-phase power cord with UNEL plug
- 8 jumpers with safety plugs (Ø 4 mm) for assembling the various installation conditions

RECOMMENDED ACCESSORIES AND SOFTWARE:

- Multi-function microprocessor instrument for electric testing
- Digital current probe
- Digital autoranging multimeter
- Circuit design, simulation and animation software for electrical engineering projects - mod. SW-ELT/EV

POWER SUPPLY:

230 V / PE 50-60 Hz; Max. absorption: 250 VA

THEORETICAL-EXPERIMENTAL HANDBOOKS

Application handbook with exercises.

DEMONSTRATION PANEL FOR BUS SYSTEMS FOR INTELLIGENT BUILDINGS

Mod. PDG-4/EV

INTRODUCTION

This panel can be used by teachers for their lessons and by students for an easy learning and testing on (domotic) BUS systems supplying them with the means for verifying the rule of art and the relevant technical standards. Actual electrical devices installed, already connected with each other, enable to check the operation, besides carrying out the measurements of all the electric parameters with conventional instruments.

The panel is made of insulating material and it represents the support of the necessary devices for carrying out the testing programme. The apparatuses are represented on the panel with their standardized international symbols and electrical block diagram, for an easy reference with their lay-out.
Furthermore, when necessary, test points correspond to standardized educational terminals with high protection degree against accidental contacts.

TRAINING PROGRAM:

This panel can be used to define the innovatory electrical installations for the control of building with BUS typology, with reference to the following topics:

- Programming components for BUS
- Control devices
- ON/OFF actuators and dimmers
- Wireless control (infrared emitter/receiver)
- Presence detection
- Control and movement of blinds
- Closed-loop brightness control
- Heating control

TECHNICAL SPECIFICATIONS:

Framework is made of sheet steel chemically treated and painted with several coats of epoxy varnish; its base is provided with rubber feet and it can be positioned on a working top.
All the necessary electric components for the correct power supply of circuits are included in the panel.

Main components installed:

- 1 power supply unit for generating the Bus Line
- 2 connectors for shunting the Bus Line
- 2 data strips for connecting modular components
- 1 serial USB interface provided with bus coupler
- 1 two-channel pushbutton provided with bus coupler
- 3 interfaces for 4-channel bus coupler for switches / pushbuttons / limit switches with clean contacts
- 1 binary output 2x6 A 230 Vac, provided with bus coupler
- 1 presence detector, provided with bus coupler
- 1 infrared receiver
- 1 decoder for infrared receiver, provided with bus coupler
- 2 switches for blinds, with bus coupler and two blinds in miniature provided with window simulator
- 1 room thermostat, provided with bus coupler
- 1 brightness sensor, provided with bus coupler
- 1 universal dimmer actuator for incandescent lamps, provided with bus coupler
- 3 lamp sockets with lamps E14 230 V 35 W
- 1 lamp socket with lamp E14 230 V 2.6 W

Dimensions of demonstration panel: 800 x 600 mm
Dimensions of framework: 840 x 450 x 680 mm
Net weight: 33 kg

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SOFTWARE INDISPENSABLE (NOT INCLUDED)

Original **Design Software ETS (EIB Tool Software)** multilanguage edited by consortium Konnex, to be purchased separately.
This software enables to assign the specific functionality to the installation, as well as the starting and diagnosis of BUS devices. This software can be used with a personal computer (not included in the equipment) connected with the BUS system via USB interface.

SUPPLIED ACCESSORIES:

- 1 portable infrared transmitter of 4+4 channels
- 1 single-phase power cord with UNEL plug
- 1 cable for connection with PC
- 6 tables with application typologies of BUS system

ADDITIONAL COMPONENTS THAT CAN BE INSTALLED ON DEMAND:

Programme of "ADVANCED BUS"

It is designed to assemble a Bus Field including some Bus Lines (line/field coupler being able to realize a functional field with the main line).
It consists of:

- line/field couper
- coupling coil

Additional functions

They enable to state specific modes of use of the installation according to requirements defined by the end user. These additional functions are carried out with:

- scenario module for storing up to 4 scenarios
- time module for driving up to 4 outputs with timed-delayed function

POWER SUPPLY:

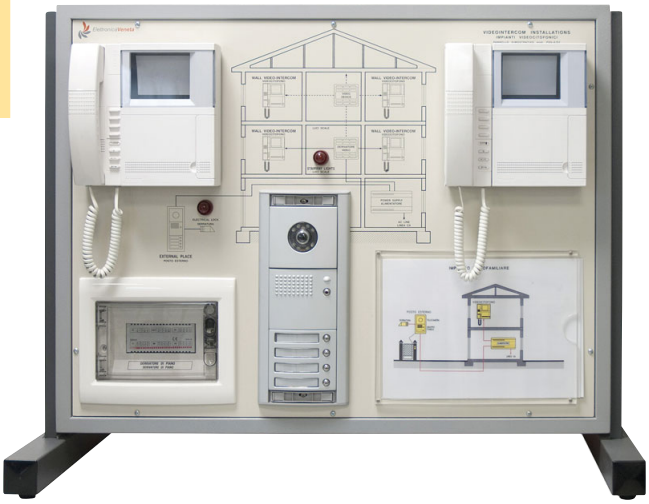
230 V / PE 50-60 Hz
Max. absorption: 250 VA

THEORETICAL-EXPERIMENTAL HANDBOOKS

Application handbook with exercises.

DEMONSTRATION PANEL OF DIGITAL COLOUR VIDEO INTERPHONES

Mod. PDG-6/EV



INTRODUCTION

This demonstration panel can be used by teachers for their lessons and by students for an easy learning and testing on video interphone systems supplying them with the means for verifying the rule of art and the relevant technical standards. Actual electrical devices installed, already connected with each other, enable to check the operation, besides carrying out the measurements of all the electric parameters with conventional instruments.
The panel is made of insulating material and it represents the support of the necessary devices for carrying out the testing programme.
The apparatuses are clearly represented on the panel with their standardized international symbols and electrical block diagram, for an easy reference with their lay-out.
Furthermore, when necessary, test points correspond to standardized educational terminals with high protection degree against accidental contacts.

TRAINING PROGRAM:

This panel shows an electrical installation concerning colour video interphones with addressable digital two-wire system that may be available in a residential or office building, with reference to the following topics:

- components of a video interphone
- "porter" interphone
- camera unit
- intercommunicating indoor video interphone sets
- video signal distributors
- power supply unit

Furthermore, this panel is designed to deal with topics, visual checks, tests concerning:

- operating tests
- check of circuit separation

TECHNICAL SPECIFICATIONS:

Framework is made of sheet steel chemically treated and painted with several coats of epoxy varnish; its base is provided with rubber feet and it can be positioned on a working top.
All the necessary electric components for the correct power supply of circuits are included in the panel.

Main components installed:

- 1 outdoor station with colour video camera, digital amplified phone unit, plate with four lighted
- calling buttons
- 2 wall-mounted video interphones with flat colour monitor of 4", 3 service buttons, 4 pushbuttons for intercommunication
- 1 electronic power supply unit
- 1 video signal shunt

Dimensions of demonstration panel: 800 x 600 mm
Dimensions of framework: 840 x 450 x 680 mm
Net weight: 30 kg

SUPPLIED ACCESSORIES:

- 1 single-phase power cord with UNEL plug

RECOMMENDED ACCESSORIES:

- Digital autoranging multimeter

POWER SUPPLY:

230 V / PE 50-60 Hz
Max. absorption: 250 VA

THEORETICAL-EXPERIMENTAL HANDBOOKS

Application handbook with exercises.

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DEMONSTRATION PANEL OF ANTI THEFT SYSTEMS

Mod. PDG-7/EV

INTRODUCTION

This demonstration panel can be used by teachers for their lessons and by students for an easy learning and testing on anti theft systems supplying them with the means for verifying the rule of art and the relevant technical standards. Actual electrical devices installed, already connected with each other, enable to check the operation, besides carrying out the measurements of all the electric parameters with conventional instruments.
The panel is made of insulating material and it represents the support of the necessary devices for carrying out the testing programme.
The apparatuses are clearly represented on the panel with their standardized international symbols and electrical block diagram, for an easy reference with their lay-out.
Furthermore, when necessary, test points correspond to standardized educational terminals with high protection degree against accidental contacts.

TRAINING PROGRAM:

This panel shows an electrical installation concerning anti theft systems that may be available in a residential or office building, with reference to the following topics:

- components of an anti theft system
- performance levels
- electronic control units
- perimetric, volumetric detection sensors
- system keys or switches
- horns for alarm signals
- telephone diallers, radio links for emergency calls

Furthermore, this panel is designed to deal with topics, visual checks, tests concerning:

- operating tests
- check of circuit separation

TECHNICAL SPECIFICATIONS:

Framework is made of sheet steel chemically treated and painted with several coats of epoxy varnish; its base is provided with rubber feet and it can be positioned on a working top.
All the necessary electric components for the correct power supply of circuits are included in the panel.

Main components installed:

- 1 first-level electronic control unit with programmable functions including:
  - access via programming keyboard of 10000 combinations
  - 4 programmable alarm circuits
  - one 24h alarm circuit
  - scheduling alarm times
  - power supply unit for recharging the internal battery
  - battery of 12 Vdc
  - relay for output circuits
  - protection fuses
  - specific outputs for powering the detectors, recharging the external batteries, controlling the self-powered sirens
  - LEDs for signalling the operating state / malfunction of control unit
- 1 passive infrared volumetric detector
- 1 volumetric detector of double (IR + microwave) technology
- 1 vibration detector
- 1 magnetic detector with NC contact
- 1 self-protected electronic siren self-powered by battery of 12 V
- 1 alarm device for interiors with two-tone siren
- 1 remote control and programming keyboard
- 1 electronic control key

Dimensions of demonstration panel: 800 x 600 mm
Dimensions of framework: 840 x 450 x 680 mm
Net weight: 30 kg

SUPPLIED ACCESSORIES:

- 1 single-phase power cord with UNEL plug

RECOMMENDED ACCESSORIES:

- Digital autoranging multimeter

POWER SUPPLY:

230 V / PE 50-60 Hz
Max. absorption: 250 VA

THEORETICAL-EXPERIMENTAL HANDBOOKS

Application handbook with exercises.

DEMONSTRATION PANEL OF FIRE PROTECTION SYSTEMS

Mod. PDG-8/EV

INTRODUCTION

This demonstration panel can be used by teachers for their lessons and by students for an easy learning and testing on fire detection systems supplying them with the means for verifying the rule of art and the relevant technical standards. Actual electrical devices installed, already connected with each other, enable to check the operation, besides carrying out the measurements of all the electric parameters with conventional instruments.
The panel is made of insulating material and it represents the support of the necessary devices for carrying out the testing programme. The apparatuses are clearly represented on the panel with their standardized international symbols and electrical block diagram, for an easy reference with their lay-out.
Furthermore, when necessary, test points correspond to standardized educational terminals with high protection degree against accidental contacts.

TRAINING PROGRAM:

This panel shows an electrical installation concerning fire protection systems that may be available in a residential or office building, with reference to the following topics:

- components of a fire protection system
- electronic control units
- fire detection sensors
- system keys or switches
- fire alarm sirens
- telephone diallers, radio links for emergency calls

Furthermore, this panel is designed to deal with topics, visual checks, tests concerning:

- operating tests
- check of circuit separation

TECHNICAL SPECIFICATIONS:

Framework is made of sheet steel chemically treated and painted with several coats of epoxy varnish; its base is provided with rubber feet and it can be positioned on a working top. All the necessary electric components for the correct power supply of circuits are included in the panel.

Main components installed:

- 1 microprocessor electronic control unit with various operating configurations including:
  - 6 balanced input circuits
  - power supply unit for recharging the internal battery
  - relay for output circuits
  - protection fuses
  - specific outputs for powering detectors, pre-alarm and alarm signals
  - LEDs for signalling the operating state / malfunction of control unit
  - Adjustment of operating times
- 1 rate-of-rise heat detector
- 1 smoke detector
- 1 manual pushbutton of fire warning
- 1 percussion sound and light alarm
- 1 electromagnet for releasing fire-stopping doors

Dimensions of demonstration panel: 800 x 600 mm
Dimensions of framework: 840 x 450 x 680 mm
Net weight: 37 kg

SUPPLIED ACCESSORIES:

- 1 single-phase power cord with UNEL plug
- 1 table with application typology of fire detection system

RECOMMENDED ACCESSORIES:

- Digital autoranging multimeter

POWER SUPPLY:

230 V / PE 50-60 Hz
Max. absorption: 250 VA

THEORETICAL-EXPERIMENTAL HANDBOOKS

Application handbook with exercises.

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DEMONSTRATION PANEL FOR DESIGN AND FUNCTIONAL ANALYSIS OF THE ELECTRONIC/ELECTRICAL SYSTEMS OF AN INTELLIGENT BUILDING

Mod. PDG-12/EV

INTRODUCTION

The panel for the management of an intelligent building consists of actual electrical components, already connected with each other and consequently operating, so that students can learn and test electronic systems of building utilities. Students can reprogram the installed components partially or totally, besides checking their setting at work. Furthermore electric parameters can be measured with conventional instruments.
This panel is enclosed in a metallic framework supported by side uprights provided with castors for an easy transport inside the laboratory. This framework is made of sheet steel chemically treated and painted with several coats of epoxy varnish. The panel is made of insulating material and it represents the ideal support of the necessary components for carrying out the testing programme. The apparatuses are clearly represented on the panel with their standardized international symbols and with a lay-out plan. All the necessary electric components for the correct power supply of circuits are included in the panel.

TRAINING PROGRAM:

This panel shows an electrical installation operating on BUS system for the installations of "intelligent" management of a residential building. The control and checking elements of power consuming devices are connected with the BUS, and they refer to the following topics:

- lighting installation of house interiors with control devices and actuators on/off switch and dimmer
- outdoor house lighting installation
- sound warning system
- control of heating system with thermostat and actuator
- control of opening/shutting of blinds
- Wireless control, IR transmitter and receiver for controlling lights, blinds, heating, etc…
- presence detection in the building via sensor
- control of technical alarms
- control of anti theft alarms
- control of scenarios

Furthermore, using software packets will lead:

- to modify the programming of installed components partially or totally
- to develop graphic pages for system supervision

TECHNICAL SPECIFICATIONS:

Framework is made of sheet steel chemically treated and painted with several coats of epoxy varnish; its base is provided with castors for an easy transport in the laboratory. Main components installed:

- 1 switchboard with data strip for the connection of power supply unit and of modular components including the connectors for shunting the bus line
- 1 USB interface for the connection with personal computer
- 9 control pushbuttons for lights, with 2 or 4 channels with bus coupler
- 1 universal dimmer actuator for incandescent lamps with bus coupler
- 1 bus interface connected with technical alarm sensor signalling presence of water
- 1 infrared receiver and decoder for infrared receiver with bus coupler
- 2 six-channel binary outputs – 6 A 230 Vac – for enabling power consuming devices, with bus coupler
- 1 presence detector with bus coupler
- 2 miniaturized blinds with shutters for simulating doors or windows
- 1 switch for moving and managing two blinds, with bus coupler
- 1 thermostat with bus coupler for controlling room temperature, and with actuator displayed by two warning lights
- 10 lamp sockets with lamps of 230 V for lighting
- 1 time module for driving up to four outputs with timed, delayed function
- 1 scenario module for retrieving four different scenes

Dimensions of demonstration panel: 1260 x 960 mm
Dimensions of framework: 1300 x 600 x 1700 mm
Net weight: 74 kg

Sample configuration with PC and desk for computer (not included)

SOFTWARE INDISPENSABLE (NOT INCLUDED)

Original **Design Software ETS (EIB Tool Software)** multilanguage edited by consortium Konnex, to be purchased separately.
This software enables to assign the specific functionality to the installation, as well as the starting and diagnosis of BUS devices.
This software can be used with a personal computer (not included in the equipment) connected with the BUS system via USB interface.

SUPPLIED ACCESSORIES:

- 1 portable infrared transmitter of 4+4 channels
- 1 single-phase power cord with UNEL plug
- 1 cable for connection with PC

POWER SUPPLY:

230 V / PE 50-60 Hz
Max. absorption: 500 VA

THEORETICAL-EXPERIMENTAL HANDBOOKS

Application handbook with exercises.

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23-C

ELECTRICAL ENGINEERING

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DEMONSTRATION PANELS FOR INDUSTRIAL ELECTRICAL INSTALLATIONS

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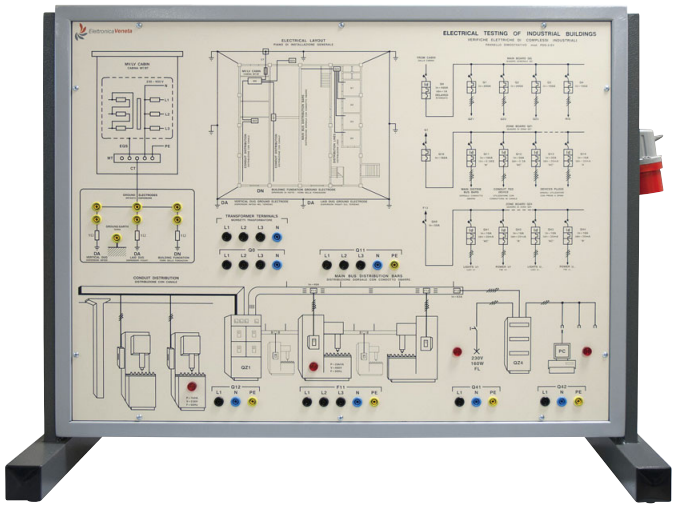
DEMONSTRATION PANEL FOR THE ELECTRIC TESTING CARRIED OUT IN INDUSTRIAL BUILDINGS

Mod. PDG-2/EV

INTRODUCTION

This panel can be used by teachers for their lessons and by students for an easy learning and testing on electrical prevention systems supplying them with the means for verifying the rule of art and the relevant technical standards.
Actual electrical devices installed, already connected with each other, enable to check the operation, besides carrying out the measurements of all the electric parameters with conventional instruments.

The panel is made of insulating material and it represents the support of the necessary devices for carrying out the testing programme. The apparatuses are represented on the panel with their standardized international symbols, electrical block diagram and lay-out, for an easy reference. Furthermore, when necessary, test points correspond to standardized educational terminals with high protection degree against accidental contacts. Four switchboards including the protection devices (main switchboard, department switchboards) are available in the rear part of the equipment.



TRAINING PROGRAM:

This panel can be used to define the electrical installations of an industry (power distribution via TN system) with reference to the following topics:

- Design of the electrical installation in industrial sheds
- Main switchboard (cabin switchboard)
- Department switchboard
- Distribution by channel or by ducts-bars
- Installation plans
- Graphical symbols for installation plans
- Earth plates and plan of earthing systems
- Installations in places with risk of explosion
- Installations in places with risk of fire
- Drawing up Form A (atmospheric discharges) and Form B (earthing systems)

Furthermore, this panel is designed to deal with topics, visual checks, tests concerning:

- Analysis of diagrams and documents, warning signs
- Suitability of materials and of equipment
- Protection against direct contacts
- Protection against indirect contacts
- Precautions against fire starting and propagation
- Breaking devices for servicing
- Functional and emergency control devices
- IP protection degree of cases
- Identification of circuits, of fuses, of operation switches
- Suitability of the connections of conductors
- Checking the current-carrying capacity of ducts
- Checking the section of the protection conductor according to fault current
- Correct choice of protection devices against overcurrents
- Continuity tests of protection and equipotential conductors
- Measurement of isolation resistance
- Measurement of fault loop impedance
- Polarity tests
- Analyzing the functionality of differential circuit breakers

TECHNICAL SPECIFICATIONS:

Framework is made of sheet steel chemically treated and painted with several coats of epoxy varnish; its base is provided with rubber feet and it can be positioned on a working top.
All the necessary electric components for the correct power supply of circuits are included in the panel.

Main components installed:

- 1 three-phase isolation transformer 230-400 V / 230-400 V 750 VA
- 1 simulator of cabinet earthing system with 3 fixed resistances of 1 Ω
- 1 four-pole magnetothermal circuit breaker 4 x 6 a, curve C, with releasing coil
- 1 delayed differential relay of 0.03-1 A, with detecting TA
- 2 sets of three fuse holders with fuses of 2 A
- 1 magnetothermal differential circuit breaker 4 x 3 A "C" / 0.3 A "S" "A"
- 1 magnetothermal differential circuit breaker 2 x 1.6 A "C" / 0.3 A "AC"
- 1 magnetothermal differential circuit breaker 2 x 0.5 A "C / 30 mA "AC"
- 1 magnetothermal differential circuit breaker 2 x 1 A "C / 30 mA "A"

Dimensions of demonstration panel: 800 x 600 mm
Dimensions of framework: 840 x 450 x 680 mm
Net weight: 50 kg

SUPPLIED ACCESSORIES:

- 1 single-phase power cord with EEC socket and plug
- 3 jumpers with safety plugs (Ø 4 mm) for assembling the various installation conditions

RECOMMENDED ACCESSORIES:

- Multi-function microprocessor instrument for electric testing
- Digital current probe
- Digital autoranging multimeter
- Electric CAD for Windows

POWER SUPPLY:

3 x 400 V / N / PE 50-60 Hz
Max. absorption: 750 VA

THEORETICAL-EXPERIMENTAL HANDBOOKS

Application handbook with exercises.

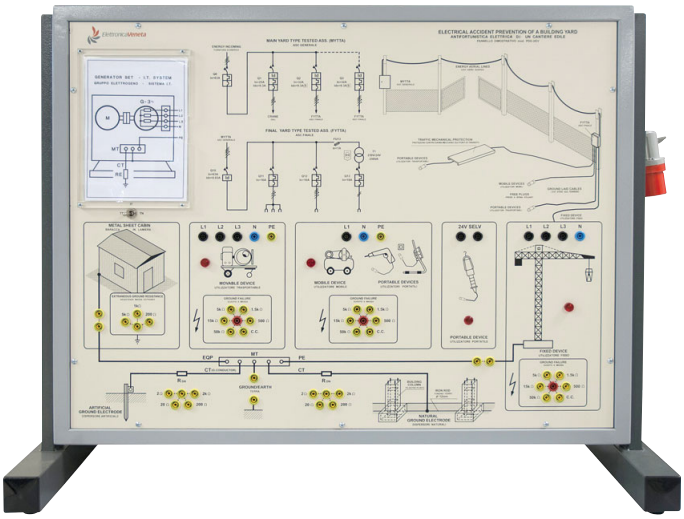
DEMONSTRATION PANEL OF ELECTRICAL PREVENTION SYSTEMS IN A BUILDING YARD

Mod. PDG-3/EV

INTRODUCTION

This demonstration panel can be used by teachers for their lessons and by students for an easy learning and testing on electrical prevention systems supplying them with the means for verifying the rule of art and the relevant technical standards. Actual electrical devices installed, already connected with each other, enable to check the operation, besides carrying out the measurements of all the electric parameters with conventional instruments.

The panel is made of insulating material and it represents the support of the necessary devices for carrying out the testing programme. The apparatuses are represented on the panel with their standardized international symbols, electrical block diagram and lay-out, for an easy reference. Furthermore, when necessary, test points correspond to standardized educational terminals with high protection degree against accidental contacts. Two switchboards including the protection devices (reproduction of ASC-certified boards for yards) are available in the rear part of the equipment.



TRAINING PROGRAM:

This panel can be used to define the electrical installations of a building yard (power distribution via TT, TN or IT system) with reference to the following topics:

- Main switchboard of power distribution
- Department switchboard
- Distribution cables laid on the ground and hanging by ropes
- Protection of electric cables against mechanical damages in passage points
- Fixed power consuming devices
- Transportable power consuming devices
- Movable power consuming devices
- Portable power consuming devices
- Powering the yard via TT, TN or IT system
- Protection against direct contacts
- Protection against indirect contacts
- Earth conductor
- Artificial earth plates
- Natural earth plates
- Equipotential connections

Furthermore, this panel can be used to carry out the following testing and measurements by instruments:

- Suitability of materials and of equipment
- Protection and breaking devices
- Identification of neutral and earth conductors
- Measurement of earth resistance
- Continuity tests of protection conductors
- Analyzing the functionality of differential circuit breakers
- Measurement of isolation resistance
- Checking the protection devices with automatic break
- Measurement of fault loop resistance / impedance

TECHNICAL SPECIFICATIONS:

Framework is made of sheet steel chemically treated and painted with several coats of epoxy varnish; its base is provided with rubber feet and it can be positioned on a working top.
All the necessary electric components for the correct power supply of circuits are included in the panel.

Main components installed:

- 1 three-phase isolation transformer 230-400 V / 230-400 V 500 VA
- 1 switch for selecting TT, IT, TN distribution system
- 1 simulator of cabinet earthing system with fixed resistance of 0.3 Ω
- 2 simulators of earth plate with resistances of 2 Ω, 20 Ω, 200 Ω, 2 kΩ
- 1 simulation of extraneous conducting part with resistances of 200 Ω, 1000 Ω, 5000 Ω
- 1 four-pole operation switch and differential circuit breaker of 25 A 30 mA "AC"
- 1 magnetothermal differential circuit breaker 4 x 1 A "C" / 0.3 A "S"
- 1 magnetothermal differential circuit breaker 4 x 1 A "C" / 0.3 A "AC"
- 1 magnetothermal circuit breaker 4 x 0.5 A "C
- 1 magnetothermal circuit breaker 2 x 0.5 A "C
- 1 magnetothermal circuit breaker 1/N 2 A "C
- one 1/N breakable fuse holder with fuse of 2 A
- 1 SELV transformer of 230/24 V 50 VA
- 1 simulator of isolation fault in a power consuming device (to earth) with resistances of 50 kΩ, 15 kΩ, 5 kΩ, 500 Ω and bolted fault

Dimensions of demonstration panel: 800 x 600 mm
Dimensions of framework: 840 x 450 x 680 mm
Net weight: 54 kg

SUPPLIED ACCESSORIES:

- 1 single-phase power cord with EEC socket and plug
- 10 jumpers with safety plugs (Ø 4 mm) for assembling the various installation conditions
- 4 identification tables of the selected distribution system

RECOMMENDED ACCESSORIES:

- Multi-function microprocessor instrument for electric testing
- Digital current probe
- Digital autoranging multimeter
- Electric CAD for Windows

POWER SUPPLY:

3 x 400 V / N / PE 50-60 Hz
Max. absorption: 750 VA

THEORETICAL-EXPERIMENTAL HANDBOOKS

Application handbook with exercises.

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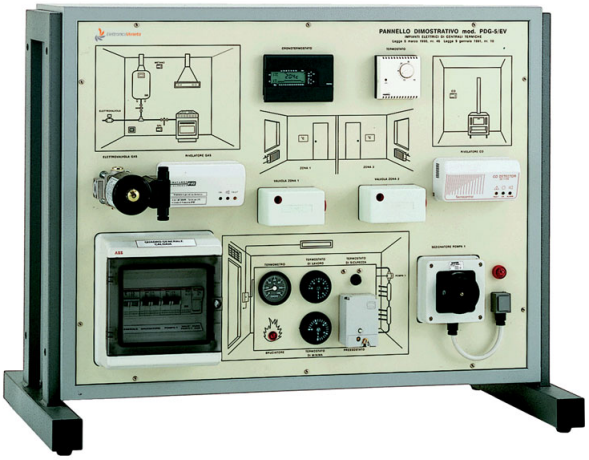
DEMONSTRATION PANEL OF ELECTRICAL SYSTEMS OF CENTRAL HEATING PLANTS

Mod. PDG-5/EV

INTRODUCTION

This demonstration panel can be used by teachers for their lessons and by students for an easy learning and testing on electrical prevention systems supplying them with the means for verifying the rule of art and the relevant technical standards. Actual electrical devices installed, already connected with each other, enable to check the operation, besides carrying out the measurements of all the electric parameters with conventional instruments.

The panel is made of insulating material and it represents the support of the necessary devices for carrying out the testing programme. The apparatuses are represented on the panel with their standardized international symbols, electrical block diagram and lay-out, for an easy reference. Furthermore, when necessary, test points correspond to standardized educational terminals with high protection degree against accidental contacts.



TRAINING PROGRAM:

This panel shows an electrical installation that can be used in central heating plants of buildings of residential, business, craft, industrial use, with reference to the following topics:

- Oil-fired central heating plants exceeding 100000 kcal/h
- Gas-fired central heating plants exceeding 30000 kcal/h
- Compliance of the system with CEI Guide 64-50
- Classification of places (AD zones) for boiler rooms
- Outdoor emergency switch
- Switchboard for central heating plant
- Ducts and apparatuses allowed in a central heating plant
- Heat generator, thermostats, pressure switches, for working and safety
- Fuel cutoff valves
- Gas detection and signalling
- Detection and signalling of carbon oxide CO

Furthermore, this panel is designed to deal with topics, visual checks, tests concerning:

- Operation tests

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TECHNICAL SPECIFICATIONS:

Framework is made of sheet steel chemically treated and painted with several coats of epoxy varnish; its base is provided with rubber feet and it can be positioned on a working top.
All the necessary electric components for the correct power supply of circuits are included in the panel.

Main components installed:

- 1 heat generator including operation thermostat, minimum temperature thermostat and maximum temperature thermostat
- 1 safety pressure switch
- 1 GAS cutoff valve
- 1 electro-mechanical room thermostat
- 1 room chronothermostat
- 1 simulator of circulation pump
- 2 zone valves with electrical control of 24 V
- 1 single-phase transformer of 230 V / 24 V 50 VA
- 1 (outdoor) circuit breaker 2 x 25 A
- 1 switch for protection and control of burner 2 x 1 A
- 1 switch of pump protection 2 x 1 A
- 1 relay 2 x 16 A 24 Vac for thermostats-pump interface
- 1 circuit breaker 2 x 16 A (of pump servicing)
- 1 detector of METHANE or of LPG
- 1 detector of carbon oxide CO

Dimensions of demonstration panel: 800 x 600 mm
Dimensions of framework: 840 x 450 x 680 mm
Net weight: 36 kg

SUPPLIED ACCESSORIES:

- 1 single-phase power cord with UNEL plug

RECOMMENDED ACCESSORIES:

- Digital autoranging multimeter

POWER SUPPLY:

230 V / PE 50-60 Hz
Max. absorption: 250 VA

THEORETICAL-EXPERIMENTAL HANDBOOKS

Application handbook with exercises.

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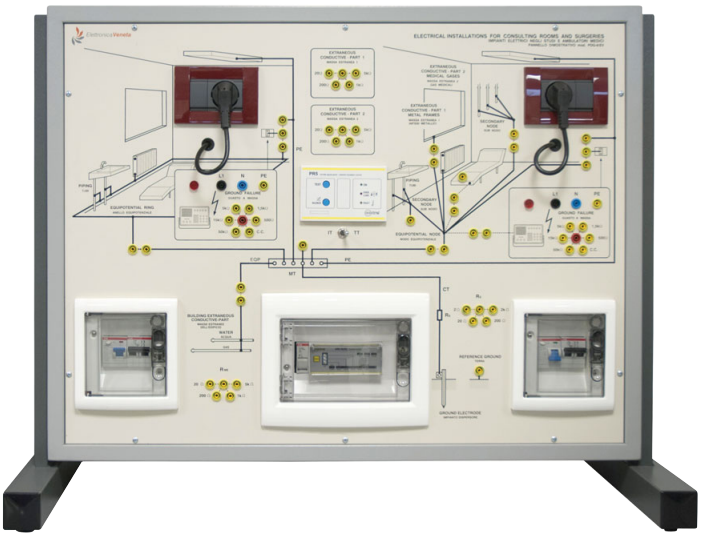
DEMONSTRATION PANEL OF INSTALLATIONS FOR MEDICAL CONSULTING ROOMS AND SURGERIES

Mod. PDG-9/EV

INTRODUCTION

This demonstration panel can be used by teachers for their lessons and by students for an easy learning and testing on electrical prevention systems supplying them with the means for verifying the rule of art and the relevant technical standards. Actual electrical devices installed, already connected with each other, enable to check the operation, besides carrying out the measurements of all the electric parameters with conventional instruments.

The panel is made of insulating material and it represents the support of the necessary devices for carrying out the testing programme. The apparatuses are represented on the panel with their standardized international symbols, electrical block diagram and lay-out, for an easy reference. Furthermore, when necessary, test points correspond to standardized educational terminals with high protection degree against accidental contacts.



TRAINING PROGRAM:

This panel shows an electrical installation that can be found in a building used as consulting room, with reference to the following topics:

- Rooms of group 0, 1, 2
- Patients' area
- Equipotential loop and branch point
- Protection with automatic power cutoff
- Protection by isolation transformer
- Isolation resistance of walls and of floors
- Protection by electric separation and SELV, PELV circuits
- Measurement of first-fault current

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TECHNICAL SPECIFICATIONS:

Framework is made of sheet steel chemically treated and painted with several coats of epoxy varnish; its base is provided with rubber feet.

Main components installed:

- 1 single-phase isolation transformer of 230 V / 230 V 230 VA
- 1 switch for selecting TT, IT distribution system
- 1 monitor for checking the isolation of IT system
- 1 remote warning device for isolation monitor
- 1 simulator of earth plate with resistances of 2 Ω, 20 Ω, 200 Ω, 2 kΩ
- 3 simulations of extraneous conducting part with resistances of 200 Ω, 1000 Ω, 5000 Ω (pipes of water for radiator, metallic frame)
- 1 magnetothermal circuit breaker 2 x 0.5 A "C"
- 1 magnetothermal circuit breaker 2 x 1 A "C"
- 1 differential circuit breaker 2 x 25 A / 30 mA "A"; two 2-pin sockets – 10/16 A, 2P + Earth
- 2 simulators of isolation fault in a power consuming device (to earth) with resistances of 50 kΩ, 15 kΩ, 5 kΩ, 1500 Ω, 500 Ω and bolted fault

Dimensions of demonstration panel: 800 x 600 mm
Dimensions of framework: 840 x 450 x 680 mm
Net weight: 35 kg

SUPPLIED ACCESSORIES:

- 1 single-phase power cord with UNEL plug
- 8 jumpers with safety plugs (Ø 4 mm) for assembling the various installation conditions

RECOMMENDED ACCESSORIES:

- Multi-function microprocessor instrument for electric testing
- Digital current probe
- Digital autoranging multimeter
- Mod. SW-ELT/EV: Circuit design, simulation and animation software for electrical engineering projects

POWER SUPPLY:

230 V / PE 50-60 Hz
Max. absorption: 250 VA

THEORETICAL-EXPERIMENTAL HANDBOOKS

Application handbook with exercises.

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DEMONSTRATION PANEL OF ELECTRIC TESTING IN AGRICULTURAL AND LIVESTOCK ENVIRONMENTS

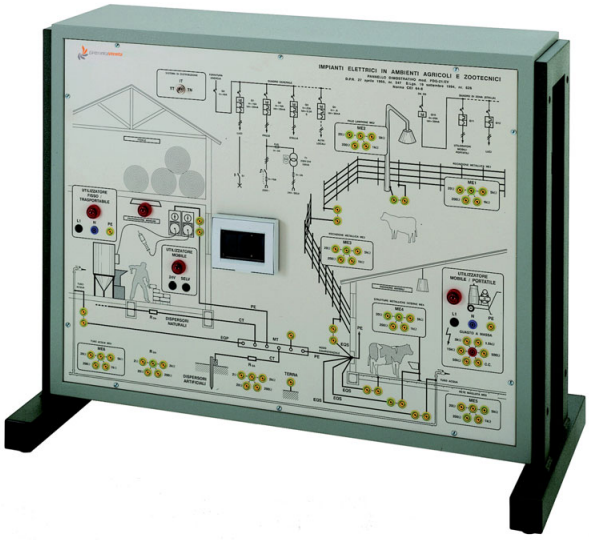
Mod. PDG-21/EV

INTRODUCTION

This demonstration panel can be used by teachers for their lessons and by students for an easy learning and testing on electric accident-prevention systems supplying them with the means for verifying the rule of art and the relevant technical standards.

Actual electrical devices installed, already connected with each other, enable to test the operation, besides carrying out the measurements of all the electric parameters with conventional instruments.

The panel is made of insulating material and it represents the support of the necessary devices for carrying out the testing programme. The apparatuses are represented on the panel with their standardized international symbols, electrical block diagram and lay-out, for an easy reference. Furthermore, when necessary, test points correspond to standardized educational terminals with high protection degree against accidental contacts.



TRAINING PROGRAM:

This panel shows an electrical installation that can be found in agricultural and livestock facilities, with reference to the following topics:

- Main switchboard of power distribution
- System breaking
- Protection against direct contacts; protection against indirect contacts
- IP protection degrees
- Protection of electric cables against mechanical damages provoked by animals
- Fire protection
- Fixed power-consuming devices
- Transportable and movable power-consuming devices
- Portable power-consuming devices
- Powering the farm by "TT- TN – IT" distribution system
- Earthing system
- Artificial, natural earth plates
- Equipotential connections

Furthermore, this panel can be used to carry out the following testing and measurements by instruments:

- Measurement of isolation resistance
- Suitability of materials and of equipment
- Protection and breaking devices
- Identification of neutral and earth conductors
- Measurement of earth resistance
- Continuity tests of protection conductors
- Analyzing the functionality of differential circuit breakers
- Checking the protection devices with automatic break
- Measurement of fault loop resistance
- Protection by automatic disconnection of power supply
- Protection by electric separation and SELV, PELV circuits

TECHNICAL SPECIFICATIONS:

Framework is made of sheet steel chemically treated and painted with several coats of epoxy varnish; its base is provided with rubber feet.

Main components installed:

- 1 single-phase isolation transformer of 230 V / 230 V / 230 VA
- 1 switch for selecting TT, TN, IT distribution system
- 1 simulator of cabinet earthing system with fixed resistance of 0.3 Ω
- 1 simulator of earth plate with resistances of 2 Ω, 20 Ω, 200 Ω, 2 kΩ
- 1 simulator of natural earth plate with resistances of 2 Ω, 20 Ω, 200 Ω, 2 kΩ
- 6 simulators of extraneous conducting parts of various type, with resistances of 200 Ω, 1000 Ω, 5000 Ω
- 1 main switchboard including:
  - 1 two-pole main differential circuit breaker; In = 25 A
  - 2 two-pole magnetothermal differential circuit breakers; In = 0.5 A; Icn = 6 kA; "curve C"; Idn = 30 mA "AC"
  - 1 two-pole magnetothermal differential circuit breaker; In = 1 A; Icn = 6 kA; "curve C"; Idn = 0.3 A "A" "S"
- 1 controlled IEC 309 socket – 230 V / PE 16 A IP55
- 1 zone switchboard including:
  - 1 pure two-pole differential circuit breaker; In = 25 A; Idn = 30 mA; "AC"
  - 1 two-pole magnetothermal circuit breaker; In = 0.5 A; Idn = 6 kA; "curve C"
  - 1 SELV transformer, with output of 24 V 50 VA
  - 1 breakable fuse holder with fuse 10.3 x 38; In = 2 A
  - 1 two-pole magnetothermal circuit breaker; In = 1 A; Icn = 6 kA; "curve C"
- 1 IEC 309 socket – 24 V 16 A IP44
- 1 lighting point and switch with protection degree IP55
- 1 simulator of isolation fault in a power consuming device (to earth) with resistances of 50 kΩ, 15 kΩ, 5 kΩ, 500 Ω and bolted fault

Dimensions of demonstration panel: 800 x 600 mm
Dimensions of framework: 840 x 450 x 680 mm
Net weight: 38 kg

SUPPLIED ACCESSORIES:

- 1 single-phase power cord with UNEL plug
- 10 jumpers with safety plugs (Ø 4 mm) for assembling the various installation conditions

RECOMMENDED ACCESSORIES:

- Multi-function microprocessor instrument for electrical testing
- Digital current probe
- Digital autoranging multimeter
- Mod. SW-ELT/EV: Circuit design, simulation and animation software for electrical engineering projects

POWER SUPPLY:

230 V / PE 50-60 Hz
Max. absorption: 250 VA

THEORETICAL-EXPERIMENTAL HANDBOOKS

Application handbook with exercises.

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DEMONSTRATION PANEL FOR DESIGN AND FUNCTIONAL ANALYSIS OF THE ELECTRONIC/ELECTRICAL SYSTEMS OF AN INTELLIGENT OPEN SPACE

Mod. PDG-13/EV

INTRODUCTION

This panel for the management of an intelligent open space consists of actual electrical components, already connected with each other and consequently operating, so that students can learn and test electronic systems of building utilities. Students can reprogram the installed components partially or totally, besides checking their setting at work. Furthermore electric parameters can be measured with conventional instruments.

This panel is enclosed in a metallic framework supported by side uprights provided with castors for an easy transport inside the laboratory. This framework is made of sheet steel chemically treated and painted with several coats of epoxy varnish. The panel is made of insulating material and it represents the ideal support of the necessary components for carrying out the testing programme. The apparatuses are clearly represented on the panel with their standardized international symbols and with a lay-out plan.
All the necessary electric components for the correct power supply of circuits are included in the panel.

TRAINING PROGRAM:

This panel shows an electrical installation operating on BUS system for the installations of "intelligent" management of an open space of business use such as banks, jeweller's shops and/or environments needing particular safety systems.

The control and checking elements of power consuming devices are connected with the BUS, and they refer to the following topics:

- lighting installation of building interiors with control devices and on/off actuators
- control of accesses by magnetic badge reader
- control of technical alarms by video surveillance
- control of heating system by thermostat and actuator
- control of opening/shutting of blinds
- presence detection in the building via sensor
- control of anti theft alarms
- control of scenarios: system functionality with retrieval of typical situations on needs of power consuming devices such as daytime normal operation, partial operation for cleaning, operation with closed room, etc…

Furthermore, using software packets will lead:

- to modify the programming of installed components partially or totally, for zone configuration according to user's needs
- to develop graphic pages for system supervision

TECHNICAL SPECIFICATIONS:

Framework is made of sheet steel chemically treated and painted with several coats of epoxy varnish; its base is provided with castors for an easy transport in the laboratory.
Main components installed:

- 1 switchboard with data strip for the connection of power supply unit and of modular components including the connectors for shunting the bus line
- 1 USB interface for the connection with personal computer
- 7 control pushbuttons for lights, with 2 or 4 channels with bus coupler
- 2 six-channel binary outputs – 6 A 230 Vac – for enabling power consuming devices, with bus coupler
- 1 two-channel binary output – 6 A 230 Vac – for enabling video recording on presence condition in the watched area
- 1 presence detector with bus coupler
- 2 miniaturized blinds with shutters for simulating doors or windows
- 1 switch for moving and managing two blinds, with bus coupler
- 1 thermostat with bus coupler for controlling room temperature (air conditioning), and with hot/cold actuators displayed by four warning lights
- 12 lamp sockets with lamps for lighting
- 1 transponder reader for enabling accesses
- 1 transponder programmer for different access levels
- 1 four-channel oe-year clock module for driving system functions according to time
- 1 scenario module for retrieving four different scenes
- 2 B/W micro CCD cameras for interiors with electronic optical components and objective of 60°
- 2 power supply units of 12 Vdc for powering the cameras
- 1 tabletop professional B/W monitor of 9" powered with 230 V~
- 1 alarmable cyclic selector of manual/automatic sequence for controlling up to 4 cameras
- 1 alarmable video recorder with programmable speed, duration of 3, 6, 12, 24 hours

Dimensions of demonstration panel: 1260 x 960 mm
Dimensions of framework: 1300 x 600 x 1700 mm
Net weight: 84 kg

Sample configuration with PC and desk for computer (not included)

SOFTWARE INDISPENSABLE (NOT INCLUDED)

Original **Design Software ETS (EIB Tool Software)** multilanguage edited by consortium Konnex, to be purchased separately.
This software enables to assign the specific functionality to the installation, as well as the starting and diagnosis of BUS devices.
This software can be used with a personal computer (not included in the equipment) connected with the BUS system via USB interface.

SUPPLIED ACCESSORIES:

- 1 single-phase power cord with UNEL plug

POWER SUPPLY:

230 V / PE 50-60 Hz
Max. absorption: 500 VA

THEORETICAL-EXPERIMENTAL HANDBOOKS

Application handbook with exercises.

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MS

23-C

MODULAR SYSTEMS FOR LABORATORY ACTIVITIES

(Design and testing)

MS

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Aim:

- Basic training in the sectors of electricity, Electrical Installations, Electric Machines and Measurements, Production, Control, Distribution and Use of electric power

Equipment:

- Laboratory of Electrical Installations
- Laboratory of Electric Machines
- Laboratory of Production and Control of electric power
- Instruments and accessories

SECTION INDEX

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23-C

LABORATORY OF ELECTRICAL INSTALLATIONS

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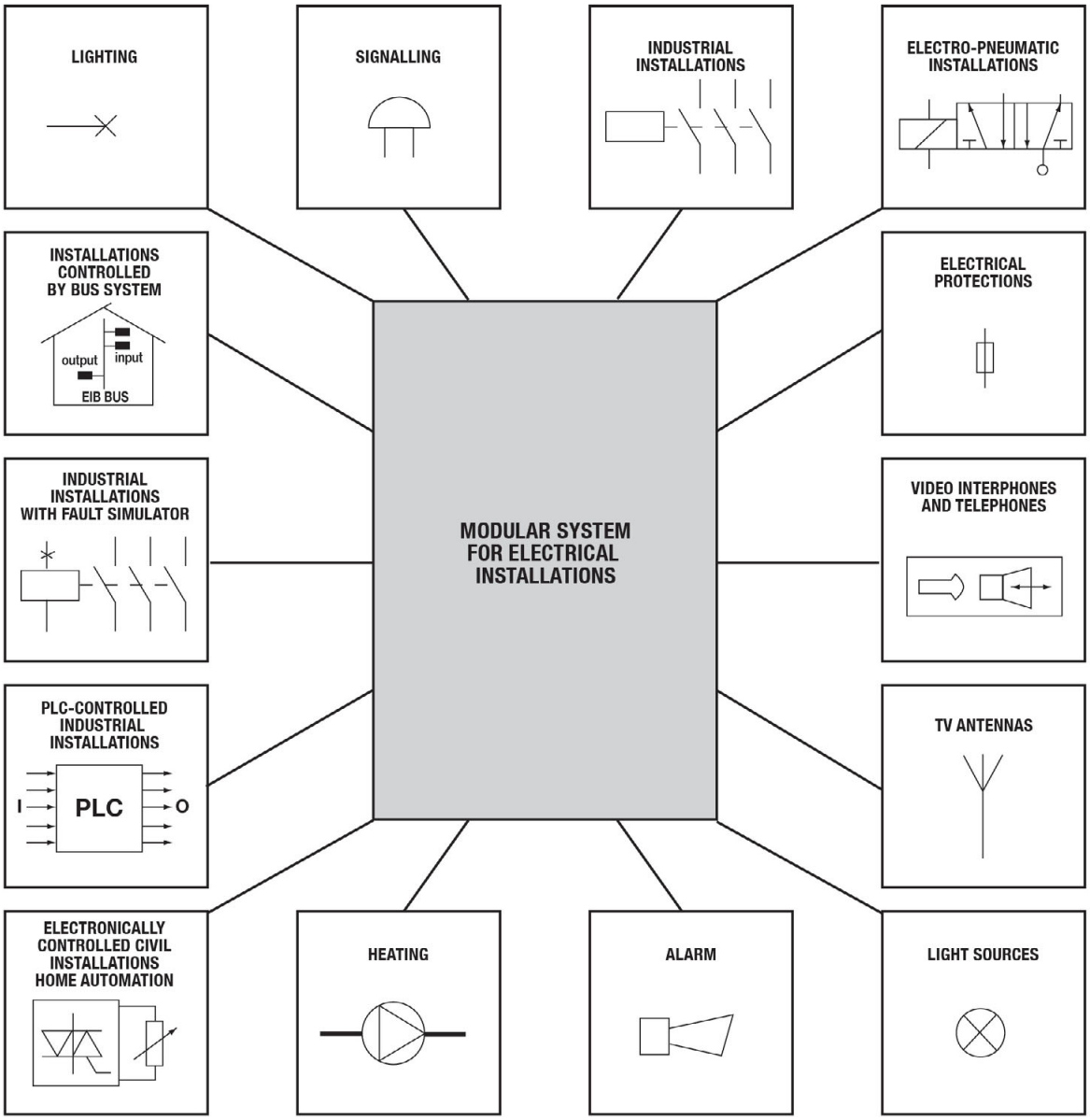
LABORATORY OF ELECTRICAL INSTALLATIONS

INTRODUCTION

This laboratory has been designed so that students can design, assemble, analyze and test a wide range of more and more complex electric circuits. At this purpose various sets of interchangeable modules marked with the symbols of the installed electrical components are used; thus merely connecting these modules with each other via flexible leads supplied with the equipment enables to assemble various circuits. The available modules are grouped into sets consistent with he various types of installations.

Some panels with pre-assembled components are proposed as alternative to the set of modules. Each panel represents a type of installation. Then a house in miniature showing all the typical installations of a residential building is proposed to complete the programme.



23-C

BASICS OF ELECTRICAL ENGINEERING

BASIC ELECTRICAL ENGINEERING BOX Mod. CBE-1/EV **MS** 7

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BASIC ELECTRICAL ENGINEERING BOX

Mod. CBE-1/EV

INTRODUCTION

This equipment is designed for an easy basic learning of general electrical engineering, of electrical installations and measurements.
It supplies the means for testing basic laws and principles thanks to the available electrical components that can be connected with each other in different configurations.

Symbols and wiring diagrams of each component are clearly represented on the fore panel of the equipment for an easy reference. Connections are made easier by standardized terminals and by very flexible leads of different colours.
All the necessary supply voltages for tests are available in the equipment and they all are safety extra-low voltages to avoid any risk of electrical accident.

Main experiments that can be carried out:
Measurement of voltages, currents and power

- Diode rectifiers and filters
- Ohm's law
- Kirchhoff's and Thévenin's laws
- Ohmic / inductive / capacitive circuits
- Studying transformers
- Essential lighting installations
- Sound and light signalling installations

TRAINING PROGRAM:

GENERAL ELECTRICAL ENGINEERING AND MEASUREMENTS

- Measurements of alternating current and voltage
- Connecting diodes with various configurations
  - half-wave rectifier
  - full-wave rectifier
  - Graetz bridge rectifier
  - Voltage doublers
- Measurements of direct current and voltage
- Connecting resistors with various configurations
  - measurements of resistance
  - testing Ohm's law
  - resistors in series, voltage divider
  - resistors in parallel, current divider
  - resistors in series and in parallel
  - maximum power transfer
  - Kirchhoff's laws
  - Superposition principle
  - Thévenin's theorem

- Measurements of power
  - measurement of DC power
  - Joule's law
  - AC power
- Connecting capacitors with various configurations
  - charging and discharging a DC capacitor
  - DC capacitors in series
  - DC capacitors in parallel
- Electromagnetic phenomena
  - inductance of a coil
  - coils in series
  - coils in parallel
- Ohmic / inductive / capacitive circuits
  - RC circuit
  - RL circuit
  - Series resonant circuit
  - Parallel resonant circuit
  - Q-factor
  - Coupled circuits
  - attenuators
- Transformers
- Smoothing filters
  - inductive input
  - capacitive input
  - LC filter

ELECTRICAL INSTALLATIONS

- Lighting a lamp by switch
- Lighting more lamps by changeover switch
- Lighting a lamp by two-way switches
- Lighting a lamp by two-way switches and inverters
- Lighting system of a hotel room
- Lighting system of archives
- Lighting one or more lamps by switch relay
- Changeover switch relay
- Sound signalling
- Light signalling
- Sound/light signalling
- Impulse remote control of a power consuming device by relay
- Self-holding remote control

TECHNICAL SPECIFICATIONS:

Framework is made of press formed sheet steel chemically treated and painted with several coats of epoxy varnish. The panel of schematic diagram is made of insulating material. The equipment is also provided with a key-locked drawer that includes all the accessories.

Main components installed:

Main switch, fuse and warning light

- 1 single-phase safety transformer – 115-230 V / 6-12-24 Vac 1 A
- 2 fuse-holders with fuses type 6x30 of 1 A
- 1 moving-iron ammeter with ranges of -0.5 – 1 A ac/dc
- 1 moving-iron voltmeter with range of -25 Vac/dc
- 10 resistors of different values (2 Ω, 4Ω, 8 Ω, 16 Ω, 31 Ω, 5 Ω, 63 Ω, 250 Ω, 500 Ω, 1000 Ω, 2000 Ω)
- 1 linear rheostat of 100 Ω - 25 W
- 4 diodes of 6 A – 100 V
- 2 lamp-sockets with warning lights of 24 V
- 1 ringer of 24 Vac
- 1 electrolytic capacitor of 100 µF – 25 Vdc
- 2 electrolytic capacitors of 500 µF – 25 Vdc
- 2 coils of 60 mH – 0.5 A
- 2 pushbuttons of general use
- 2 two-way switches of general use
- 1 inverter of general use
- 1 two-exchange contact relay, coil of 24 Vac
- 1 stepper relay, coil of 24 Vac

Dimensions: 495 x 430 x 130 mm
Net weight: 10 kg

SUPPLIED ACCESSORIES:

- 25 cables of various size with plugs of 4 mm
- 1 single-phase power cord with socket and plug

POWER SUPPLY:

230 V single-phase 50-60 Hz - 25 VA

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23-C

23-C

INFRASTRUCTURES FOR ELECTRICAL INSTALLATIONS

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BENCH FOR DESIGNING AND TESTING ELECTRICAL SYSTEMS

Mod. 398/EV

INTRODUCTION

This bench represents the ideal solution for implementing experimental programmes of electrical installations. A unique framework includes two vertical frames for fixing the modules, a power switchboard and a supporting table with a wide working top.

This bench is the support for the testing modules concerning the various electrical installations and it outputs the necessary supply voltages for their correct operation. This bench represents a wholly self-sufficient system, then it optimizes the design and testing times in the laboratory of electrical installations and systems.

An alternative is shown in the next page with the vertical frame mod. TSI/EV.

TRAINING PROGRAM:

As regards the training programme that can be implemented, please refer to the sets of testing modules and respective accessories.

TECHNICAL SPECIFICATIONS:

This bench is made of structural and sheet steel painted with epoxy varnish; its working top is covered with plastic material and rubber mats.
The housings for storing the modules are available in the rear side of the bench and they are provided with key lock.
Two key-locked drawers are available below the working top to store working tools and/or various small parts.
Holding capacity: 2 x 17 modules of single unit.

Electric characteristics:

- 1 three-phase line of 400 V (or of 230 V) + neutral + earth – 10 A; high sensitivity magnetothermal differential automatic protection; electromagnetic key control; emergency pushbutton, LED signalling power on, safety terminals for leads with plugs of 4 mm and 2 universal single-phase sockets

- 1 multimeter of 20000 Ω/V:
  - voltage up to 500 Vdc/ac;
  - current up to 2.5 Adc – 10 Aac;
  - resistance up to 500 kΩ
  - accuracy: ±2.5% DC, ±3% AC and Ω

Dimensions: 2000 x 1000 x 880 + desk of 600 mm
Net weight: 170 kg

POWER SUPPLY:

3 x 400 V / N / PE 50-60 Hz (other voltages on demand)
Max. absorption.: 6 kVA

VERTICAL MODULE HOLDER FRAME

Mod. TSI/EV

INTRODUCTION

This frame ensures the highest flexibility for implementing experimental programmes of electrical installations. It supports the modules of the experimental programme of electrical installations.

This bench represents an alternative of the bench for designing and testing electric systems mod. 398/EV. It consists of a metallic framework with guides and fixing systems consistent with the modules of electric systems, thus enabling to implement the experimental programme, with the assistance of power supply unit mod. UAT/EV, UAT-1/EV and/or module mod. AZ-1PH/EV.

TECHNICAL SPECIFICATIONS:

This frame is made of aluminium section bars and of sheet steel chemically treated and painted with several coats of epoxy varnish.

Frame base is equipped with cross feet that do not need any fixing device when positioned on the supporting table.

Holding capacity: 25 modules of single unit.

Dimensions: 1100 x 500 x 800 mm
Net weight: 10 kg

THREE-PHASE TABLETOP POWER SUPPLY UNIT

Mod. UAT/EV

INTRODUCTION

This power supply unit ensures the highest flexibility for implementing experimental programmes of electrical installations. This unit outputs the supply voltages for the electrical installations and it can be used together with vertical frame mod. TSI/EV that supports the various modules, for the realization of the experimental programme of electrical installations.

This equipment consists of a metallic case that must be laid on a table; it includes all the control devices and electric protections for the correct power supply of the circuits assembled on the frame.

TECHNICAL SPECIFICATIONS:

Metallic case of sheet steel chemically treated and painted with several coats of epoxy varnish. The schematic diagram is silk-screen-printed on a panel of aluminium.

Electric characteristics:
1 three-phase line of 400 V (or of 230 V) + neutral + earth – 10 A; high sensitivity magnetothermal differential automatic protection; electromagnetic key control; emergency pushbutton, LED signalling power on, safety terminals for leads with plugs of 4 mm, 2 universal single-phase sockets and power cord with three-phase plug.

Dimensions: 400 x 405 x 160 mm
Net weight: 5 kg

SUPPLIED ACCESSORIES:

- 1 three-phase power cord with socket and plug

POWER SUPPLY:
3 x 400 V / N / PE 50-60 Hz (other voltages on demand)
Max. absorption.: 6 kVA

SINGLE-PHASE TABLETOP POWER SUPPLY UNIT

Mod. UAT-1/EV

INTRODUCTION

This power supply unit ensures the highest flexibility for implementing experimental programmes of electrical installations. This unit outputs the single-phase supply voltages for the electrical installations and it can be used together with vertical frame mod. TSI/EV that supports the various modules, for the realization of the experimental programme of electrical installations.

This equipment consists of a metallic case that must be laid on a table; it includes all the control devices and electric protections for the correct power supply of the circuits assembled on the frame.

TECHNICAL SPECIFICATIONS:

Metallic case of sheet steel chemically treated and painted with several coats of epoxy varnish. The schematic diagram is silk-screen-printed on a panel of aluminium.

Electric characteristics:
1 three-phase line of 400 V (or of 230 V) + neutral + earth – 10 A; high sensitivity magnetothermal differential automatic protection; electromagnetic key control; emergency pushbutton, LED signalling power on, safety terminals for leads with plugs of 4 mm, 4 universal single-phase sockets and power cord with single-phase plug.

Dimensions: 400 x 405 x 160 mm
Net weight: 4,5 kg

SUPPLIED ACCESSORIES:

- 1 single-phase power cord with German/French plug

POWER SUPPLY:
230 V / PE 50-60 Hz
Max. absorption.: 2 kVA

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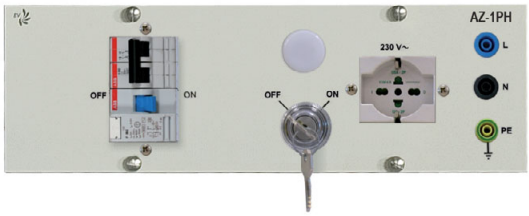
SINGLE-PHASE POWER SUPPLY MODULE

Mod. AZ-1PH/EV

INTRODUCTION

This unit ensures the single-phase power supply for the electrical installations and it can be used together with vertical frame mod. TSI/EV that supports the various modules, for the realization of the experimental programme of electrical installations.



TECHNICAL SPECIFICATIONS:

- 1 universal UNEL socket – 10/16 A, 230 Vac
- 1 differential circuit breaker, 10 A, Idn = 30 mA
- 1 key switch of 16 A
- 1 warning light for signalling power on
- 3 safety terminals (L-N-PE) with diameter of 4 mm
- 1 single-phase power cord.

This module is provided with a safety plastic cover on the rear side.

POWER SUPPLY:
The module is powered by the mains with single-phase supply voltage pf 230 V + E 50 Hz

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TESTING MODULES FOR ELECTRICAL INSTALLATIONS

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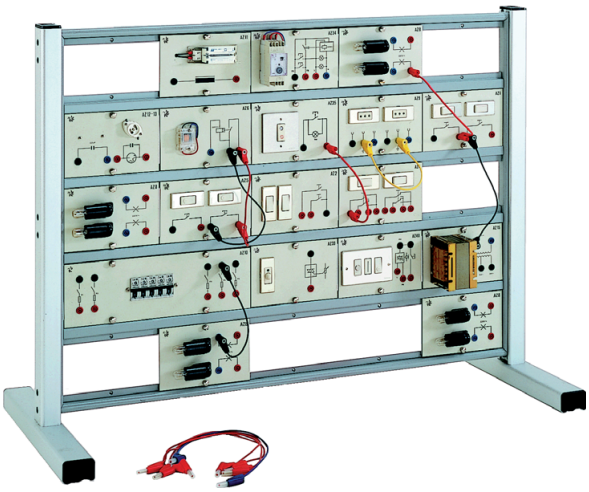
TESTING MODULES FOR LIGHTING INSTALLATIONS

Mod. A/EV

INTRODUCTION

This system has been designed so that students can assemble, analyze and test a wide range of more and more complex electric circuits; it consists of interchangeable modules; thus merely connecting these modules with each other via flexible leads supplied with the equipment enables to assemble various circuits.

Modules are made of insulating material and they represent the support of the necessary devices for implementing the experimental programme, besides offering the graphic representation and standardized electric symbol of the used component; connections are made easier by standardized educational terminals (Ø 4 mm) with high protection degree against accidental contacts.



The set of modules for lighting installations has been designed specifically to assemble, analyze and test lighting installations of civil and service sectors. Modules can be inserted in bench mod. 398/EV to implement the training programme.

As an alternative, vertical frame mod. TSI/EV can be used and the equipment can be powered by power supply unit mod. AZ-1PH/EV (both these units are supplied separately, on demand).

TRAINING PROGRAM:

- lamp controlled from a point
- groups of lamps controlled by two switches
- groups of lamps controlled by a changeover switch
- group of lamps controlled from two points + 1 socket
- group of lamps controlled from 3 points + 3 sockets
- group of lamps controlled from 3 points with relay
- groups of lamps controlled from 3 points
- groups of lamps controlled from 3 points by switch relay
- control of fluorescent lamp
- lighting system of a hotel bedroom
- lighting system of archives from 3 points
- system for switching staircase light on with a certain time-delay
- lighting system for a flat
- lighting from 2 points by touch sensitive electronic switches
- lighting more than 2 points by touch sensitive electronic switches
- lighting by dimmer switch

TECHNICAL SPECIFICATIONS:

The set of modules for assembling the lighting installations mod. A/EV includes:

- 1 Module AZ-1
  - 2 switches for civil uses
- 1 Module AZ-2
  - 1 changeover switch for civil uses
- 2 Modules AZ-3
  - 2 two-way switches for civil uses
- 1 Module AZ-4
  - 2 inverters for civil uses
- 2 Modules AZ-5
  - 2 pushbuttons for civil uses
- 1 Module AZ-6
  - 1 switch relay (coil of 230 V)
- 1 Module AZ-7
  - 2 changeover switch relay (coil of 24 V)
- 3 Modules AZ-8
  - 2 lamp-sockets for schematic diagrams with lamps of 230 V
- 1 Module AZ-9
  - 1 single-phase socket – 230 V – 10 A
- 1 Module AZ-9a
  - 1 single-phase socket – 230 V – 16 A
- 1 Module AZ-10
  - 5 board fuse-holders with breakable fuses of 4/6 A
- 1 Module AZ-11
  - 1 reactor for fluorescent lamp
- 1 Module AZ-12, AZ-13
  - 1 capacitor and starter for fluorescent lamp
- 1 Module AZ-14
  - 1 fluorescent lamp with pins
- 1 Module AZ-15
  - 1 transformer 115-230 / 12-24 V 50-60 Hz 72 VA
- 1 Module AZ-34
  - 1 timing relay (powered by 230 Vac) for staircase lighting
- 2 Modules AZ-35
  - 1 LED button for stairwell lighting with neon glow lamp of 230 V
- 1 Module AZ-39
  - 1 electronic dimmer switch , 500 W – 230 V
- 1 Module AZ-40
  - 1 touch sensitive LED button, 500 W – 230 V

SUPPLIED ACCESSORIES:

- set of 50 cables with safety plugs (Ø 4 mm)

POWER SUPPLY:
230 V / PE 50-60 Hz

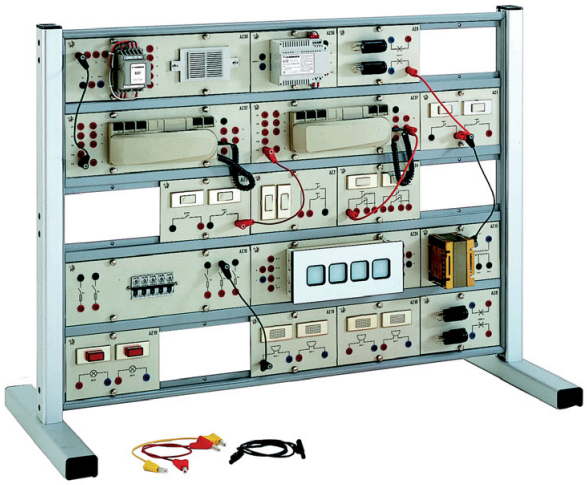
THEORETICAL-EXPERIMENTAL HANDBOOKS
Application handbook with exercises.

TESTING MODULES FOR ELECTRICAL SIGNALLING INSTALLATIONS

Mod. B/EV

INTRODUCTION

This system has been designed so that students can assemble, analyze and test a wide range of more and more complex electric circuits; it consists of interchangeable modules; thus merely connecting these modules with each other via flexible leads supplied with the equipment enables to assemble various circuits. Modules are made of insulating material and they represent the support of the necessary devices for implementing the experimental programme, besides offering the graphic representation and standardized electric symbol of the used component; connections are made easier by standardized educational terminals (Ø 4 mm) with high protection degree against accidental contacts.



The set of modules for signalling installations has been designed specifically to assemble, analyze and test electric systems of visual, sound warning,as well as interphone systems for civil and service sectors. Modules can be inserted in bench mod. 398/EV to implement the training programme. As an alternative, vertical frame mod. TSI/EV can be used and the equipment can be powered by power supply unit mod. AZ-1PH/EV (both these units are supplied separately, on demand).

TRAINING PROGRAM:

- ringer controlled from a point
- ringing system with call and answer from 2 points
- control system of two deviated ringers
- ringing system for 2 flats and an outdoor station
- ringing system for flats with porter's lodge and electric lock
- optical signalling system among offices
- optical signalling system among offices with floor indicator
- signalling system among offices of a multi-floor building with two corridors per floor
- ringer for asking audience in offices
- signalling system for a school
- signalling system for a hotel
- signalling system for a hospital floor
- entry phone system with electric porter
- intercommunicating system with three intercoms
- intercommunicating system between three intercoms and an outdoor station

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TECHNICAL SPECIFICATIONS:

The set of modules for assembling the signalling installations mod. B/EV includes:

- 1 Module AZ-1
  - 2 switches for civil uses
- 2 Modules AZ-3
  - 2 two-way switches for civil uses
- 4 Modules AZ-5
  - 2 pushbuttons for civil uses
- 1 Module AZ-10
  - 5 board fuse-holders with breakable fuses of 4/6 A
- 1 Module AZ-15
  - 1 transformer 115-230 / 12-24 V 50-60 Hz 72 VA
- 2 Modules AZ-16, AZ-17
  - 2 ringers of 24 Vac for civil uses
- 2 Modules AZ-18
  - 2 buzzers of 24 Vac
- 6 Modules AZ-19
  - 2 lamp-sockets with warning lights of 24 V
- 1 Module AZ-20
  - 1 three-button panel with lamps of 24 V
- 1 Module AZ-21
  - 1 electric lock (coil of 12Vac)
- 4 Modules AZ-22
  - 2 LED buttons with lamps of 24 V
- 2 Modules AZ-23
  - 2 lamp-sockets with directional lights of 24 V
- 2 Modules AZ-24
  - 1 lighting badge with display
- 2 Modules AZ-25
  - 2 lamp-sockets with floor-indicating lamps of 24 V
- 8 Modules AZ-26
  - 1 bistable relay with lamp socket (coil and lamp of 24 Vac)
- 1 Module AZ-27
  - 1 driving relay with buzzer (buzzer of 24 Vac; relay coil of 4.5 Vac)
- 8 Modules AZ-28
  - 1 Jack switch and buzzer (coil of 24 Vac)
- 2 Modules AZ-29
  - 1 bistable relay (coil of 24 Vac)
- 2 Modules AZ-30
  - 3 LED buttons with lamps of 24 V for calling maid, porter, etc…
- 6 Modules AZ-31
  - 1 auxiliary relay (coil of 24 Vac)
- 1 Module AZ-32
  - 2 jack switches for signalling installations
- 2 Modules AZ-33
  - 2 blinking warning lights with lamps of 24 V
- 1 Module AZ-36
  - 1 power supply unit for entry phone with supply voltage of 230 Vac
- 3 Modules AZ-37
  - 1 entry phone with three buttons for intercommunicating calls, one button for electric lock and another button for special functions
- 1 Module AZ-38
  - 1 amplified outdoor station, 1 relay for excluding the outdoor station for intercommunicating calls

SUPPLIED ACCESSORIES:

- set of 100 cables with safety plugs (Ø 4 mm)

POWER SUPPLY:
230 V / PE 50-60 Hz

THEORETICAL-EXPERIMENTAL HANDBOOKS
Application handbook with exercises.

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TESTING MODULES FOR INDUSTRIAL INSTALLATIONS

Mod. C/EV

INTRODUCTION

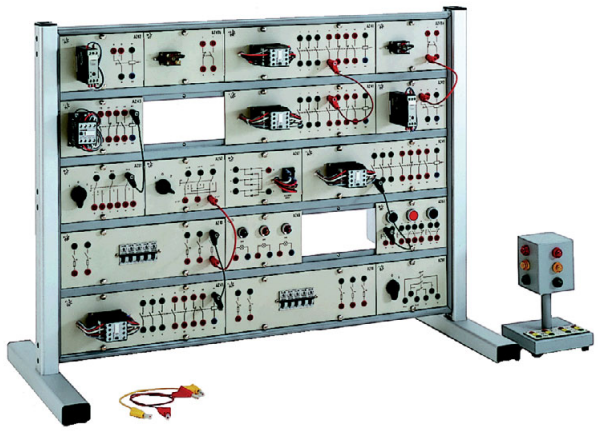
This system has been designed so that students can assemble, analyze and test a wide range of more and more complex electric circuits; it consists of interchangeable modules; thus merely connecting these modules with each other via flexible leads supplied with the equipment enables to assemble various circuits.

Modules are made of insulating material and they represent the support of the necessary devices for implementing the experimental programme, besides offering the graphic representation and standardized electric symbol of the used component; connections are made easier by standardized educational terminals (Ø 4 mm) with high protection degree against accidental contacts.

The set of modules for industrial installations has been designed specifically to assemble, analyze and test typical installations of industrial sector in wired logic such as motor starting, timed sequential cycles.

Modules can be inserted in bench mod. 398/EV to implement the training programme. As an alternative, vertical frame mod. TSI/EV can be used and the equipment can be powered by power supply unit mod. UAT/EV (both these units are supplied separately, on demand).

This system can also be assembled in programmable logic with the integration of a PLC trainer (not included).



TRAINING PROGRAM:

- controlling a contactor from a point
- jogging of a contactor
- separate control of two contactors
- remote control reverser
- remote control reverser with block on push-buttons
- remote control reverser with timer
- remote control of an elevator (A)
- star-delta starting
- starting with stator resistors
- starting with autotransformer
- starting with rotor resistances; exclusion with continuous variation
- remote controlled pole-change switch for 2-winding motors
- remote controlled pole-change switch for single-winding (Dahlander) motors
- reverse current braking
- direct current braking
- control of a circuit breaker
- switch keyer
- changeover switch keyer
- inverter keyer
- star/delta starter keyer
- speed switch keyer
- control of an elevator (B)
- sequence lighting of advertising neon signs
- starting with rotor resistances; exclusion with step variation
- remote control reverser, star-delta starter
- emergency/extra power line
- traffic light system
- main control of a crane

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TECHNICAL SPECIFICATIONS:

The set of modules for assembling the industrial installations mod. C/EV includes:

- 2 Modules AZ-10
  - 5 board fuse-holders with breakable fuses of 4/6 A
- 1 Module AZ-15
  - 1 transformer 115-230 / 12-24 V 50-60 Hz 72 VA
- 4 Modules AZ-41
  - 1 electromagnetic contactor for industrial uses, coil of 24 Vac
- 6 Modules AZ-42
  - 1 delayed relay – 1.5 - 30 s, coil of 24 Vac
- 3 Modules AZ-43
  - 1 auxiliary relay for industrial uses - coil of 24 Vac
- 2 Modules AZ-44
  - 3 push-buttons for industrial uses
- 2 Modules AZ-46
  - 3 lamp sockets for industrial uses with lamps of 24 V
- 1 Module AZ-47
  - 1 three-phase Graetz bridge - 600 V 25 A max.
- 2 Modules AZ-48
  - 1 thermal relay for industrial uses with NO-NC auxiliary contacts
- 2 Modules AZ-49a
  - 1 micro switch for industrial uses
- 2 Modules AZ-49b
  - 1 micro switch for industrial uses (MBB)
- 2 Modules AZ-49c
  - 1 micro switch for industrial uses (BBM)
- 1 Module AZ-50
  - 1 four-pole switch keyer – 16 A 400 V
- 1 Module AZ-51
  - 1 three-pole changeover switch keyer - 16 A 400 V
- 1 Module AZ-52
  - 1 three-pole inverter keyer - 16 A 400 V
- 1 Module AZ-53
  - 1 star/delta starting keyer - 16 A 400 V
- 1 Module AZ-54
  - 1 three-pole keyer (pole-change switch for Dahlander motors) - 16 A 400 V
- 1 Module AZ-55
  - 3 three-phase terminal boards for power circuits
- 1 Module AZ-56
  - 9 three-phase terminal boards for switching/connecting control circuits
- 1 Traffic light unit mod. TL-1
  - 1 traffic light in miniature with 12 lamps of 24 V

SUPPLIED ACCESSORIES:

- set of 60 cables with safety plugs (Ø 4 mm)

RECOMMENDED ACCESSORIES:

- Accessories for completing industrial installations: see details from pag. MS 41

POWER SUPPLY:

3 x 400V (3 x 230 V) / PE 50-60 Hz

THEORETICAL-EXPERIMENTAL HANDBOOKS

Application handbook with exercises.

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INDUSTRIAL INSTALLATIONS WITH CONTACTORS AND FAULT SIMULATOR

Mod. TST-1/EV

INTRODUCTION

This system has been designed so that students can assemble, test and troubleshoot a wide range of circuits for the control of motors; thus merely connecting the devices included in the panel, with each other via flexible leads supplied with the equipment enables to assemble the circuits.

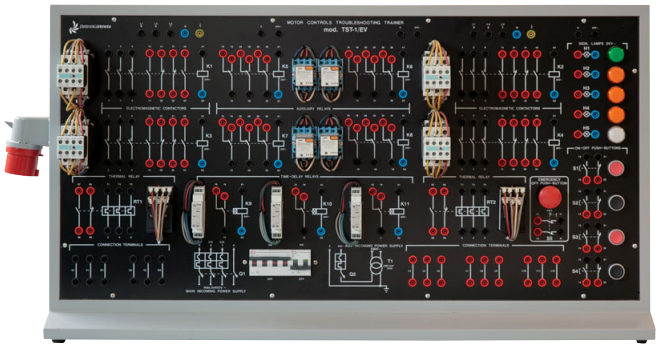
This panel is made of insulating material and it represents the support for all the components. Electrical connections are simplified by the graphic representation and standardized electric symbols of these components and by educational terminals with high protection degree against accidental contacts.

This trainer has been designed specifically to assemble power and control circuits and to troubleshoot electric circuits for starting motors, in industrial and service sectors.

It consists of a wide panel of insulating material included in a metallic framework that must be laid directly on a working table. The arrangement of its components, properly conceived, includes: a line of SELV 24 Vac with magnetothermal protection, for control circuits; a three-phase power line with magnetothermal protection, for power circuits; contactors; auxiliary relays; thermal relays and timers; it also includes push-buttons and lamps for controlling and signalling the state of circuits.

A proper "fault panel" provided with key lock, is used to insert a wide range of faults in the components: these faults are those commonly occurring in automation boards of industries.

This system can also be assembled in programmable logic with the integration of a PLC trainer (not included).



TRAINING PROGRAM:

This programme consists of some exercises that enable teachers and/or students to implement their "circuit variants"

1) controlling a contactor from a point
2) jogging of a contactor
3) separate control of two contactors
4) remote control reverser
5) remote control reverser with block on push-buttons
6) remote control reverser with timer
7) star-delta starting
8) starting with stator resistors
9) starting with autotransformer
10) starting with rotor resistances
11) remote controlled pole-change switch for 2-winding motors
12) remote controlled pole-change switch for single-winding (Dahlander) motors
13) reverse current braking
14) remote control reverser, star-delta starter
15) emergency/extra power line
16) main control of a crane

TECHNICAL SPECIFICATIONS:

Metallic case of sheet steel chemically treated and painted with several coats of epoxy varnish.
Panel of insulating material with silk-screen-painted schematic diagram.

Main components installed and wired on safety terminals:

- 4 electro-magnetic contactors for industrial uses, with three NO working contacts, 2+2 NO-NC auxiliary contacts and a coil of 24 Vac
- 4 auxiliary relays for industrial uses with 3 exchange contacts and coil of 24 Vac
- 3 multi-function, multi-range timers, 24 Vac power supply with exchange contact
- 2 three-pole thermal relays with NO-NC auxiliary contacts
- 5 lamp sockets with warning lights of 24 V of different colours
- 4 push-buttons of different colours, with NO-NC contacts, for industrial uses
- 1 emergency push-button with mechanical holding and 2 NO-NC contacts
- 5 three-phase terminal boards for connecting the applications (stator, rotor, etc… connections)
- 1 three-phase power supply and distribution unit with neutral and earth conductors, protected against overcurrents by differential circuit breaker of 6 A, for powering power circuits
- 1 auxiliary power supply unit, protected against overcurrents by differential circuit breaker of 3 A, for outputting and distributing voltage of 24 Vac for control circuits (single-phase SELV transformer of 72 VA)
- 1 fault-insertion system that can be used to insert up to 51 faults on the devices included in the panel. Each fault can provoke the cutoff or short-circuit of the electric components on which it ha been inserted. Thus this system can ensure 102 fault conditions in total.

Dimensions: 1100 x 300 x 580 mm
Net weight: 35 kg

SUPPLIED ACCESSORIES:

- Set of 60 cables with safety plugs (Ø 4 mm)
- Three-phase power cord with EEC socket and plug
- Single-phase power cord with UNEL plug

RECOMMENDED ACCESSORIES:

- Accessories for completing industrial installations: see details from pag. MS 41

POWER SUPPLY:

main power supply: 3 x 400 (o 230) V /N/PE 50-60 Hz
auxiliary power supply: 230 V 50-60 Hz
max. absorption: 3 kVA

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TESTING MODULES FOR ELECTRO-PNEUMATIC SYSTEMS

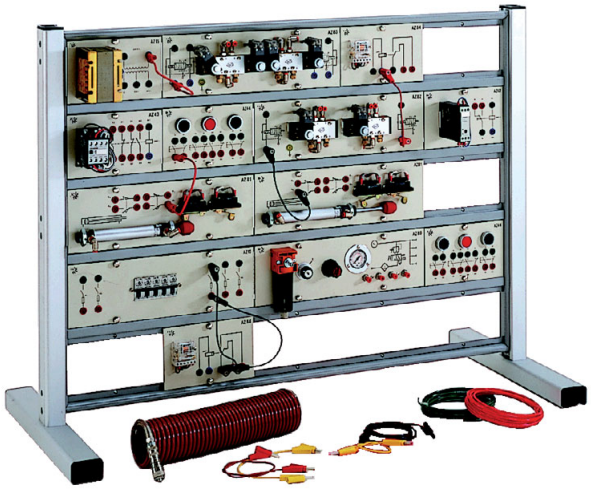
Mod. D/EV

INTRODUCTION

This system has been designed so that students can assemble, analyze and test a wide range of more and more complex electric circuits; it consists of interchangeable modules; thus merely connecting these modules with each other via flexible leads and hoses supplied with the equipment enables to assemble various circuits.
Modules are made of insulating material and they represent the support of the necessary devices for implementing the experimental programme, besides offering the graphic representation and pneumatic, electric symbol of the used component; electrical connections are made easier by standardized educational terminals (Ø 4 mm) with high protection degree against accidental contacts, whereas those of pneumatic type are carried out with pipes of Rilsan® and quick connections.

This set of modules for electro-pneumatic systems has been designed specifically to assemble, analyze and test the typical installations of industrial automation in wired. Modules can be inserted in bench mod. 398/EV to implement the training programme. As an alternative, vertical frame mod. TSI/EV can be used and the equipment can be powered by power supply unit mod. AZ-1PH/EV (both these units are supplied separately, on demand).

This system can also be assembled in programmable logic with the integration of a PLC trainer (not included).



TRAINING PROGRAM:

- controlling a cylinder by monostable solenoid valve
- controlling a cylinder by bistable solenoid valve
- controlling a cylinder by monostable solenoid valve and self-holding circuit
- temporary storage with prevalent insertion
- temporary storage with prevalent reset
- temporary binary counter for circuits with bistable solenoid valve
- temporary binary counter for circuits with monostable solenoid valve
- permanent binary counter for circuits with bistable solenoid valve
- permanent binary counter for circuits with monostable solenoid valve
- control of a sliding door
- semi-automatic control of a double-acting cylinder by monostable solenoid valve
- semi-automatic control of a double-acting cylinder by bistable solenoid valve
- electric control of a cylinder by monostable solenoid valve (anti-repetitiveness)
- electric control of a cylinder by bistable solenoid valve (anti-repetitiveness)
- electric control of a cylinder by monostable solenoid valve and impulse relay (anti-repetitiveness)

- electric control of a cylinder by bistable solenoid valve and impulse relay (anti-repetitiveness)
- automatic control by monostable solenoid valve and stop pushbutton with return to a0 at the end of the cycle
- automatic control by bistable solenoid valve and stop pushbutton with return to a0 at the end of the cycle
- automatic control by bistable solenoid valve and stop pushbutton with immediate return to a0
- automatic control by bistable solenoid valve and stop and emergency pushbutton with different returns
- automatic control by bistable solenoid valve and stop and emergency pushbutton with immediate return to a0
- controlling a cylinder by bistable solenoid valve and delayed-excitation timer
- electric diagrams for using delayed-excitation timer, with monostable solenoid valve and instantaneous contact
- semi-automatic control of a cylinder, with bistable distributor, delayed excitation
- semi-automatic control of a cylinder, with bistable distributor, delayed excitation and exchange contact
- semi-automatic movement with limit switch, timer and monostable distributor
- semi-automatic movement with limit switch, timer and bistable distributor
- safety two-hand control

LOGICAL FUNCTIONS IMPLEMENTED WITH FUNCTIONAL ELECTRIC DIAGRAMS:

- identity function (YES)
- inverse function (NOT)
- sum function (inclusive OR)
- exclusive OR
- product function (AND)
- inhibition function
- examples of logical equations

INDUSTRIAL APPLICATIONS:

- pick-and-place cycle with bistable solenoid valves
- pick-and-place cycle with monostable solenoid valves
- pick-and-place cycle with monostable solenoid valves and safety and emergency circuits
- pick-and-place cycle with bistable solenoid valves and safety and emergency circuits
- "L" cycle with bistable solenoid valves
- "L" cycle with bistable solenoid valves, automatic and semiautomatic control circuits, and anti-repetitiveness condition
- "L" cycle with monostable solenoid valves, automatic and semiautomatic control circuits, and anti-repetitiveness condition

TECHNICAL SPECIFICATIONS:

The set of modules for implementing electro-pneumatic systems mod. D/EV includes:

- 1 Module AZ-10
  - 5 board fuse-holders with breakable fuses of 4/6 A
- 1 Module AZ-15
  - 1 transformer 115-230 / 12-24 V 50-60 Hz 72 VA
- 1 Module AZ-42
  - 1 delayed relay – 1.5 - 30 s, coil of 24 Vac
- 4 Modules AZ-43
  - 1 auxiliary relay for industrial uses - coil of 24 Vac
- 2 Modules AZ-44
  - 3 push-buttons for industrial uses
- 1 Module AZ-80
  - 1 pneumatic feeding with pneumatic switch, pressure controller, pressure gauge and 4-way distributor
- 2 Modules AZ-81
  - 1 double-acting cylinder with electric limit switches
- 1 Module AZ-82
  - two 5/2 monostable solenoid valves – 24 Vac
- 1 Module AZ-83
  - two 5/2 bistable solenoid valves – 24 Vac
- 1 Module AZ-84
  - 1 impulse relay (single-pole two-way switch) with coil of 24 Vac.

SUPPLIED ACCESSORIES:

- set of 50 cables with safety plugs (Ø 4 mm)
- 1 extension for pneumatic feeding with spiral pipe and quick connections
- 10 m of Rilsan® pipe (Ø 4 mm)
- 1 extractor for unthreading Rilsan® pipe from quick connections
- 1 cutter for Rilsan® pipe

RECOMMENDED ACCESSORIES:

- Silent compressor provided with wheels and tank, overpressure valve and pressure reducer with connection fitting M.12 MINI ¼"

  Technical specifications of compressor:

  * capacity: 20 l
  * flow rate: 55 l/min
  * pressure: 7 bars
  * motor power: 0.5 kW
  * revolutions per minute: 1400
  * noise level: < 57 dB
  * power supply: 230 V, single-phase – 50-60 Hz
  * automatic thermal protection
  * dimensions: 650 x 350 x 750 mm
  * weight: 30 kg

POWER SUPPLY:

Electrical: 230 V / PE 50-60 Hz
Pneumatic feeding: compressed air; flow rate of 20 l/min; max. pressure: 8 bars.

THEORETICAL-EXPERIMENTAL HANDBOOKS

Application handbook with exercises.

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TESTING MODULES FOR INSTALLATIONS WITH ELECTRICAL PROTECTIONS

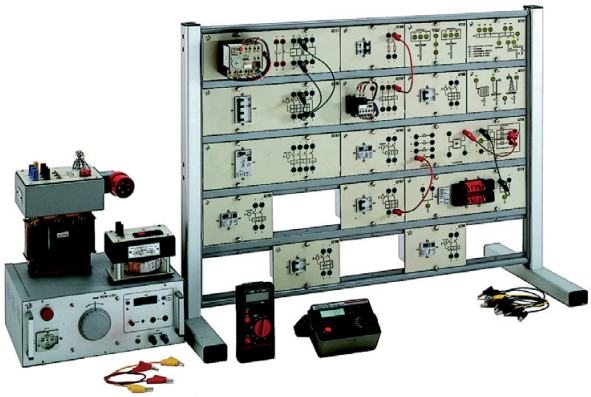
Mod. E/EV

INTRODUCTION

This system has been designed so that students can assemble, analyze and test a wide range of more and more complex electric circuits; it consists of interchangeable modules; thus merely connecting these modules with each other via flexible leads supplied with the equipment enables to assemble various circuits.

Modules are made of insulating material and they represent the support of the necessary devices for implementing the experimental programme, besides offering the graphic representation and standardized electric symbol of the component; electrical connections are made easier by standardized educational terminals (Ø 4 mm) with high protection degree against accidental contacts.

This set of modules for installations with electric protections has been designed specifically to assemble, analyze and test either the protection devices separately and the assembly according to the technical standards in force. Modules can be inserted in bench mod. 398/EV to implement the training programme. As an alternative, vertical frame mod. TSI/EV can be used and the equipment can be powered by power supply unit mod. UAT/EV (both these units are supplied separately, on demand).



TRAINING PROGRAM:

PROTECTIONS VIA DIFFERENTIAL CIRCUIT BREAKERS

- installation with differential circuit breaker for sine-wave stray currents (type AC); testing current and tripping times
- installation with differential circuit breaker for stray currents, pushbutton with D.C. offset (type A); testing current and tripping times
- installation with delayed differential circuit breaker (type S); testing current and tripping times
- installation with differential circuit breaker of very high sensitivity; testing current and tripping times
- installation with selective differential protections; testing selectivity degree
- installation with differential circuit breaker for three-phase systems with and without neutral conductor

PROTECTIONS VIA MAGNETO-THERMAL CIRCUIT BREAKER AND FUSES

- installation with magneto-thermal circuit breaker of tripping curve C (former U) – testing current/tripping time curve
- installation with magneto-thermal circuit breaker of tripping curve B (former G) – testing current/tripping time curve
- coordination of magneto-thermal protections – testing the selectivity degree
- installation with fuses of different current-carrying capacities
- coordination of mixed fuse/magneto-thermal protections – testing the selectivity degree
- installation with magneto-thermal circuit breaker for three-phase systems with and without neutral conductor

PROTECTIONS VIA THERMAL RELAY

- installation with electro-mechanical thermal relay - testing current/tripping time curve
- installation with electronic overload relay - testing the operation
- installation with thermal relay and fuses – coordination of protections

PROTECTIONS AGAINST TRANSIENT OVERVOLTAGES

- additional protection system from overvoltages of atmospheric or industrial origin

COMBINED DIFFERENTIAL, MAGNETO-THERMAL AND FUSE PROTECTIONS

- distribution system with combined protections – testing coordination and sensitivity – detection of presumed short-circuit current

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PROTECTION VIA ISOLATION TRANSFORMER

- installation with isolation transformer and control monitor
- installation with isolation transformer of safety extra low voltage – testing system insulation

EARTHING SYSTEM AND EQUIPOTENTIAL LINKS

- TN, TT and IT distribution system
- Protection earthing system – measurement of resistance
- Earthing system with equipotential links – testing the continuity of protection and equipotential conductors
- Measurement of stray current and of contact voltages

TECHNICAL SPECIFICATIONS:

The set of modules for implementing installations with electric protections mod. E/EV includes:

- 1 Module AZ-101
  - 1 selective (S) four-pole differential circuit breaker of type A; In = 63 A / Idn = 0.3 A
- 1 Module AZ-102
  - 1 two-pole differential circuit breaker of type A; In = 25 A / Idn = 30 mA
- 1 Module AZ-103
  - 1 two-pole differential circuit breaker of type AC; In = 25 A / Idn = 30 mA
- 1 Module AZ-104
  - 1 two-pole differential circuit breaker of type A; In = 16 A / Idn = 10 mA
- 1 Module AZ-105
  - 1 four-pole magneto-thermal circuit breaker; In = 16 A (curve C) – breaking power = 10 kA
- 1 Module AZ-106
  - 1 two-pole magneto-thermal circuit breaker; In = 10 A (curve C) – breaking power = 10 kA
- 1 Module AZ-107
  - 1 two-pole magneto-thermal circuit breaker; In = 6 A (curve C) – breaking power = 6 kA
- 1 Module AZ-108
  - 1 two-pole magneto-thermal circuit breaker; In = 6 A (curve B) – breaking power = 6 kA
- 1 Module AZ-109
  - 1 breakable pair of fuse-holders with fuses
- 1 Module AZ-110
  - 1 three-pole thermal relay protected against phase lack – control range of 2.5 to 4 A
- 1 Module AZ-111
  - 1 electronic relay for protection against overloads – control range of 1 to 4 A
- 1 Module AZ-112a
  - 1 isolation monitor for IT lines
- 1 Module AZ-112b
  - 2 remote signalling devices for isolation monitor
- 1 Module AZ-113
  - simulation of 2 earth electrodes of variable resistance
- 1 Module AZ-114
  - simulation of 3 extraneous conducting parts of various resistance
- 1 Module AZ-115
  - earth collector for connection and breaking of protection earthing system and of equipotential conductors, with 2 extraneous conducting parts
- 1 Module AZ-116
  - 1 three-phase line with neutral conductor, 1 AC/DC power consuming device and earth fault simulation
- 1 Module AZ-41
  - 1 electro-magnetic contactor for industrial uses, with coil of 24 Vac
- 1 Module AZ-118
  - 2 suppressors of transient overvoltages

SET OF INSTRUMENTS AND ACCESSORIES OF THE EQUIPMENT:

- 1 single-phase isolation transformer mod. TIM-1/EV – 230/230 V; 50-60 Hz; 500 VA
- 1 single-phase isolation transformer of safety extra-low voltage mod. TIB-1/EV – 230/24 V; 50-60 Hz; 100 VA
- 1 three-phase isolation transformer mod. TIT-1/EV – 230-400 / 230-400 V; 50-60 Hz; 500 VA
- 1 device for adjusting the testing current of differential circuit breakers mod. RCD-1/EV, with Idn of 10-30 mA
- 1 device for adjusting the testing current of magneto-thermal circuit breakers and of fuses mod. RCM-1/EV. Control of rated current up to50 A; instrument for detectinmg tripping times
- 1 set of 38 cables with safety plugs (Ø 4 mm)

NECESSARY INSTRUMENTS (not included in the equipment)

- 1 instrument for testing the operation of differential circuit breakers
- 1 analyzer of fault loop resistance and of the presumed short-circuit current
- 1 digital current probe for measuring rated and stray currents and peak memory
- 1 digital autoranging multimeter

POWER SUPPLY:
3 x 400 V (3 x 230 V) / PE 50-60 Hz

THEORETICAL-EXPERIMENTAL HANDBOOKS
Application handbook with exercises.

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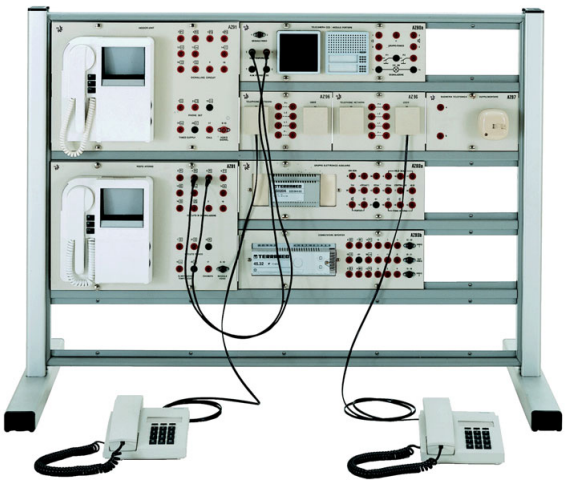
TESTING MODULES FOR TELEPHONE AND VIDEO INTERPHONE SYSTEMS

Mod. F1/EV



INTRODUCTION

This system has been designed so that students can assemble, analyze and test a wide range of more and more complex electric circuits; it consists of interchangeable modules; thus merely connecting these modules with each other via flexible leads supplied with the equipment enables to assemble various circuits. Modules are made of insulating material and they represent the support of the necessary devices for implementing the experimental programme, besides offering the graphic representation and standardized electric symbol of the component; electrical connections are made easier by standardized educational terminals (Ø 4 mm) with high protection degree against accidental contacts.

This set of modules for interphone systems has been designed specifically to assemble, analyze and test video interphone signalling installations applied to civil service sector.

This equipment also includes a set of devices for intercommunication telephony. Modules can be inserted in bench mod. 398/EV to implement the training programme. As an alternative, module holder frame mod. TSI/EV can be used and the equipment can be powered by power supply unit mod. AZ-1PH/EV (both these units are supplied separately, on demand).

TRAINING PROGRAM:

- installation with indoor unit and outdoor unit (single-family house)
- installation with an outdoor unit and two indoor units (two-family house)
- telephone system with electronic exchange for the control of various telephone sets with options

TECHNICAL SPECIFICATIONS:

The set of modules for implementing telephone and video interphone systems mod. F1/EV includes:

- 1 Module AZ-90
  - 1 outdoor video interphone unit, with camera (CCD), button panel for two calls and porter
- 2 Modules AZ-91
  - 1 indoor wall-type video interphone unit, with monitor and micro-telephone
- 1 Module AZ-92
  - 1 power supply unit for analog entryphone systems
- 1 Module AZ-93
  - 1 electronic switch of voice exclusion in outdoor unit
- 1 Module AZ-94
  - 1 floor shunt for 4 indoor units
- 1 Module AZ-95
  - 1 electronic branch exchange for shunting an external line with several internal telephone sets; 1 telephone set of impulse dialling
- 2 Modules AZ-96
  - 1 telephone set of impulse dialling
- 1 Module AZ-97
  - 1 additional ringer for call repetition

SUPPLIED ACCESSORIES:

- Set of 40 cables with safety plugs (Ø 4 mm)

POWER SUPPLY:

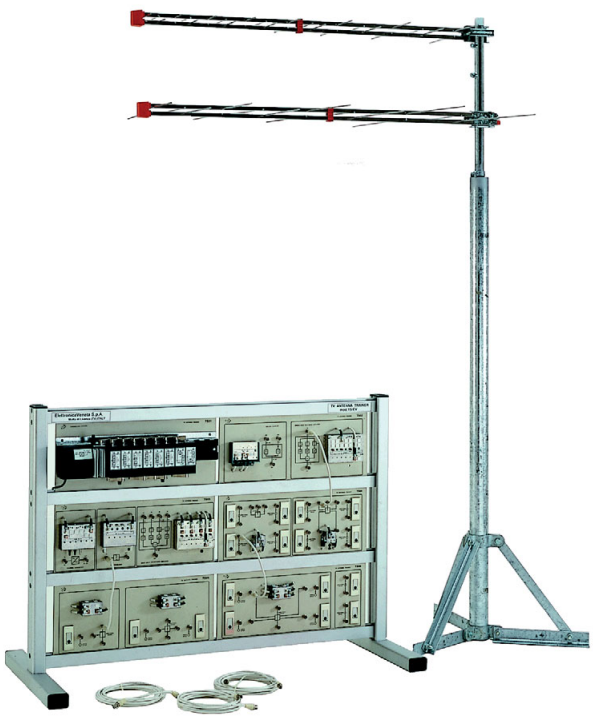
230 V / PE 50-60 Hz

THEORETICAL-EXPERIMENTAL HANDBOOKS

Application handbook with exercises.

TESTING MODULES FOR TV ANTENNA SYSTEMS

Mod. TS/EV



INTRODUCTION

This system is one of the models of the set of electric installations and also of Transmission Systems (Cat. 21). It consists of modules conceived for theoretical-experimental courses concerning the design and assembly of the devices used in modern terrestrial TV reception systems, as well as the measurements carried out on them. Each module of this system includes various functional devices enabling to carry out different exercises in flexible way and according to the instructions available in the theoretical-experimental handbook supplied with the equipment, so that the peculiar characteristics of the included electronic circuits and the global characteristics of the system using them can be examined efficaciously.

Trainer mod. TS/EV is designed to examine the characteristic and application aspects of design and assembly of a TV antenna reception system, and to analyze the amplification and distribution of television signals in detail. It also includes a handy and functional vertical frame for modules.

This trainer consists of panels of insulating material where the block diagram has been silk-screen-printed for an easier use during exercises. Each module includes "professional" devices enabling to assemble a lot of central antenna systems starting from the basic single-user system.

TRAINING PROGRAM:

- Characteristics and operation of components for TV antenna systems: mixers; broad-band, multi-input and channel amplifiers; filters; converters; power supply units; cables; sockets; shunts; dividers and antennas
- Distribution network: in cascade on 1 and 2 columns, and by nodes
- Single broad-band system; multiple system with band amplifiers, channel converter and with channel and power amplifiers
- Using equalizing filter
- Using antennas

TECHNICAL SPECIFICATIONS:

The set of modules for implementing TV antenna systems mod. TS/EV includes:

- 1 Module TS01 consisting of:
  - 1 power supply unit
  - 1 UHF band pre-amplifier
  - 1 channel amplifier – band I channel B (*)
  - 1 channel amplifier – band III channel D (*)
  - 1 channel amplifier – UHF band channel 25 (*)
  - 1 channel amplifier – UHF band channel 40 (*)
  - 1 channel amplifier – UHF band channel 61 (*)
  - 1 VHF band output amplifier
  - 1 UHF band output amplifier
- 1 Panel TS02 consisting of:
  - 1 two-input (VHF and UHF) mixer
  - 1 broad-band (VHF and UHF) amplifier
- 1 Panel TS03 consisting of:
  - 1 broad-band four-input (bands I-III-IV-V) branch exchange
  - 1 UHF/band I converter from channel 61 to B (*)
  - 1 equalizing filter
- 1 Panel TS04 consisting of:
  - 1 two-output divider; 1 four-output divider
  - 4 directional TV sockets
- 1 Panel TS05 consisting of:
  - 1 one-output directional junction box
  - 1 two-output directional junction box
  - 3 simple sockets (terminals)
- 1 Panel TS06 consisting of:
  - 1 four-output directional junction box
  - 4 simple sockets (terminals); 2 directional sockets

Dimensions: 1100 x 800 x 800 mm
Net weight: 20 kg

RECOMMENDED ACCESSORIES FOR COMPLETION:

- Colour bar generator
- Field meter

SUPPLIED ACCESSORIES:

- 1 vertical rack for modules
- 1 log-periodic antenna – band III
- 1 log-periodic antenna – band IV/V
- 1 antenna mast with support
- 1 set of 20 terminalized cables with antenna plugs of various sizes
- 8 terminations of 75 Ω, 2 direct current separators,
- 2 female-female adapters

(*): different channels can be supplied on demand

POWER SUPPLY:

230 V / PE 50-60 Hz

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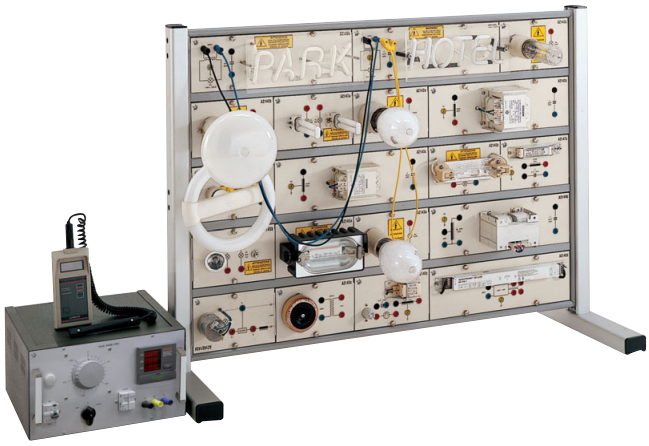
TESTING MODULES FOR INSTALLATIONS OF LIGHT SOURCES

Mod. H/EV

INTRODUCTION

This system has been designed so that students can assemble, analyze and test a wide range of more and more complex electric circuits; it consists of interchangeable modules; thus merely connecting these modules with each other via flexible leads supplied with the equipment enables to assemble various circuits. Modules are made of insulating material and they represent the support of the necessary devices for implementing the experimental programme, besides offering the graphic representation and standardized electric symbol of the component; connections are made easier by standardized educational terminals (Ø 4 mm) with high protection degree against accidental contacts.

This set of modules for installations with different light sources has been designed specifically to assemble, analyze and test electric lighting systems of civil service sector. Modules can be inserted in bench mod. 398/EV to implement the training programme. As an alternative, vertical frame mod. TSI/EV can be used **and the equipment can be powered by power supply unit mod. UAM-1/EV (included in the equipment).**



TRAINING PROGRAM:

- lighting system with mercury-vapor lamps
- lighting system with high-pressure sodium-vapor lamps
- lighting system with low-pressure sodium-vapor lamps
- lighting system with high-efficiency fluorescent lamps
- lighting system with halogen and incadescent lamps
- lighting system with halide-vapor lamps
- lighting system with lamps of mixed light
- lighting system with fluorescent lamps for particular applications
- lighting system with fluorescent lamps of quick lighting
- lighting system of advertising type with cold-cathode colour luminescent tubes
- testing the luminous intensity of various light sources
- sizing and realization of indoor and outdoor installations

TECHNICAL SPECIFICATIONS:

The set of modules for implementing the installations with light sources mod. H/EV includes:

- 1 Module AZ-140a:
  - 1 mercury-vapor lamp with fluorescent bulb of 230 V – 250 W; 1 lamp socket E 40
- 1 Module AZ-140b:
  - 1 mercury-vapor lamp including reflector, of 230 V – 250 W; 1 lamp socket E 40
- 1 Module AZ-140c:
  - 1 ballast for mercury-vapor lamp of 230 V – 250 W
  - 1 power factor correction capacitor of 18 µF
- 1 Module AZ-141:
  - 1 lamp of mixed light with fluorescent bulb of 230 V – 250 W
  - 1 lamp socket E 40
- 1 Module AZ-142a:
  - 1 halide-vapor lamp with diffusing bulb of 230 V – 250 W
  - 1 lamp socket E 40
- 1 Module AZ-142b:
  - 1 halide-vapor lamp with transparent bulb of 230 V – 250 W
  - 2 lamp sockets F
- 1 Module AZ-142c:
  - 1 ballast for halide-vapor lamp with transparent bulb of 230 V – 250 W
  - 1 power factor correction capacitor of 32 µF
- 2 Modules AZ-142/143d:
  - 1 lighter for halide-vapor/HP sodium-vapor lamps
- 1 Module AZ-143a:
  - 1 HP sodium-vapor lamp with diffusing bulb of 230 V – 150 W
  - 1 lamp socket E 40
- 1 Module AZ-143b:
  - 1 HP sodium-vapor lamp with transparent bulb of 230 V – 150 W
  - 1 lamp socket E 40
- 1 Module AZ-143c:
  - 1 ballast for High-Pressure sodium-vapor lamp of 230 V – 150 W
  - 1 power factor correction capacitor of 20 µF
- 1 Module AZ-144a:
  - 1 LP (Low-Pressure) sodium-vapor lamp of clear glass with coat reflecting infrared rays - 230 V – 35 W
  - 1 lamp socket BY 22d
- 1 Module AZ-144b:
  - 1 ballast for low-pressure sodium-vapor lamp of 230 V – 35 W
  - 1 power factor correction capacitor of 20 µF
- 1 Module AZ-145a:
  - 1 incandescent halogen lamp of 230 V – 200 W
  - 1 floodlight; 2 lamp sockets R7s-15
- 1 Module AZ-145b:
  - 1 incandescent halogen lamp of 12 V – 20 W
  - 1 incandescent halogen lamp of 12 V – 20 W with reflector; 2 lamp sockets G4
- 1 Module AZ-145c:
  - 1 single-phase transformer of safety extra low voltage – 230/12 V 48 VA
- 1 Module AZ-146
  - 1 circular fluorescent lamp of 230 V – 24 W including electronic power supply; 1 lamp socket E 27
- 1 Module AZ-147a
  - 2 miniaturized fluorescent lamps of 230 V – 9 W of high efficiency and low consumption with built-in starter
  - 2 lamp sockets G 23
- 1 Module AZ-147b:
  - 1 ballast for fluorescent lamps of 230 V – 2x9 W of high efficiency and low consumption
  - 1 power factor correction capacitor of 2 µF
- 2 Modules AZ-148a
  - 1 ceiling light fixture with 2 lamp sockets G13 for fluorescent tube of 18-20 W
- 2 Modules AZ-148c:
  - 1 ballast for fluorescent tubes of 230 V – 20 W, lighted by starter; 1 electronic starter
  - 1 power factor correction capacitor of 4.5 µF
- 1 Module AZ-148d:
  - 1 electronic ballast for fluorescent tubes of 230 V – 20 W
- 1 set of fluorescent lamps of 20 W – 230 V, including:
  - 2 fluorescent lamps with day light
  - 1 fluorescent lamp with warm light
  - 1 fluorescent lamp of Wood's glass
  - 1 fluorescent lamp emitting light accentuated in a specific zone of spectrum
- 1 Module AZ-149a
  - 1 neon sign with cold-cathode red fluorescent tube; 1 power supply unit for neon sign (supply voltage of 230 V)
- 1 Module AZ-149b
  - 1 neon sign with cold-cathode green fluorescent tube; 1 power supply unit for neon sign (supply voltage of 230 V)

SUPPLIED ACCESSORIES:

- set of 15 cables with safety plugs (Ø 4 mm)
- 1 shield of transparent material for protecting the operator when testing on light sources
- 1 digital lux meter with 3½-digit Liquid-Crystal Display (LCD) – 1999 points, silicon photodiode sensor with correction of spectral response, automatic ranges of 0.1 – 200 k Lux, DATA HOLD function and automatic switching-off; powered by battery of 9 V
- 1 single-phase power supply unit mod. UAM-1/EV of 230 V / 0-250 Vac 5 A, with control and protection devices, equipped with digital instrument for the simultaneous measurement of voltage, current, active power, power factor and reactive, apparent power, frequency, with voltage regulator of 5 A, protection by differential circuit breaker of 10 mA and fuses

POWER SUPPLY:
230 V / PE 50-60 Hz

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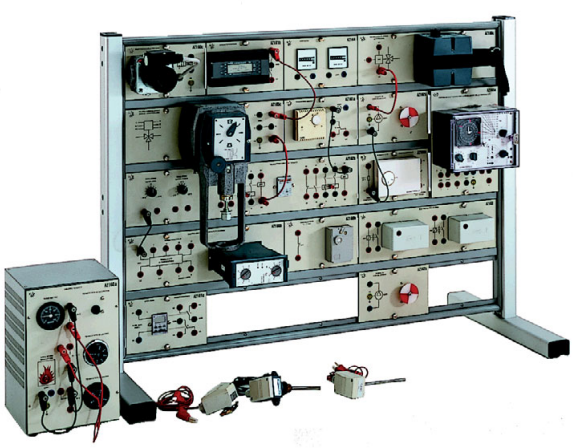
TESTING MODULES FOR ELECTRICAL SYSTEMS FOR HEATING PLANTS

Mod. I/EV

INTRODUCTION

This system has been designed so that students can assemble, analyze and test a wide range of more and more complex electric circuits; it consists of interchangeable modules; thus merely connecting these modules with each other via flexible leads supplied with the equipment enables to assemble various circuits. Modules are made of insulating material and they represent the support of the necessary devices for implementing the experimental programme, besides offering the graphic representation and standardized electric symbol of the component; connections are made easier by standardized educational terminals (Ø 4 mm) with high protection degree against accidental contacts.

This set of modules for heating plants has been designed specifically to assemble, analyze and test electric systems used in heating plants. Modules can be inserted in bench mod. 398/EV to implement the training programme. As an alternative, vertical frame mod. TSI/EV can be used and the equipment can be powered by power supply unit mod. AZ-1PH/EV (both these units are supplied separately, on demand).



TRAINING PROGRAM:

- electric system for the control of room temperature by thermostat and a circulation pump
- electric system for the control of ambient temperature of two zones by thermostats and two circulation pumps
- electric system for the control of ambient temperature of two zones by a circulation pump, a spare pump and two zone valves controlled by thermostats
- system for the control of ambient temperature of two zones by regulation of inlet flow rate via mixing valve, electronic control unit and temperature sensors
- system for temperature control of a radiating panel by proportional room thermostat, three-way valve and thermostat of water maximum temperature

TECHNICAL SPECIFICATIONS:

The set of modules for implementing the electrical systems for heating plants mod. I/EV includes:

- 1 Module AZ-160a:
  - 1 heating unit, with working thermostat, minimum-temperature thermostat, maximum-temperature thermostat and burner simulator
- 1 Module AZ-160b:
  - 1 safety pressure switch 1-6 bars
- 1 Module AZ-160c:
  - 1 fuel cutoff valve of electric control, powered with 230 V 50-60 Hz
- 1 Module AZ-161a:
  - 1 electro-mechanical room thermostat
- 1 Module AZ-161b:
  - 1 room chronothermostat
- 1 Module AZ-161c:
  - 1 electronic program timer with 2 contacts, powered with 230 V 50-60 Hz
- 2 Modules AZ-162a:
  - 1 simulator of circulation pump of 230 V 50-60 Hz
- 1 Module AZ-162b:
  - 2 miniature contactors with coil of 24 Vac, equipped with simulator of protection thermal relay
- 1 Module AZ-163:
  - 2 zone valves with electric control of 24 V
- 1 Module AZ-164:
  - 2 hour counters powered with 230 V 50 Hz
- 1 Module AZ-165a:
  - 1 electronic control unit for the control of temperature in heating plants with mixing valves, powered with 230 V 50-60 Hz
- 1 Module AZ-165b:
  - 1 outdoor temperature sensor and simulation device of air temperature, 1 inlet temperature sensor and simulation device of water temperature
- 1 Module AZ-165c:
  - 1 servo-controlled three-way mixing valve powered with 230 V 50-60 Hz
- 1 Module AZ-166a:
  - 1 proportional room thermostat
- 1 Module AZ-166b:
  - 1 electronic control unit for controlling temperature in heating plants with mixing valve, powered with 24 V 50-60 Hz and provided with thermostat of water maximum temperature
- 1 Module AZ-166c:
  - 1 motor-driven three-way mixing valve powered with 24 V 50-60 Hz
- 1 Module AZ-15
  - 1 transformer 115-230 / 12-24 V 50-60 Hz 72 VA

SUPPLIED ACCESSORIES:

- set of 15 cables with safety plugs (Ø 4 mm)

POWER SUPPLY:
230 V / PE 50-60 Hz

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TESTING MODULES FOR ELECTRICAL SYSTEMS OF ANTI THEFT ALARM

Mod. L-A/EV

INTRODUCTION

This system has been designed so that students can assemble, analyze and test a wide range of more and more complex electric circuits; it consists of interchangeable modules; thus merely connecting these modules with each other via flexible leads supplied with the equipment enables to assemble various circuits. Modules are made of insulating material and they represent the support of the necessary devices for implementing the experimental programme, besides offering the graphic representation and standardized electric symbol of the component; connections are made easier by standardized educational terminals (Ø 4 mm) with high protection degree against accidental contacts.

This set of modules for alarm systems has been designed specifically to assemble, analyze and test electric systems of detection and signalling in the field of anti theft system for civil and service sectors. Modules can be inserted in bench mod. 398/EV to implement the training programme. As an alternative, vertical frame mod. TSI/EV can be used and the equipment can be powered by power supply unit mod. AZ-1PH/EV (both these units are supplied separately, on demand).

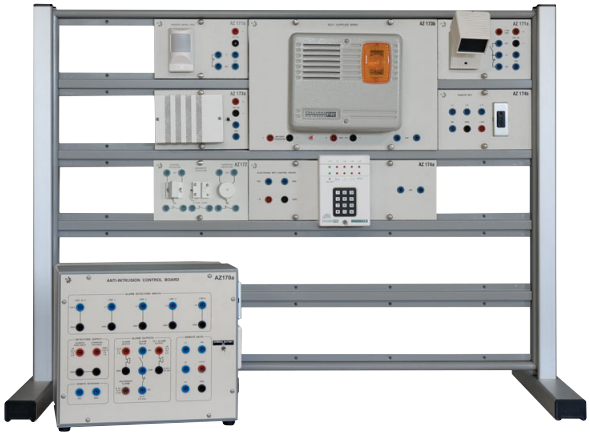
TRAINING PROGRAM:

- one-zone burglar alarm system, with electronic control unit, microwave presence detector and additional siren two-zone
- burglar alarm system, with electronic control unit, passive infrared presence detector, microcontacts, additional siren and self-powered outdoor siren
- two-zone burglar alarm system, with electronic control unit, passive infrared presence detector, microwave presence detector, microcontacts, electronic key for remote control of control unit, additional siren and self-powered outdoor siren

TECHNICAL SPECIFICATIONS:

The set of modules for implementing alarm systems mod. L-A/EV includes:

- 1 Module AZ-170a:
  - 1 electronic control unit with 4 alarm lines, self-protected with 24h anti-sabotage line and self-powered by buffer battery. Power supply: 230 Vac. Output: 12 Vdc
- 1 Module AZ-171a:
  - 1 volumetric sensor of double technology (microwaves and IR); microwaves with operating range up to 10 m. Power supply: 12 Vdc
- 1 Module AZ-171b:
  - 1 passive infrared volumetric sensor with operating range up to 10 m. Power supply: 12 Vdc



- 1 Module AZ-172:
  - 1 magnetic detector with NC contact
  - 1 inertial sensor with NC contact
  - 1 sensor of vibration and glass breaking with NC contact
- 1 Module AZ-173a:
  - 1 indoor alarm device with two-tome electronic siren. Power supply: 12 Vdc
- 1 Module AZ-173b:
  - 1 outdoor electronic siren with flashing light, self-protected and self-powered with battery of 12 Vdc
- 1 Module AZ-174a:
  - 1 remote keyboard for enabling, disabling, choking and for total control of electronic control unit (remote programming)
- 1 Module AZ-174b:
  - 1 remote electronic key for enabling, disabling, chocking the control unit

SUPPLIED ACCESSORIES:

- set of 30 cables with safety plugs (Ø 4 mm)

POWER SUPPLY:

230 V / PE 50-60 Hz

THEORETICAL-EXPERIMENTAL HANDBOOKS

Application handbook with exercises.

TESTING MODULES FOR FIRE FIGHTING AND TECHNICAL ALARM SYSTEMS

Mod. L-B/EV

INTRODUCTION

This system has been designed so that students can assemble, analyze and test a wide range of more and more complex electric circuits; it consists of interchangeable modules; thus merely connecting these modules with each other via flexible leads supplied with the equipment enables to assemble various circuits. Modules are made of insulating material and they represent the support of the necessary devices for implementing the experimental programme, besides offering the graphic representation and standardized electric symbol of the component; connections are made easier by standardized educational terminals (Ø 4 mm) with high protection degree against accidental contacts.

This set of modules for alarm systems has been designed specifically to assemble, analyze and test electrical systems of detection and signalling in the field of fire fighting alarm for civil and service sectors.

Modules can be inserted in bench mod. 398/EV to implement the training programme. As an alternative, vertical frame mod. TSI/EV can be used and the equipment can be powered by power supply unit mod. AZ-1PH/EV (both these units are supplied separately, on demand).

TRAINING PROGRAM:

- fire fighting system including photoelectronic smoke detector and alarm device connected with electronic control unit
- fire fighting system including rate-of-rise detector and alarm device connected with electronic control unit
- fire fighting system including photoelectronic smoke detector, rate-of-rise detector and alarm device connected with electronic control unit with OR-AND lines
- alarm system with gas leak detector
- alarm system with carbon monoxide detector

TECHNICAL SPECIFICATIONS:

The set of modules for implementing alarm systems mod. L-B/EV includes:

- 1 Module AZ-170b:
  - 1 electronic control unit with 2 lines of fire alarm and manual alarms, self-powered by 2 buffer batteries x 12 Vdc. Power supply: 230 Vac. Output: 24 Vdc
- 1 Module AZ-173c:
  - 1 fire alarm ringer. Power supply: 24 Vdc
- 1 Module AZ-175a:
  - 1 photoelectronic smoke detector. Power supply: 24 Vdc
- 1 Module AZ-175b:
  - 1 rate-of-rise detector. Power supply: 24 Vdc
- 1 Module AZ-175c:
  - 1 electronic gas detector. Power supply: 230 Vac
- 1 Module AZ-175d:
  - 1 electronic CO detector. Power supply: 230 Vac

SUPPLIED ACCESSORIES:

- set of 20 cables with safety plugs (Ø 4 mm)

POWER SUPPLY:

230 V / PE 50-60 Hz

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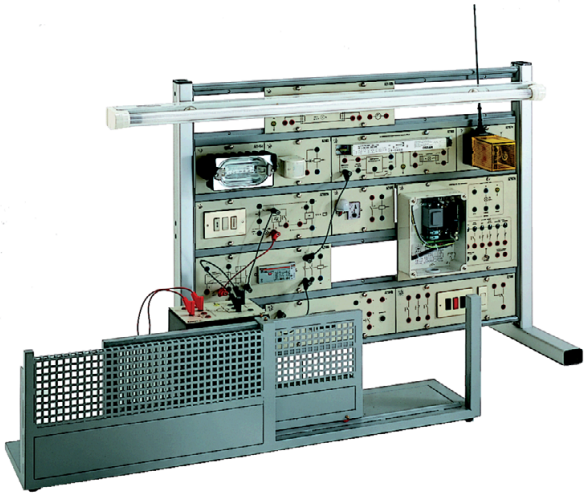
TESTING MODULES FOR ELECTRONICALLY CONTROLLED CIVIL INSTALLATIONS HOME AUTOMATION

Mod. M/EV

INTRODUCTION

This system has been designed so that students can assemble, analyze and test a wide range of more and more complex electric circuits; it consists of interchangeable modules; thus merely connecting these modules with each other via flexible leads supplied with the equipment enables to assemble various circuits. Modules are made of insulating material and they represent the support of the necessary devices for implementing the experimental programme, besides offering the graphic representation and standardized electric symbol of the component; connections are made easier by standardized educational terminals (Ø 4 mm) with high protection degree against accidental contacts.



This set of modules for systems of home automation has been designed specifically to assemble, analyze and test systems using electric devices controlled by electronics or by micro-electronics.

These devices improve comfort, safety and performance of traditional electrical installations. Modules can be inserted in bench mod. 398/EV to implement the training programme. As an alternative, vertical frame mod. TSI/EV can be used and the equipment can be powered by power supply unit mod. AZ-1PH/EV (both these units are supplied separately, on demand).

TRAINING PROGRAM:

- lighting system with twilight switch
- lighting system with presence sensor
- lighting system with controller and remote control for one or more lighting points with incandescent lamps
- lighting system with controller for fluorescent lamps
- lighting system with automatic control of luminous intensity versus the level of room lighting
- system for optimizing electric power consumption by programming of priority for power consuming devices
- emergency lighting system with separate self-powered lighting fixtures
- emergency lighting system with self-powered lighting fixtures of central control
- system for the automatic control of a gate by electronic control unit, radio control, through beam sensor and driving unit with limit switch

TECHNICAL SPECIFICATIONS:

The set of modules for implementing electronically controlled civil installations mod. M/EV includes:

- 1 Module AZ-180:
  - 1 electronic twilight switch
- 1 Module AZ-181:
  - 1 electronic presence sensor using passive infrared rays
- 1 Module AZ-182a:
  - 1 receiver electronic controller of luminous intensity with fuse; 1 coded multi-channel remote control
- 1 Module AZ-182b:
  - 1 electronic step-by-step receiver of light control, with fuse
- 1 Module AZ-183:
  - 1 electronic dimmable ballast for fluorescent lamps
- 1 Module AZ-184a:
  - 1 electronic control unit for control and adjustment of luminous intensity, with possibility of automatic control
- 1 Module AZ-184b:
  - 1 electronic unit for automatic control of internal luminous versus environmental luminosity (peripheral unit for module AZ-184a)
- 1 Module AZ-184c:
  - 1 electronic unit for gradual switching on and off within a preset time (peripheral unit for module AZ-184a)
- 1 Module AZ-185:
  - 1 electronic control unit for optimizing consumptions by priority selection of power consuming devices
- 2 Modules AZ-186:
  - 1 self-powered fluorescent lamp of 8 W for emergency lighting
- 1 Module AZ-187a:
  - 1 electronic control unit for automation of gates with radio control card
- 1 Module AZ-187b:
  - 1 pair of photoelectric through beam sensors
- 1 Module AZ-187c:
  - 1 blinking alarm device for automation of gates including radio control antenna
- 1 Module AZ-187d:
  - 1 driving unit with single-phase motor and limit switches
- 1 Module AZ-188:
  - 1 two-way switch of civil use; 2 pushbuttons with 1 NO contact
  - 1 pushbutton with 1 NC contact
- 2 Modules AZ-145a:
  - 1 incandescent halogen lamp of 230 V 200 W
  - 2 lamp sockets R7s-15
- 1 Module AZ-148b:
  - 1 ceiling lighting fixture with 2 lamp sockets G 13 for fluorescent tube of 36-40 W, 1 fluorescent lamp of 36 W – 230 V

SUPPLIED ACCESSORIES:

- set of 50 cables with safety plugs (Ø 4 mm)

POWER SUPPLY:
230 V / PE 50-60 Hz

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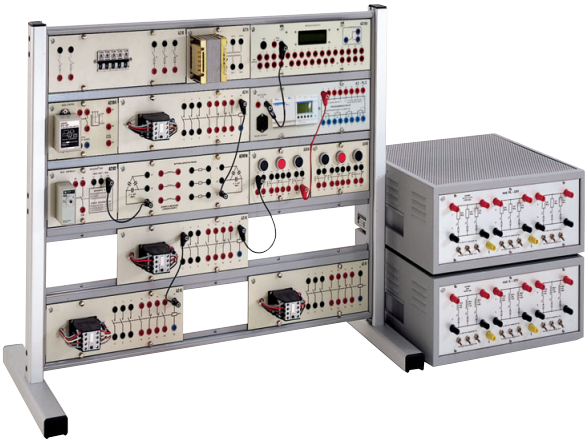
TESTING MODULES FOR ELECTRONICALLY CONTROLLED INDUSTRIAL INSTALLATIONS

Mod. N/EV

INTRODUCTION

This system has been designed so that students can assemble, analyze and test a wide range of more and more complex electric circuits; it consists of interchangeable modules; thus merely connecting these modules with each other via flexible leads supplied with the equipment enables to assemble various circuits. Modules are made of insulating material and they represent the support of the necessary devices for implementing the experimental programme, besides offering the graphic representation and standardized electric symbol of the component; connections are made easier by standardized educational terminals (Ø 4 mm) with high protection degree against accidental contacts.



This set of modules has been designed specifically to assemble, analyze and test systems using electric devices controlled by electronics or by micro-electronics.

These devices improve safety and performance of traditional industrial electrical installations. Modules can be inserted in bench mod. 398/EV to implement the training programme. As an alternative, vertical frame mod. TSI/EV can be used and the equipment can be powered by power supply unit mod. AZ-1PH/EV (both these units are supplied separately, on demand).

TRAINING PROGRAM:

- system for gradual starting and stop of a three-phase asynchronous motor by electronic static relay
- three-step power factor correction system for a three-phase power consuming device by electronic control unit
- power supply system of a three-phase power consuming device with presence control and phase sequence relay
- automated system for a production line with electronic piece counter, proximity and through beam sensor
- level control system by electronic control unit and level sensors
- automation system by programmable logic intelligent relay

TECHNICAL SPECIFICATIONS:

The set of modules for implementing electronically controlled industrial installations mod. N/EV includes:

- 1 Module AZ-190:
  - 1 electronic gradual static starter for three-phase asynchronous motor of 400 V 1 kW
- 1 Module AZ-191a:
  - 1 electronic control unit for three-step power factor correction
- 3 Modules AZ-191b:
  - 1 three-phase capacitive power factor correction battery of 2 µF; 1 three-phase capacitive power factor correction battery of 4 µF; discharge resistors; inductances for limiting the connection transient
- 1 Module AZ-192:
  - 1 presence control and phase sequence relay of 400 V
- 1 Module AZ-193:
  - 1 electronic digital piece counter with proximity and through beam sensor
- 1 Module AZ-194:
  - 1 electronic control unit for level control with level sensor
- 1 Module AZ-195:
  - 1 electronic message display; capacity of 31 alphanumeric texts
- 1 Module AZ-PLC:
  - 1 programmable intelligent relay with six inputs and four digital relay outputs
- 1 Module AZ-10:
  - 5 board fuse holders with breakable fuses (4 / 6 A)
- 1 Module AZ-15:
  - 1 transformer 115-230 / 12-24 V 50-60 Hz 72 VA
- 4 Modules AZ-41:
  - 1 electromagnetic contactor of industrial uses, with coil of 24 Vac
- 2 Modules AZ-44:
  - 3 pushbuttons for industrial uses

SUPPLIED ACCESSORIES:

- set of 55 cables with safety plugs (Ø 4 mm)

ACCESSORIES RECOMMENDED TO SIMULATE A POWER CONSUMING DEVICE WHOSE POWER FACTOR MUST BE CORRECTED:

- 1 Resistive load mod. RL-2/EV (230/400 V)
- 1 Inductive load mod. IL-2/EV (230/400 V)

POWER SUPPLY:

3 x 400 V (3 x 230 V) / PE 50-60 Hz

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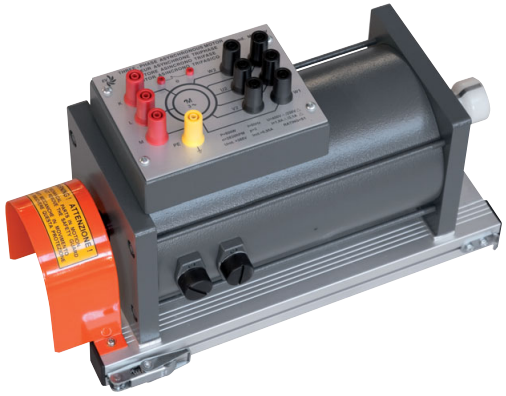
THREE-PHASE ASYNCHRONOUS WOUND-ROTOR MOTOR

Mod. M-5A/EV

INTRODUCTION

This motor is included in a set of apparatuses consisting of: electric rotating machines of reduced power, rotor and stator starting rheostats, centrifugal braking device and experimental flywheel; these components are used for the electro-mechanical testing of industrial installations and of the related control circuits assembled by students on their own working benches.
This motor is provided with educational terminals for easier electrical connections and with base and joints for a quick mechanical coupling.



Motor of solid industrial construction, equipped with silk-screen-printed schematic diagram showing the wiring diagram and the names of the windings on standardized safety terminals. This motor can easily be handled in the laboratory and it is provided with a base and with a quick coupling system with machines of the same series; it is also equipped with male-female coupling joints on shaft prongs.
The rating plate is silk-screen-printed directly on the schematic diagram for immediate reference.

TECHNICAL SPECIFICATIONS:

- Power: 0.5 kW
- Voltage: 400/690 V 50 Hz (*)
- R.p.m.: 3000 (*) – 2 poles
- Rotor voltage: 400 V
- Form of construction: B3
- Protection: IP22
- Thermal protector included

(*) other values of supply voltage and frequency and of r.p.m. are available on demand

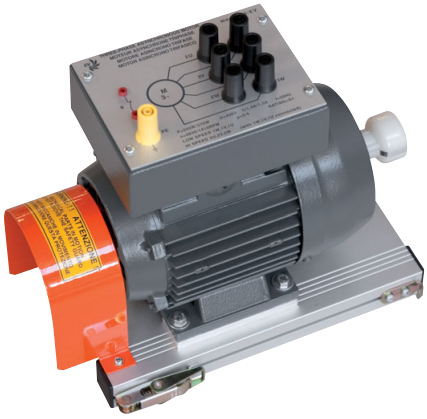
Dimensions: 440 x 160 x 250 mm
Net weight: 14 kg

THREE-PHASE ASYNCHRONOUS TWO-POLE CAGE MOTOR (Dahlander)

Mod. M-6/EV

INTRODUCTION

This motor is included in a set of apparatuses consisting of: electric rotating machines of reduced power, rotor and stator starting rheostats, centrifugal braking device and experimental flywheel; these components are used for the electro-mechanical testing of industrial installations and of the related control circuits assembled by students on their own working benches.
This motor is provided with educational terminals for easier electrical connections and with base and joints for a quick mechanical coupling.



Motor of solid industrial construction, equipped with silk-screen-printed schematic diagram showing the wiring diagram and the names of the windings on standardized safety terminals.
This motor can easily be handled in the laboratory and it is provided with a base and with a quick coupling system with machines of the same series; it is also equipped with male-female coupling joints on shaft prongs.
The rating plate is silk-screen-printed directly on the schematic diagram for immediate reference.

TECHNICAL SPECIFICATIONS:

- Power: 0.45 / 0.3 kW
- Voltage: 400 V 50 Hz (*)
- R.p.m.: 3000 / 1500 (*) – 2 / 4 poles
- Form of construction: B3
- Protection: IP44
- Thermal protector included

(*) other values of supply voltage and frequency and of r.p.m. are available on demand

Dimensions: 440 x 160 x 250 mm
Net weight: 14 kg

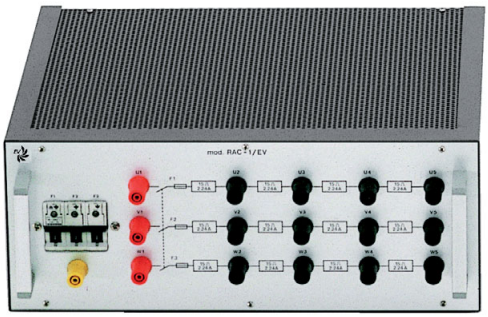
UNIT WITH LOAD AND STARTING RESISTORS

Mod. RAC-1/EV

INTRODUCTION

This rheostat can be used as electric load and to start electric rotating machines; it is included in a set of apparatuses consisting of: electric rotating machines of reduced power, rotor and stator starting rheostats, centrifugal braking device and experimental flywheel; these components are used for the electro-mechanical testing of industrial installations and of the related control circuits assembled by students on their own working benches. This rheostat is mounted on a tabletop framework provided with educational terminals for easier electrical connections.

This unit consists of a metallic tabletop case provided with removable cover for an easier vision of internal components. The equipment consists of three separate single-phase resistive sections; each section is divided into 4 sectors that can be connected separately to obtain various values of resistance. As these sections are separate, this unit enables to carry out single-phase or three-phase configurations, as well as series and parallel connections. Components are mounted on the fore panel where they are represented graphically with the relevant connection terminals. This unit is sized to be used as universal step rheostat either in starting at reduced voltage (stator or rotor windings) and for the braking of d.c. and a.c. machines with maximum power of 0.5 kW.



TECHNICAL SPECIFICATIONS:

- 3 resistors with power of 300 W
- Resistance value: 4 x 15 Ω (each resistor)
- Total value of resistance of each resistor: 60 Ω
- Maximum current: 2.2 A
- Protection against overloads by fuses

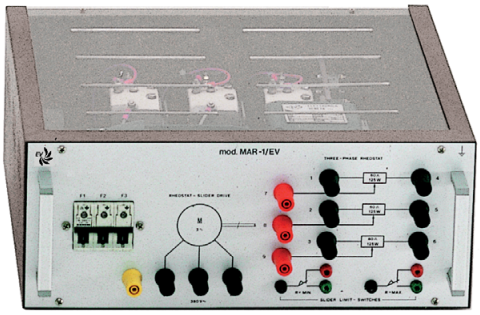
Dimensions: 400 x 405 x 160 mm
Net weight: 11 kg

THREE-PHASE MOTOR REDUCER WITH STARTING RHEOSTAT

Mod. MAR-1/EV

INTRODUCTION

This motor-driven rheostat has been designed specifically to automate the starting of electric rotating machines. This equipment is included in a set of apparatuses consisting of: electric rotating machines of reduced power, rotor and stator starting rheostats, centrifugal braking device and experimental flywheel; these components are used for the electro-mechanical testing of industrial installations and of the related control circuits assembled by students on their own working benches. This rheostat is mounted on a tabletop framework provided with educational terminals for easier electrical connections.



This unit consists of a metallic tabletop case provided with removable cover for an easier vision of internal components.
The equipment consists of a three-phase motor reducer of small power, of a toroidal three-phase rheostat for rotor starting and of two limit micro switches mounted at the ends of the toroidal rheostat.
The assembly provided with standardized connection terminals of Ø 4 mm enables to wire control and power circuits for starting a three-phase asynchronous wound-rotor motor by a rotor rheostat of continuous exclusion; this last function is implemented by the three-phase motor reducer; in fact, when coupled to the starting rheostat, this motor reducer connects and disconnects the rotor resistances of the motor automatically. This equipment is recommended for the electric connection with asynchronous slip-ring motor mod. M-5A/EV.

TECHNICAL SPECIFICATIONS:

- 1 three-phase motor reducer of 230/400 V 150 VA
- 1 three-phase rheostat with power 3 x 125 W
- Value of resistance: 3 x 60 Ω
- Maximum current: 1.5 A
- Protection against overloads by fuses

Dimensions: 400 x 405 x 160 mm
Net weight: 21 kg

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STARTING AUTOTRANSFORMER FOR THREE-PHASE MOTORS

Mod. SA-M/EV

INTRODUCTION

Using autotransformers is the most rational starting method for reducing stator voltage in three-phase motors.
It is used in the following types of motors:

- three-phase squirrel-cage motors with power ranging from 50 kW to some hundreds of kW
- double cage motors with similar or higher power

Voltage terminals are chosen according to the specific mechanical load of the motor, to obtain a proper starting.

TECHNICAL SPECIFICATIONS:

- Input rated voltage: 3 x 400 V (star configuration).
- Rated power: 500 VA.
- Output terminals: 50%, 65% and 80% of rated power.
- This unit is particularly recommended for three-phase asynchronous squirrel-cage motors with power up to approximately 500 W.
- This unit is housed in a tabletop metallic box. All the connections are available on the fore panel, in a silk-screen-printed mask, and they can easily be identified. All the terminals are of safety type and have a diameter of 4 mm. The symbols shown in the silk-screen-printed mask correspond to the electric international symbols.

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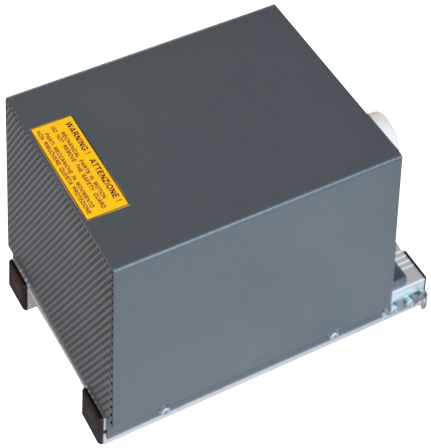
EXPERIMENTAL FLYWHEEL
Mod. VST-1/EV

INTRODUCTION

This experimental flywheel is included in a set of apparatuses consisting of: electric rotating machines of reduced power, rotor and stator starting rheostats, centrifugal braking device and experimental flywheel; these components are used for the electro-mechanical testing of industrial installations and of the related control circuits assembled by students on their own working benches. This flywheel is mounted on a base and is provided with a joint enabling a quick mechanical connection.



This unit is a mechanical load of inertial type consisting of a metallic mass shaped as a flywheel; it is coupled to electric machines of M series (with 80 mm high shafts).
This flywheel is designed for machines with maximum power up to 0.5 kW, to examine the typical operation of motors during starting or braking phase, as it occurs for big industrial machinery.
It is made of heavy metal and it consists of three disks mounted on a support with ball bearings and coupling joint; each disk can be used separately and it outputs a moment of inertia of 0.0145 kgm^2, for a total moment of inertia of 0.043 kgm^2.

TECHNICAL SPECIFICATIONS:

- Moment of inertia I: 0.0145 - 0.029 - 0.043 kgm^2
- Max. speed of rotation: 4000 r.p.m.

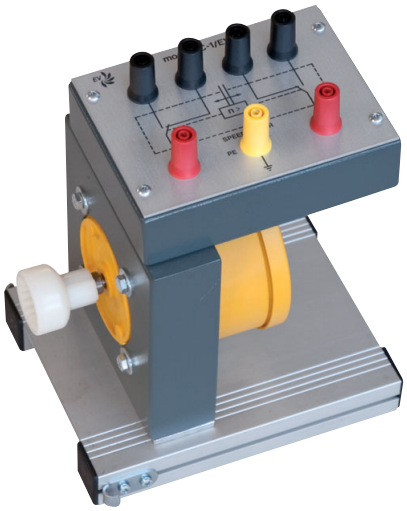
Dimensions: 440 x 160 x 250 mm
Net weight: 25 kg

BRAKING DEVICE WITH CENTRIFUGAL RELAY

Mod. FRC-1/EV

INTRODUCTION

This centrifugal relay of braking control of motors is included in a set of apparatuses consisting of: electric rotating machines of reduced power, rotor and stator starting rheostats, braking device and experimental flywheel; these components are used for the electro-mechanical testing of industrial installations and of the related control circuits assembled by students on their own working benches.
This unit is mounted on a base and is provided with a joint enabling a quick mechanical connection.



This device mainly consists of a bidirectional centrifugal relay (operating on both rotation directions) that must be coupled to the motor under test, for direct current or counter current braking circuits.
At this purpose the relay is mounted on a base and it is equipped with quick connections and with a joint so that it can directly be coupled to electric machines of M series (with 80 mm high shafts).
The two electric limit switches (for each rotation direction) with NO-NC contacts are connected electrically with standardized terminals (Ø 4 mm) in the panel of silk-screen-printed schematic diagram.

TECHNICAL SPECIFICATIONS:

- Max. speed of rotation: 6000 r.p.m.
- This braking device is enabled at approximately 60 r.p.m.
- Electric contacts of 230 Vac / dc – 5 A max.

Dimensions: 160 x 160 x 250 mm
Net weight: 2 kg

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TESTING MODULES FOR BUS SYSTEMS

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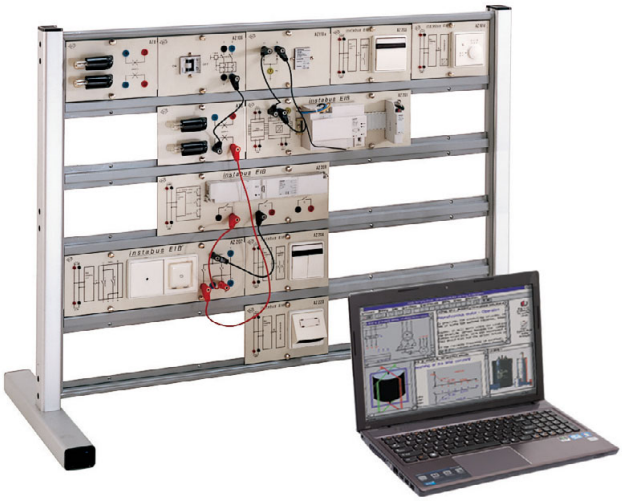
INSTALLATIONS CONTROLLED BY BUS SYSTEMS (KNX STANDARD)

Mod. VH-1/EV

INTRODUCTION

This system has been designed so that students can assemble, analyze and test a wide range of more and more complex electric circuits; it consists of interchangeable modules; thus merely connecting these modules with each other via flexible leads supplied with the equipment enables to assemble various circuits. Modules are made of insulating material and they represent the support of the necessary devices for implementing the experimental programme, besides offering the graphic representation and standardized electric symbol of the component; connections are made easier by standardized educational terminals (Ø 4 mm) with high protection degree against accidental contacts, for power circuits, and by standardized terminals (Ø 2 mm), for Bus line. Frame mod. TSI/EV (supplied on demand) can be used to support the module for the implementation of the experimental programme.

This set of modules has been designed specifically to assemble, analyze and test systems using innovatory devices for the total control of a building. These intelligent devices (each one is equipped with a microprocessor) are connected with each other via BUS system (twin). Konnex standard is the backbone for transferring all the commands, that is the logic wiring enabling building functionality. Some software applications that must be used with a personal computer are available to set the system at work and, if necessary, to monitor its operating conditions, as well as the interaction with local controls.



TRAINING PROGRAM BASE:

- Installation, connection and programming of the elements designed for BUS operation, setting at work, diagnosis of the realized systems
- System with additional protection against overvoltages of atmospheric or industrial origin
- Addressing of BUS devices
- Bus power supply unit, on/off controls and pushbuttons, on/off actuators, use of ORIGINAL EIB Tool Software
- Control of a lighting system consisting of 1 or more lighting points and of 1 or more switching on/off points
- Control of a lighting system consisting of 2 lighting points controlled by 2 separate switching on/off points and by 1 global switching on/off point
- Control of staircase lighting system

BASIC PACKET mod. VH-1/EV:

This set of modules is designed so that students can learn the basics on the operation of intelligent electric installations applying "BUS" technology according to EIB European standard. Simple and clear explanations will lead students to acquire the necessary skills for controlling the software of configuration and setting at work.

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TECHNICAL SPECIFICATIONS:

The set of modules for implementing basic installations controlled by BUS system mod. VH-1/EV includes:

- 1 Module AZ-201:
  - 1 power supply unit of 600 mA including anti-noise coil; modular assembly on omega-shaped guide outputting and controlling the voltage for Bus system (Power supply: 230 V 50-60 Hz)
  - 1 modular connector for connecting data strip with Bus cable
  - 1 data strip mounted on omega-shaped guide for connection between modular apparatuses
  - 1 overvoltage suppressor for Bus line of 24 V
- 1 Module AZ-203:
  - 1 flush-mounted one-channel pushbutton with coupler for the connection with the Bus line of 24 Vdc
- 1 Module AZ-204:
  - 1 flush-mounted two-channel pushbutton with coupler for the connection with the Bus line of 24 Vdc
- 1 Module AZ-207:
  - 1 binary output in flush configuration of two outputs, rated load of 230 Vac 6 A, provided with coupler for the connection with the Bus line of 24 Vdc
- 1 Module AZ-208:
  - 1 binary output in extended configuration of three outputs, rated load of 230 Vac 6 A, provided with coupler for the connection with the Bus line of 24 Vdc
- 1 Module AZ-220:
  - 1 interface for personal computer (USB), provided with flush-mounted coupler for the connection with the Bus line of 24 Vdc
  - 1 cable for BUS/PC connection
- 1 Module AZ-106:
  - 1 two-pole magneto-thermal circuit breaker; In = 10 A, curve C, breaking power = 10 kA
- 1 Module AZ-118a:
  - 1 suppressor of transient overvoltages for single-phase line of 230 Vac
- 2 Modules AZ-8:
  - 2 lamp sockets for schematic diagram with lamps of 230 V 3 W

SOFTWARE INDISPENSABLE (NOT INCLUDED)

Original **Design Software ETS (EIB Tool Software)** multilanguage edited by consortium Konnex, to be purchased separately.

This software enables to assign the specific functionality to the installation, as well as the starting and diagnosis of BUS devices.

This software can be used with a personal computer (not included in the equipment) connected with the BUS system via USB interface.

SUPPLIED ACCESSORIES:

- 1 set of 20 various cables with safety plugs (Ø 4 mm), for power connections, and of 12 cables with safety plugs (Ø 2 mm), for bus connections

Specifications of Personal Computer and of Printer **(not included in the equipment)** for using software:

- PC with 1 GHz processor and 512 MB RAM
- Graphic board 24 bit-colour, resolution 1024x768
- 3 GB free space on HD
- MS-Windows 2000/XP (32) vista (32)/Windows 7 (32)

POWER SUPPLY:
230 V / PE 50-60 Hz

THEORETICAL-EXPERIMENTAL HANDBOOKS
Application handbook with exercises.

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THE BASIC PACKET IS COMPLETED BY THE FOLLOWING MODULES:

MODULES FOR ASSEMBLING ELECTRICAL SYSTEMS FOR HEATING PLANTS WITH BUS Mod. VH-2/EV

Thanks to this set of modules students can complete the training supplied by packet mod. VH-1/EV with the knowledge of heating and cooling control devices using systems of "BUS" technology according to EIB European standard.

TRAINING PROGRAM:

- Controlling a zone of a heating plant with room thermostat for temperature control and actuator for circulation pump or zone valve
- Controlling a zone of a heating plant with room thermostat for temperature control and actuator with proportional valve
- Controlling a zone of a heating plant with room thermostat for temperature control, enabling by IR presence sensor, disabling by switches on windows

TECHNICAL SPECIFICATIONS:

The set of modules for implementing electric systems for heating plants with BUS system mod. VH-2/EV includes:

- 1 Module AZ-209:
  - 1 pushbutton interface for 4 switches/pushbuttons with no-potential contacts, provided with coupler for the connection with the Bus line of 24 Vdc
- 1 Module AZ-214:
  - 1 flush-mounted infrared presence sensor with coupler for the connection with the Bus line of 24 Vdc
- 1 Module AZ-215:
  - 1 actuator for Heimeier valves (proportional actuator for control of valves in heating plants); direct connection with Bus line (built-in Bus coupler); power supply 0f 24 Vdc via Bus; cycle time of 25 s/mm; stroke of 4.5 mm
- 1 Module AZ-161d:
  - 1 flush-mounted thermostat including coupler for the connection with Bus line of 24 Vdc; manual temperature control of ±3°C with respect to base reference; 5 LEDs for indicating the operating condition

SUPPLIED ACCESSORIES:

- 1 set of 8 various cables with safety plugs (Ø 4 mm), for power connections, and of other 8 cables with safety plugs (Ø 2 mm), for bus connections

THEORETICAL-EXPERIMENTAL HANDBOOKS

Application handbook with exercises.

MODULES FOR ASSEMBLING ELECTRICAL SYSTEMS FOR LUMINOSITY CONTROL WITH BUS Mod. VH-3/EV

Thanks to this set of modules students can complete the training supplied by packet mod. VH-1/EV with the knowledge of open-loop and closed-loop control devices for adjusting luminosity by systems of "BUS" technology according to EIB European standard. Applications concern both incandescent and fluorescent lamps.

TRAINING PROGRAM:

- Lighting system with dimmer for incandescent lamps
- Lighting system with dimmer for fluorescent lamps
- Automatic lighting control by luminosity sensor
- On/off control of lights and dimmer by IR transmitter and receiver

TECHNICAL SPECIFICATIONS:

The set of modules for implementing electric systems for lighting control with BUS system mod. VH-3/EV includes:

- 1 Module AZ-210:
  - 1 universal dimmer actuator of 230 V 20-500 VA, in modular assembly for omega-shaped guide including coupler for the connection with the Bus line of 24 Vdc
  - 1 portable infrared (IR) transmitter of 4+4 channels
  - 1 receiver for IR transmitter including coupler for the connection with the Bus line of 24 Vdc
  - 1 connector of modular assembly on omega-shaped guide for the connection between data strip and Bus cable
  - 1 data strip mounted on omega-shaped guide for the connection between modular apparatuses
- 1 Module AZ-211:
  - 1 dimmer actuator for driving fluorescent lamps (lamps equipped with electronic dimmable ballast), in extended assembly including coupler for the connection with the Bus line of 24 Vdc
- 1 Module AZ-212:
  - 1 luminosity sensor of extended assembly including coupler for the connection with the Bus line of 24 Vdc, and photosensitive cell
- 1 Module AZ-183:
  - 1 electronic dimmable ballast for fluorescent lamps
- 1 Module AZ-148b:
  - 1 ceiling lighting fixture with 2 lamp sockets G13 for fluorescent tube of 36-40 W, 1 fluorescent lamp of 36 W – 230 V
- 1 Module AZ-145a:
  - 1 incandescent halogen lamp of 230 V – 200 W
  - 2 lamp sockets R7s-15

SUPPLIED ACCESSORIES:

- 1 set of 11 various cables with safety plugs (Ø 4 mm), for power connections, and of 6 cables with safety plugs (Ø 2 mm), for bus connections

THEORETICAL-EXPERIMENTAL HANDBOOKS

Application handbook with exercises.

MODULES FOR ASSEMBLING ELECTRICAL SYSTEMS FOR ACCESS CONTROL WITH BUS Mod. VH-4/EV

Thanks to this set of modules students can complete the training supplied by packet mod. VH-1/EV with the knowledge of control devices for accesses using systems of "BUS" technology according to EIB European standard.

TRAINING PROGRAM:

- System with message display
- Control of a magnetic card reader
- Control of blinds

TECHNICAL SPECIFICATIONS:

The set of modules for implementing electric systems for controlling accesses with BUS system mod. VH-4/EV includes:

- 1 Module AZ-205:
  - 1 flush-mounted 4-channel pushbutton including coupler for the connection with the Bus line of 24 Vdc
- 1 Module AZ-213
  - 1 switch for blind 2 x 230 V 6 A, of modular assembly for omega-shaped guide including coupler for Bus of 24 Vdc
  - 1 connector of modular assembly on omega-shaped guide for the connection between data strip and Bus cable
  - 1 data strip mounted on omega-shaped guide for the connection between modular apparatuses
- 1 Module AZ-216
  - 1 flush-mounted message display including coupler for the connection with the Bus line of 24 Vdc
- 1 Module AZ-218
  - 1 magnetic card reader
  - 1 programmer of magnetic cards, provided with control software
  - 10 magnetic cards

SUPPLIED ACCESSORIES:

- 1 set of 5 various cables with safety plugs (Ø 4 mm), for power connections, and of 8 cables with safety plugs (Ø 2 mm), for bus connections

THEORETICAL-EXPERIMENTAL HANDBOOKS

Application handbook with exercises.

MODULES FOR ASSEMBLING ELECTRICAL CONTROL SYSTEMS OF ELECTRIC LOADS BY BUS SYSTEM Mod. VH-5/EV

Thanks to this set of modules students can complete the training supplied by packet mod. VH-1/EV with the knowledge of power control devices (electric loads that can exceed the available power, when used at the same time) by systems of "BUS" technology according to EIB European standard.

TRAINING PROGRAM:

- System with device of power detection and control of power consuming devices by ON/OFF actuators with 1 priority level
- System with device of power detection and control of power consuming devices by ON/OFF actuators with two priority levels

TECHNICAL SPECIFICATIONS:

The set of modules for implementing electric systems for controlling loads by BUS system mod. VH-5/EV includes:

- 1 Module AZ-206:
  - 1 four-channel binary input of 230 V, of modular assembly for omega-shaped guide including coupler for Bus of 24 Vdc
  - 1 binary output of modular assembly with 4 outputs, including coupler for Bus of 24 Vdc, rated voltage of 23o V 16 A
  - 1 data strip mounted on omega-shaped guide for the connection between modular apparatuses
- 1 Module AZ-185:
  - 1 electronic control unit for optimizing consumption by priority selection of power consuming devices up to two levels. The interface connection with Bus line is implemented via binary inputs and outputs. (Refer to mod. AZ-06)

SUPPLIED ACCESSORIES:

- 1 set of 12 cables with safety plugs (Ø 4 mm), for power connections, and of 2 cables with safety plugs (Ø 2 mm), for bus connections

THEORETICAL-EXPERIMENTAL HANDBOOKS

Application handbook with exercises.

MODULES FOR ASSEMBLING ELECTRICAL SYSTEMS FOR ADVANCED BUS Mod. VH-6/EV

Thanks to this set of modules students can complete the training supplied by packet mod. VH-1/EV with the knowledge for expanding the Bus line. These devices are essential for systems of medium and big size to couple the various types of installations implemented on separate lines, or because there are a lot of devices that cannot be borne by only one line (max. 64 in each line) according to EIB European standard.

TRAINING PROGRAM:

- Assembling a Bus Field containing several Bus Lines. The specific devices mentioned above can be separated on each Bus Line; these can also be correlated with each other to form an advanced Bus system

TECHNICAL SPECIFICATIONS:

The set of modules for implementing electric systems with advanced BUS system mod. VH-6/EV includes:

- 1 Module AZ-201:
  - 1 power supply unit of 600 mA including anti-noise coil; modular assembly on omega-shaped guide outputting and controlling the voltage for Bus system
  - 1 data strip mounted on omega-shaped guide for connection between modular apparatuses
  - 1 overvoltage suppressor for Bus line of 24 V
- 1 Module AZ-202:
  - 1 line/field coupler: as line coupler, it forms a functional field with the main line; as field coupler, it connects functional fields with the field line
  - 1 data strip mounted on omega-shaped guide for connection between modular apparatuses

SUPPLIED ACCESSORIES:

- 1 set of 3 cables with safety plugs (Ø 4 mm), for power connections, and of 4 cables with safety plugs (Ø 2 mm), for bus connections

REMARK:

The necessary quantity of packets mod. VH-6/EV must correspond to the number of Bus lines and/or functional fields that must be enabled.

THEORETICAL-EXPERIMENTAL HANDBOOKS

Application handbook with exercises.

OPTIONAL DEVICES FOR MODULE AZ-201 Mod. VH-7/EV

Adding the optional devices mod. VH-7/EV can supply the systems assembled on Bus with some special functions. Thus the systems described in the previous training programmes can be enriched with time driven events (2-channel weekly clock module), with timed or delayed events (time module), with typical situations retrievable by users (scenario modules), with events that can be enabled by the consideration of various inputs in OR or AND configuration (logic unit module).

TRAINING PROGRAM:

- timed or delayed events; typical situations retrievable by users
- time driven events
- events that can be enabled in OR or AND operation

TECHNICAL SPECIFICATIONS:

The set of modules for adding special functions in Bus system mod. VH-7/EV includes:

- 1 time module: modular equipment for assembly on omega-shaped guide and suitable to drive binary signals in time; available functions: 4 inputs, 4 outputs, delayed ON/OFF devices, staircase lights
- 1 scenario module: modular equipment for assembly on omega-shaped guide and suitable to store up to 4 "scenarios".
  Each scenario can contain up to 8 address groups (particular operating situations) and it can be retrieved by external commands
- 1 weekly clock programmer module: modular equipment for assembly on omega-shaped guide, with 2 output channels for controlling any type of actuator or event by Bus
- 1 logic unit module: modular equipment for assembly on omega-shaped guide, used for logical combination and for the multiplication of binary signals

ELECTRICAL INSTALLATIONS
EXPERIMENTAL PANELS

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ELECTRICAL INSTALLATIONS
EXPERIMENTAL PANELS

INTRODUCTION

These table-top panels feature professional and fully operational equipment and devices to carry out experiments on domestic, safety systems and industrial electrical installations.

The panels are handheld and ergonomic because:
- of their compact size and weight
- they can be adjusted to a vertical / horizontal position

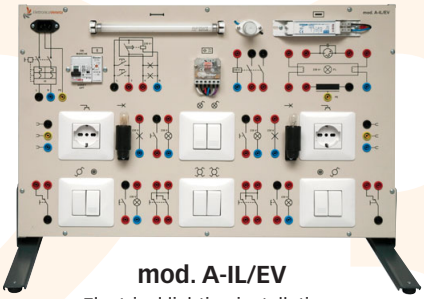
Their operation is stand-alone, but they can also interact with each other to develop higher-level functions.

The comprehensive laboratory allows to study virtually any topic related to electrical systems.

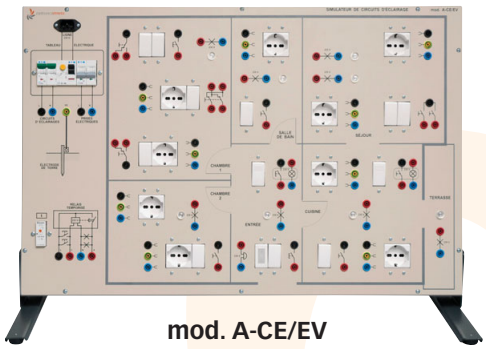
Side view of the panel - vertical position

Side view of the panel - "transport" position

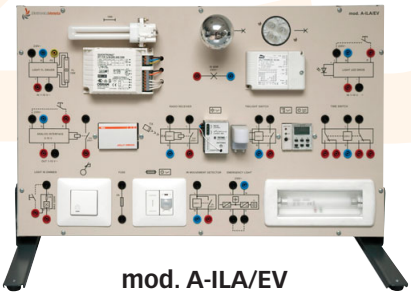
DOMESTIC INSTALLATIONS



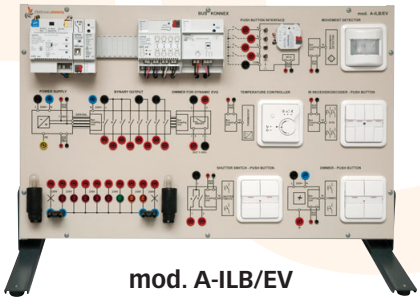
mod. A-IL/EV
Electrical lighting installations



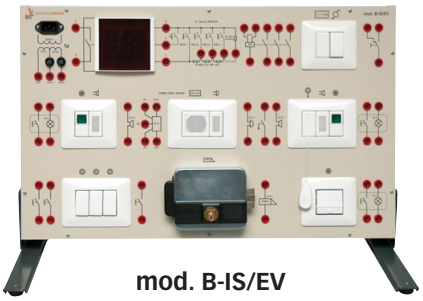
mod. A-CE/EV
Electrical installations of an apartment



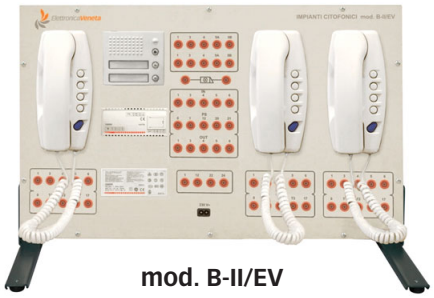
mod. A-ILA/EV
Electrical installations with electronically controlled devices (domotics)



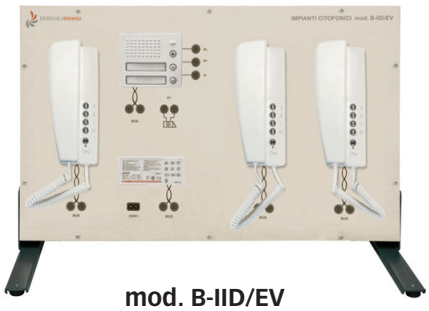
mod. A-ILB/EV
BUS KONNEX systems



mod. B-IS/EV
Optical/acoustic signalling systems



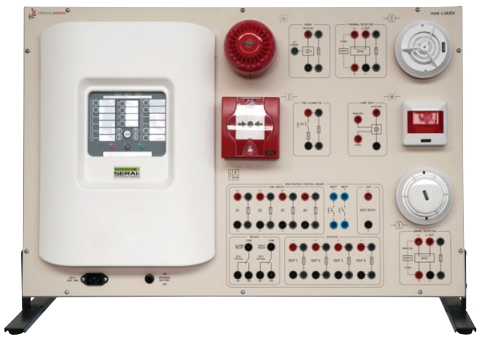
mod. B-II/EV
Analog intercom systems



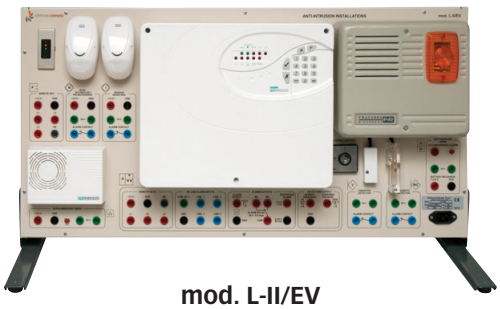
mod. B-IID/EV
Digital 2-wire intercom systems

mod. F-VIDT/EV - Digital 2-wire video intercom and telephone systems

SAFETY SYSTEM INSTALLATIONS



mod. L-IA/EV
Fire detecting systems



mod. L-II/EV
Anti theft systems

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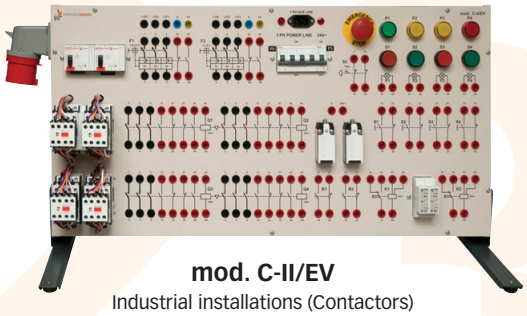
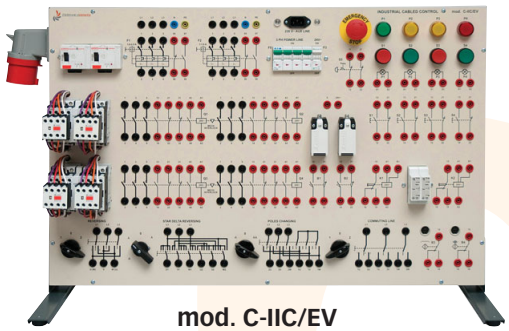
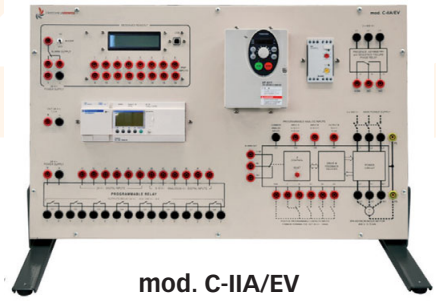
INDUSTRIAL INSTALLATIONS



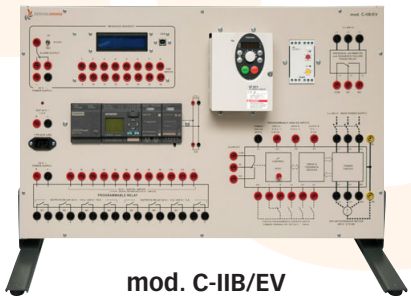
mod. C-II/EV
Industrial installations (Contactors)



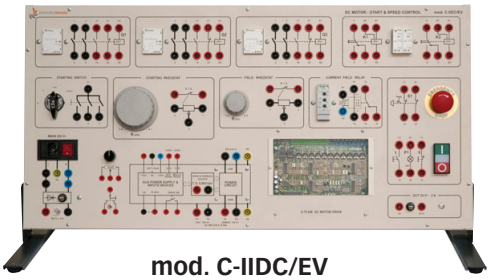
mod. C-IIC/EV
Industrial installations (Contactors and switches)



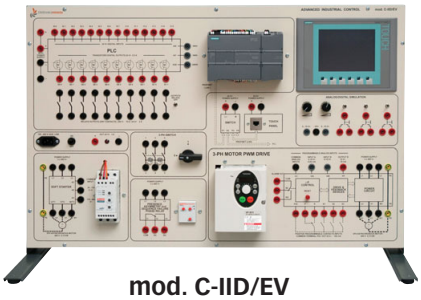
mod. C-IIA/EV
Electronically controlled industrial installations
(*Schneider* logic module)



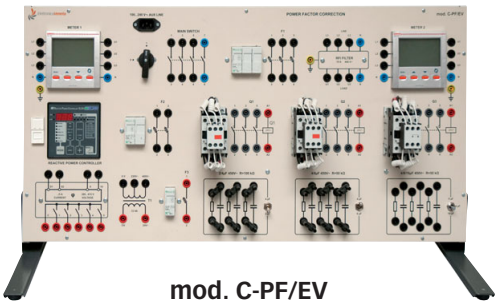
mod. C-IIB/EV
Electronically controlled industrial installations
(*Logo* logic module with KNX interface)



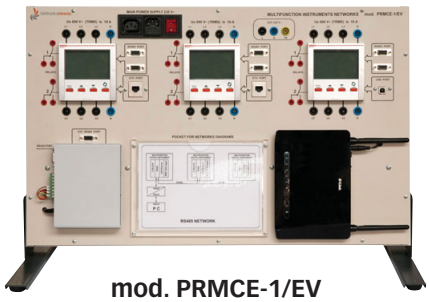
mod. C-IIDC/EV
DC motor starting and control systems



mod. C-IID/EV
Electronically controlled industrial installations
(PLC *S7-1200* + HMI touch panel)



mod. C-PF/EV
Automatic power factor correction systems



mod. PRMCE-1/EV
Monitoring electric power consumption with SCADA networks

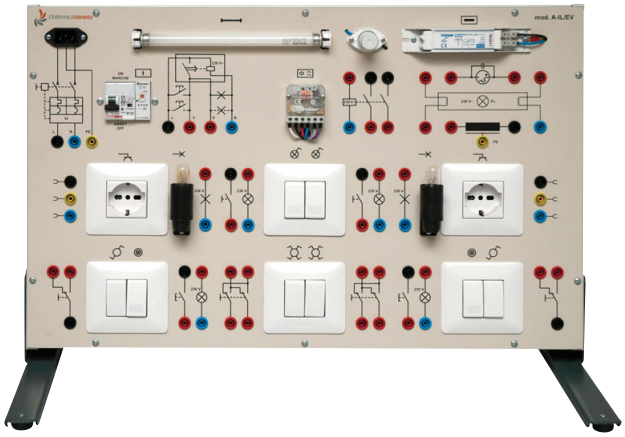
EXPERIMENTAL PANEL
ELECTRICAL LIGHTING INSTALLATIONS
Mod. A-IL/EV

INTRODUCTION

This panel is wholly independent and it includes actual devices for testing electrical lighting installations in civil and/or service sectors.
This panel also includes a magneto-thermal differential circuit breaker (In = 6 A / Idn = 30 mA) ensuring the highest operation safety; this breaker is always present in actual installations for the protection against overcurrents, indirect contacts and disconnections.
Tests and installations are carried out on the panel quickly via leads with safety plugs of 4 mm supplied with the equipment, and without the use of any working tool.
All the devices are available in the fore panel of insulating material and are represented by international electric symbols. The special construction shape of this panel enables its use on a working top in both horizontal and vertical position according to the available space and to operator's needs.

EXPERIMENTS PROGRAM:

- Controlling a lamp from a point by a switch
- Controlling two lamps from a point by a switch (lamps in series)
- Controlling two or more lamps from a point by a switch (lamps in parallel)
- Controlling a lamp from a point by switch and position or state warning light
- Controlling a lamp from a point by switch and a socket
- Controlling two lamps from a point by a changeover switch
- Controlling two lamps from a point by a changeover switch and position or state warning lights
- Controlling a lamp and a socket from a point by a changeover switch
- Controlling a lamp from two points by two two-way switches
- Controlling a lamp from two points by two two-way switches and two sockets
- Controlling two or more lamps from two points by two two-way switches
- Controlling a lamp from three/four points by two two-way switches and one/two inverters
- Controlling a lamp from a point by switch relay
- Controlling a lamp from a point by switch relay and state warning light
- Controlling a lamp from several points by switch relay
- Controlling a lamp from several points by switch relay and state warning lights
- Controlling two lamps from a point by switch relay
- Controlling two lamps from several points by switch relay
- Controlling a fluorescent lamp from a point by a switch
- Controlling a lamp from a point by timing relay (bathroom lighting)
- Controlling various lamps from several points by timing relay (staircase lighting)



TECHNICAL SPECIFICATIONS:

- Painted metallic framework with fore panel of insulating material
- Quick connections via safety leads and terminals (Ø 4 mm)
- 1 magneto-thermal differential circuit breaker – 2 poles, C, 6 A / 0.03 A, class A
- 2 single-pole switches of 250 V – 10 A, with warning neon lamp of 230 V
- 2 single-pole two-way switches of 250 V – 10 A
- 2 single-pole inverters of 250 V – 10 A
- 2 single-pole pushbuttons of 250 V – 10 A, with warning neon lamp of 230 V
- 2 universal sockets (2p + earth) 10-16 A and Unel
- 2 lamp sockets with lamps E14 of 230 V – 3 W
- 1 cyclic (switch/changeover switch) relay, excitation of 230 Vac, contacts of 250 V – 10 A
- 1 timing relay for staircase lighting, excitation of 230 Vac, contact of 250 V – 10 A
- 1 linear fluorescent lamp of 230 V - 6 W
- 1 ballast for fluorescent lamp of 6 W
- 1 board starter holder with universal starter of 4-80 W
- 1 board power plug (2p + Earth) with 1 lead 3x0.75 mm^2

Dimensions: 650 x 400 x 120 mm
Net weight: 15 kg

SUPPLIED ACCESSORIES:

- set of 40 cables with safety plugs (Ø 4 mm)

POWER SUPPLY:

Single-phase 230 V - 50-60 Hz - 1000 VA

THEORETICAL-EXPERIMENTAL HANDBOOKS

Application handbook with exercises.

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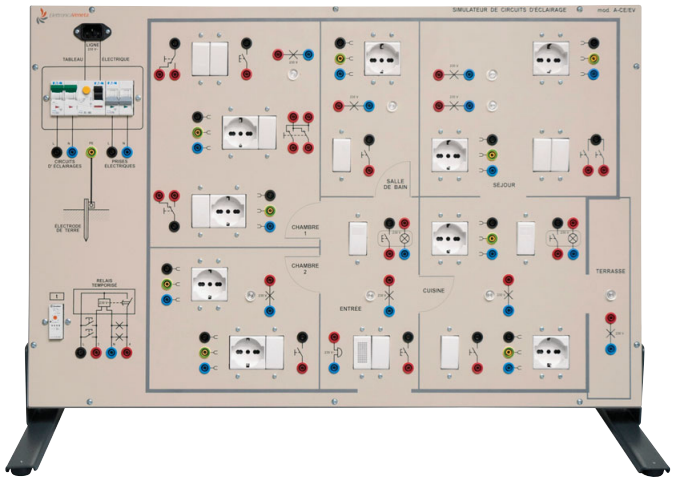
EXPERIMENTAL PANEL ELECTRICAL INSTALLATIONS OF AN APARTMENT

Mod. A-CE/EV



INTRODUCTION

Compact size tabletop trainer with real components arranged topographically to represent the typical rooms of an apartment. Thanks to the supplied ø 4mm cables with safety terminals, no tools are needed: it is therefore possible to carry out fast exercises on various types of installations on the front panel, made of isolating material.

The trainer includes:

- Grounding connection PE
- High-sensitivity ELCB Idn = 30 mA, that provides protection against direct contacts via automatic interruption
- One thermomagnetic CB of 6 A and one of 16 A, for sectioning and protection, separately for the lights circuits and the sockets circuits
- Multifunction relay for step-by-step or timed lights control (stairwell lights function)
- Acoustic alarm to realize alarmed installations

Every device is represented with international electric symbols for the quick identification of functions; the same symbols are used when plotting electrical diagrams and in blueprints of electrical installations.
With this panel, it is possible to realize and test a large variety of lighting installations and mains for the following rooms: Entrance, Hall, Kitchen, Balcony, Living room, Bathroom, Bedroom 1, Bedroom 2.

EXPERIMENTS PROGRAM:

- Apartment panel with ELCB and two TMCB
- Control of a lamp from one point (interrupted)
- Control of a lamp from one point and singaling light
- Control of a lamp from one point and one socket
- Control of two lamps from one point (commutated)
- Control of one lamp and one socket from one point with a commutator
- Control of a lamp from two points (deviated)
- Control of a lamp from two points with two deviators and one socket
- Control of a lamp from three points (inverted)
- Control of a lamp from one point (interruptor relay)
- Control of various lamps with timer relay (stairwell lights)
- Control of an acoustic alarm

TECHNICAL SPECIFICATIONS:

- Tabletop device with front panel in isolating material
- Quick connections through cables with safety terminals ø 4mm
- 1 two-poles ELCB In 25 A - Idn 0.03 A
- 1 two-poles TMCB In 6 A curve C
- 1 two-poles TMCB In 16 A curve C
- 3 one-pole switches 250 V - 10 A
- 1 one-pole commutator 250 V - 10 A
- 1 one-pole switch 250 V - 10 A with neon signaling light 230 V
- 2 unipolar deviators 250 V - 16 A also working as switches
- 1 unipolar inverter 250 V – 16 A
- 2 unipolar buttons 250 V - 10 A
- 9 universal sockets 2p + ground 10-16 A and Unel
- 8 light points with 220 V lamps
- 1 acoustic alarm 220 V
- 1 multifunction timer relay, 230 Vca excitation, contact 250 V – 10 A; resetting stairwell lights function with switching off alert, timed impulse relay, step-by-step impulse relay, fixed light
- 1 line cord 3 x 0.75 mm^2 with F+E plug type

Dimensions: 810 x 520 x 100 mm
Net weight:15 kg

SUPPLIED ACCESSORIES:

- set of 20 cables with safety plugs (Ø 4 mm)

POWER SUPPLY:

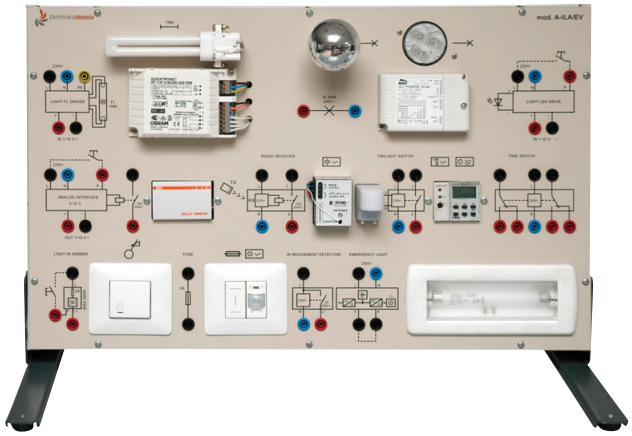
Single-phase 230 V - 50-60 Hz - 2200 VA

THEORETICAL-EXPERIMENTAL HANDBOOKS

Application handbook with exercises.

DOMESTIC INSTALLATIONS

EXPERIMENTAL PANEL
ELECTRICAL INSTALLATIONS WITH ELECTRONICALLY CONTROLLED DEVICES
(Domotics)
Mod. A-ILA/EV



INTRODUCTION

This independent panel is designed to add installations with electronic devices for improving the building comfort (home automation), to basic lighting installations.
The systems that can be assembled on this panel include dimmers for luminosity control of incandescent and fluorescent lamps with manual and remote control, IR presence sensors, twilight switches and hour programmers, emergency lighting with self-powered lamps, lighting with innovatory LED lamps. These components are fixed onto the panel of insulating material where they can be identified by their international electric symbols; electrical connections (including those with panel mod. A-IL/EV) are carried out by leads with safety plugs of 4 mm supplied with the equipment; no working tool is necessary.
The special construction shape of this panel enables its use on a working top aside panel mod. A-IL/EV.

EXPERIMENTS PROGRAM:

- luminosity control systems with dimmer of manual control
- luminosity control systems with dimmer of radio control
- luminosity control systems of fluorescent lamps by manual control and radio control
- lighting installations with lamps controlled by presence sensor / twilight switch / clock
- lighting systems with emergency lamps, lit automatically and excluded manually
- lighting systems with LED lamps of fixed light and with luminosity control

TECHNICAL SPECIFICATIONS:

- Painted metallic framework with wide fore panel of insulating material
- Quick connections via safety leads and terminals (Ø 4 mm)
- 1 button dimmer for resistive load and ferromagnetic transformers of 230 V 60-500 W/VA
- 1 universal mini receiver of 433.92 MHz, with range of 10-20 m, power supply of 230 Vac
- 1 two-channel mini transmitter, powered by battery
- 1 switch with IR movement sensor, with adjustable twilight threshold and delayed switching off, powered with 230 V, output relay contact 230 V – 2 A with inductive loads
- 1 twilight switch with outdoor sensor, control of 2-200 Lux, power supply of 230 V, output relay contact 230 V – 3 A with inductive loads
- 1 double (hour/week) digital switch, with automatic change of summer time, power supply of 230 V 50-60 Hz, 2 outputs relay contacts 230 V – 2 A with inductive loads
- 1 electronic dimmable ballast QT-T/E of 18 W
- 1 lamp socket G24Q-2 and compact fluorescent lamp DULUX D/E 18 W/830
- 1 lamp socket E27 and lamp of 230 V – 60 W, with silver-plated dome
- 1 controller of 1-10 Vdc for electronic dimmable ballasts
- 1 self-powered emergency lamp of 230 V 50-60 Hz, with fluorescent lamp of 4 W
- 1 LED lamp of 3 W – 350 mA
- 1 electronic dimmable power supply for LED lamp; input of 220-240 Vac 50-60 Hz; selectable output for constant voltage or current LED

Dimensions: 650 x 400 x 120 mm
Net weight: 15 kg

SUPPLIED ACCESSORIES:

- set of 15 cables with safety plugs (Ø 4 mm)

POWER SUPPLY:

Single-phase 230 V - 50-60 Hz - 100 VA

THEORETICAL-EXPERIMENTAL HANDBOOKS

Application handbook with exercises.

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EXPERIMENTAL PANEL
KONNEX BUS SYSTEMS
Mod. A-ILB/EV

INTRODUCTION

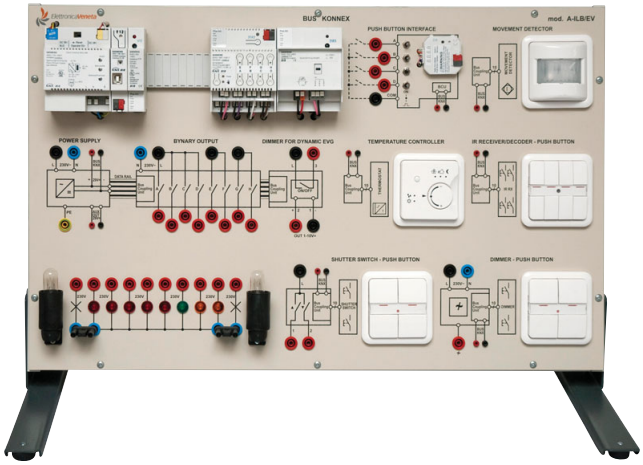
Panel with devices for testing electric automation installations (lights, blinds, heating plant) provided with KONNEX Bus systems, that can be applied in residential or service buildings. This panel can be used in stand-alone mode and together with panels A-IL/EV and A-ILA/EV; the single-phase line protected against overcurrents and earth fault is output from panel A-IL/EV, and pushbuttons and traditional switches are used with Bus interfaces; panel A-ILA/EV enables to control the various types of lamps by Bus-controlled dimmers.

Panel A-ILB/EV completes the training of engineers for electric installations of building automation, Bus systems, begun with the experimentation of basic circuits (panel mod. A-IL/EV) and enriched with home automation systems (panel mod. A-ILA/EV).

The distinctive feature of an installation applying Bus technology consists of the separation between power circuit (line of 230 V and actuators for electric loads) and Bus circuit (sensors and control and testing devices); the link between commands and load actuators is carried out by the "logic wiring". This logic wiring consists of a set of digital information, transmitted-received and executed by the devices according to the directions stated when the installation has been set at work (programming the devices).

Several control devices, sensors, actuators, identified by their international electric symbols, are available on the fore panel of insulating material. Testing is carried out quickly by leads with safety plugs of the equipment in the standard of 4 mm, for power circuits, and in the standard of 2 mm, for Bus circuits.

Software ETS4 Professional with mobile dongle license can be used to program and set the devices at work, as well as for their diagnosis.



EXPERIMENTS PROGRAM:

- electric connections of (power and Bus) devices
- addressing BUS devices
- programming BUS devices
- dimmer-ON/OFF control devices
- ON/OFF actuators and dimmer
- Wireless control (infrared transmitter/receiver)
- Presence detection devices
- Blind handling devices
- Control of heating plant (comfort mode, night-time, off)

TECHNICAL SPECIFICATIONS:

- Tabletop painted metallic framework with wide fore panel of insulating material
- Quick connections via safety leads and terminals (Ø 4 mm) for power circuits, and with diameter of 2 mm for Bus. Leads are included in the equipment
- 1 power supply unit of 640 mA including anti-noise coil; modular assembly on omega-shaped guide outputting and controlling the voltage for Bus system of 24 Vdc (SELV: Safety Extra-Low Voltage), provided with overvoltage suppressor for Bus line of 24 V. Input power supply: 120…230 Vac, 50/60 Hz
- 1 USB interface for connection with personal computer, of modular assembly on omega-shaped guide including Bus coupler
- 1 eight-channel binary output for controlling power consuming devices or groups of power consuming devices separately, with rated load of 230 V – 8 A; modular assembly on omega-shaped guide including Bus coupler
- 1 actuator for motors of blinds including Bus coupler suitable to be inserted in control box. Blind actuator is equipped with two pairs of buttons for various activations, and with two LEDs for state indications
- 1 scenario module: modular equipment suitable to store up to 4 "scenarios". Each scenario can contain up to 8 address groups (particular operating situations) and it can be retrieved by external commands
- 1 dimmer actuator of 230 V – 20-250 VA for incandescent or halogen lamps, including bus coupler. This dimmer actuator is equipped with two pairs of buttons for various activations, and with two LEDs for state indications
- 1 flush-mounted passive infrared motion sensor including coupler for the connection with Bus line
- 4 pushbuttons connected with a 4-channel Bus coupler. This Bus coupler is assembled so that it can be inserted in control boxes
- 1 flush-mounted room thermostat (living area) including coupler for the connection with Bus line
- 1 flush-mounted IR decoder-receiver including Bus coupler. This IR receiver is equipped with four pairs of buttons for various activations, and with four LEDs for state indications
- 1 portable infrared (IR) transmitter of 4+4 channels
- 8 lamp sockets with warning lights of 230 V of different colours for signalling various activations
- 2 lamp sockets E10 with lamp of 230 V – 15 W for dimmer activation

All modular devices are inserted on DIN guide provided with data strip for Bus links. A part of this data strip is available for the insertion of additional modular devices.

Dimensions: 655 x 405 x 100 mm
Net weight: 12 kg

SOFTWARE INDISPENSABLE (NOT INCLUDED)

Original **Design Software ETS (EIB Tool Software)** multilanguage edited by consortium Konnex, to be purchased separately.
This software enables to assign the specific functionality to the installation, as well as the starting and diagnosis of BUS devices. This software can be used with a personal computer (not included in the equipment) connected with the BUS system via USB interface.

SUPPLIED ACCESSORIES:

- set of 25 cables with safety plugs (Ø 4 mm) and of 16 cables with safety plugs (Ø 2 mm)

REMARK:

This panel is "open" to be integrated with new devices of home automation available on the market of KONNEX standard. Refer to panel mod. C-IIB/EV including a micro PLC with interface module EIB/KNX.

POWER SUPPLY:

Single-phase 230 V - 50-60 Hz - max 100 VA

THEORETICAL-EXPERIMENTAL HANDBOOKS

Application handbook with exercises.

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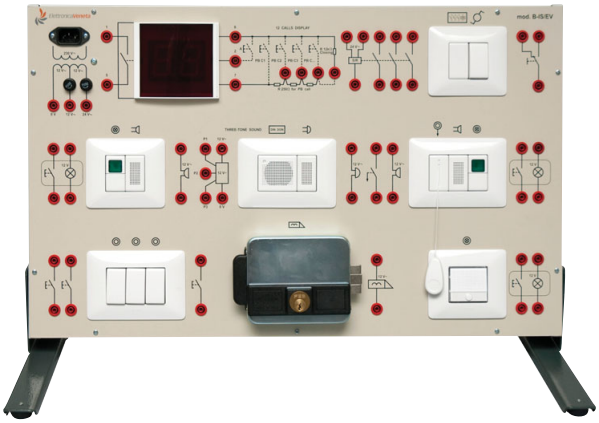
EXPERIMENTAL PANEL OPTICAL/ACOUSTIC SIGNALLING SYSTEMS

Mod. B-IS/EV



INTRODUCTION

This panel is wholly independent and it includes actual devices for testing electric optical-acoustic signalling systems in civil and/or service sectors. This panel also includes a single-phase transformer of safety extra-low voltage of 12-24 V ensuring the highest operation safety; this transformer is always present in actual installations for powering signalling circuits.
Tests and installations are carried out on the panel quickly via leads with safety plugs of 4 mm supplied with the equipment, and without the use of any working tool. All the devices are available in the fore panel of insulating material and are represented by international electric symbols. The special construction shape of this panel enables its use on a working top in both horizontal and vertical position according to the available space and to operator's needs.

EXPERIMENTS PROGRAM:

- System with a ringer controlled from one point
- System with a ringer controlled from two or more points
- System with one or more ringers controlled from one point (ringers in parallel)
- System with two ringers controlled from one point (deviated ringers)
- Ringer system with call and answer
- Acoustic signalling system for a flat (ringers and electric lock with door opener)
- Acoustic signalling system for a flat (outdoor ding-dong bell, buzzer for calls from bathroom and ringer for calls from bedrooms)
- Ringing system referred to an outdoor station with two or more flats
- Light-acoustic signalling system for alarm calls by bistable relay
- Light-acoustic signalling system with lighting labels, temporary call
- Light-acoustic signalling system with lighting labels, continuous call until reset

SUPPLIED ACCESSORIES:

- set of 30 cables with safety plugs (Ø 4 mm)

TECHNICAL SPECIFICATIONS:

- Painted metallic framework with fore panel of insulating material
- Quick connections via safety leads and terminals (Ø 4 mm)
- 1 single-phase safety transformer with output of 12-24 Vac- 1 A, protected with quick-break fuses 5 x 20 – 1 A
- 1 light indication panel with display, powered with 24 V
- 5 single-pole pushbuttons of 250 V – 10 A
- 1 single-pole pushbutton, name card with lighting
- 1 cord-operated single-pole pushbutton of 250 V – 10 A
- 2 buzzers of 12 Vac
- 1 ringer of 12 Vac
- 1 two-tone ringer of 12 Vac
- 2 lamp sockets with warning lights of 12 V – 1.5/2 W
- 1 two-pole bistable relay with excitation of 24 Vac
- 1 single-pole two-way switch of 250 V – 10 A
- 1 electric lock with excitation of 12 Vac
- 1 power plug of board-type, 2P, with cable 2 x 0.5 mm^2 and two-pole switch of 250 V – 6 A

Dimensions: 650 x 400 x 120 mm
Net weight: 14 kg

REMARK:

Testing is carried out at safety extra-low voltage of 12-24 Vac output by the transformer included in the panel.

POWER SUPPLY:

Single-phase 230 V - 50-60 Hz - 25 VA

THEORETICAL-EXPERIMENTAL HANDBOOKS

Application handbook with exercises.

EXPERIMENTAL PANEL
ANALOG INTERPHONE SYSTEMS
Mod. B-II/EV

INTRODUCTION

This panel is wholly independent and it includes actual devices for testing interphone systems that can be applied in residential and/or service sectors. This panel also includes an electronic power supply unit of safety extra-low voltage of 12-24 V ensuring the highest operation safety; this unit is always present in actual installations for powering acoustic signalling circuits and phone circuits.
Tests and installations are carried out on the panel quickly via leads with safety plugs of 4 mm supplied with the equipment, and without the use of any working tool. All the devices are available in the fore panel of insulating material and are represented by international electric symbols. The special construction shape of this panel enables its use on a working top in both horizontal and vertical position according to the available space and to operator's needs.

TECHNICAL SPECIFICATIONS:

- Painted metallic framework with fore panel of insulating material
- Quick connections via safety leads and terminals (Ø 4 mm)
- 1 self-protected electronic power supply unit for analog interphone systems; power supply: 230 Vac
- 1 analog phone module with two calling pushbuttons and lighting plate
- 1 warning light of 12 V for simulating lock opening
- 3 interphones for analog systems, including a button of lock opening and four keys for intercommunication functions; call volume adjustable on three levels
- 1 power plug of board-type, 2P, with cable 2 x 0.5 mm^2 and two-pole switch of 250 V – 6 A

Dimensions: 650 x 400 x 120 mm
Net weight: 13 kg

EXPERIMENTS PROGRAM:

- interphone system with an outdoor unit and an indoor unit (single-family system)
- interphone system with an outdoor unit and two indoor units (two-family system)
- interphone system with an outdoor unit and three indoor units (two of which are in parallel with each other)
- intercommunication system between two interphones
- intercommunication system between three interphones

REMARK:

Testing is carried out at safety extra-low voltage of 12-24 Vac output by the electronic power supply unit included in the panel.

SUPPLIED ACCESSORIES:

- set of 40 cables with safety plugs (Ø 4 mm)

POWER SUPPLY:

Single-phase 230 V - 50-60 Hz - 25 VA

THEORETICAL-EXPERIMENTAL HANDBOOKS

Application handbook with exercises.

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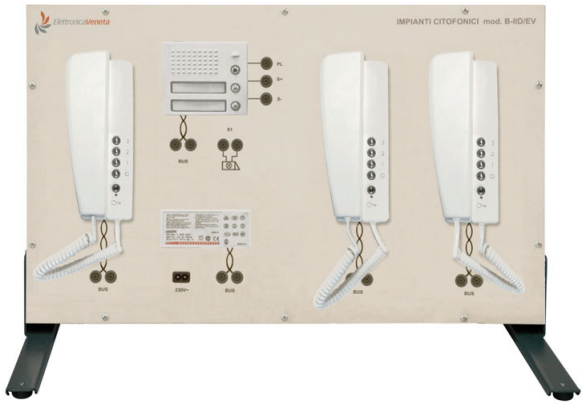
EXPERIMENTAL PANEL
DIGITAL 2-WIRE INTERPHONE SYSTEMS
Mod. B-IID/EV

INTRODUCTION

This panel is wholly independent and it includes actual devices for testing interphone systems that can be applied in residential and/or service sectors with digital innovatory technology: only two wires are used for all the connections.
This panel also includes an electronic power supply unit of safety extra-low voltage of 12-24 V ensuring the highest operation safety; this unit is always present in actual installations for powering 2-wire digital interphone circuits.
Tests and installations are carried out on the panel quickly via leads with safety plugs of 2 mm supplied with the equipment, and without the use of any working tool.
All the devices are available in the fore panel of insulating material and are represented by international electric symbols.
The special construction shape of this panel enables its use on a working top; the simplified electric wiring is implemented on its fore part; whereas the various configurations of devices are assembled on the rear part.



TECHNICAL SPECIFICATIONS:

- Painted metallic framework with fore panel of insulating material
- Quick connections via leads and terminals (Ø 2 mm)
- 1 self-protected electronic power supply unit for 2-wire digital interphone systems; power supply: 230 Vac
- 1 two-wire digital phone module with two calling pushbuttons and lighting plate
- 1 warning light for simulating lock opening
- 3 interphones for 2-wire digital systems, including a button of lock opening and three keys for intercommunication functions
- 1 power plug of board-type; 2P
- 1 cable 2 x 0.5 mm² with plug and socket of VCR-type

Dimensions: 650 x 400 x 120 mm
Net weight: 13 kg

EXPERIMENTS PROGRAM:

- interphone system with an outdoor unit and an indoor unit (single-family system)
- interphone system with an outdoor unit and two indoor units (two-family system)
- interphone system with an outdoor unit and three indoor units (two of which are in parallel with each other)
- intercommunication system between two interphones
- intercommunication system between three interphones
- interphone system including an outdoor unit and three indoor units with call to all the units and intercommunication (single-family system with several phone sets)

REMARK:

Testing is carried out at safety extra-low voltage of 12-24 Vac output by the electronic power supply unit included in the panel.

SUPPLIED ACCESSORIES:

Set of 10 cables with Ø 2 mm plugs
Set of configurators for addressing digital equipment

POWER SUPPLY:

Single-phase 230 V - 50-60 Hz - 50 VA

THEORETICAL-EXPERIMENTAL HANDBOOKS

Application handbook with exercises.

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EXPERIMENTAL PANEL
DIGITAL 2-WIRE VIDEO INTERPHONE AND TELEPHONE SYSTEMS
Mod. F-VIDT/EV

INTRODUCTION

This panel is wholly independent and it includes actual devices for testing telephone, interphone and video interphone systems that can be applied in residential and/or service sectors. Tests and installations are carried out on the panel quickly via leads with safety plugs of 2 mm supplied with the equipment, and without the use of any working tool.
All the devices are available in the fore panel of insulating material and are represented by international electric symbols. The special construction shape of this panel enables its use on a working top, in a lot of positions according to the available space and to operator's needs.

EXPERIMENTS PROGRAM:

- 2-wire interphone system with an outdoor unit and an indoor unit
- 2-wire video interphone system with an outdoor audio-video unit and an indoor audio-video unit
- telephone system with electronic branch exchange for managing up to 8 extension telephones

REMARK:

Testing is carried out at safety extra-low voltage of 12-24 Vac output by the electronic power supply unit included in the panel.

TECHNICAL SPECIFICATIONS:

- Painted metallic framework with fore panel of insulating material
- Quick connections via safety leads and terminals (Ø 4 mm)
- 1 self-protected electronic power supply unit for 2-wire digital video interphone systems; power supply: 230 Vac
- 1 module of two-wire digital CCD camera
- 1 two-wire digital phone module with two calling buttons and lighting plate
- 1 warning light of 12 V for simulating electric lock opening
- 1 interphone for 2-wire digital systems, including a button of lock opening
- 1 wall-type video interphone for 2-wire digital systems, including a button of lock opening and button for switching the screen on in automatic mode.
- 1 branch exchange with 1 input of exchange line and 8 outputs for extension telephones
- 1 network terminator with 9 jacks RJ 11 for quick connections with/from the branch exchange
- 6 tabletop impulse/multi-frequency telephone sets including lead RJ 11
- 1 panel-type, 2P power plug and cable 2 x 0.5 mm^2

Dimensions: 650 x 400 x 100 mm
Net weight: 15 kg

SUPPLIED ACCESSORIES:

- set of 12 cables with safety plugs (Ø 2 mm)

POWER SUPPLY:

Single-phase 230 V - 50-60 Hz - 150 VA

THEORETICAL-EXPERIMENTAL HANDBOOKS

Application handbook with exercises.

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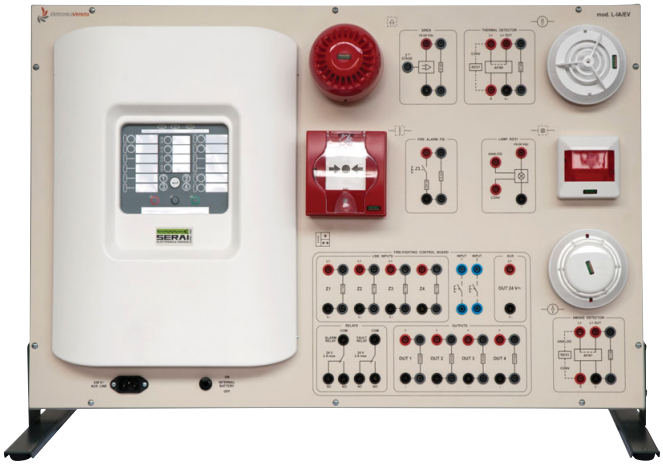
EXPERIMENTAL PANEL
FIRE DETECTING SYSTEMS
Mod. L-IA/EV

INTRODUCTION

This panel is wholly independent and it includes actual devices for testing fire detecting systems that can be applied in business and production sectors.
This panel is powered with safety extra-low voltage of 24 Vdc to ensure the highest operation safety; it also includes some buffer batteries (being available also in actual installations) that power the circuits even when the line voltage is missing. Tests and installations are carried out on the panel quickly via leads with safety plugs of 4 mm supplied with the equipment, and without the use of any working tool. All the devices are available in the fore panel of insulating material and are represented by international electric symbols. The special construction shape of this panel enables its use on a working top, in both horizontal and vertical positions according to the available space and/or to operator's needs.



EXPERIMENTS PROGRAM:

- Functions carried out by the electronic fire control unit
- Fire detecting system with manual ON button, fire control unit and optical-acoustic alarm device
- Fire detecting system with optical smoke sensor, fire control unit and optical-acoustic alarm device
- Fire detecting system with (rate-of-rise) temperature sensor, fire control unit and optical-acoustic alarm device
- Fire detecting system with optical smoke or temperature sensor, manual ON button, fire control unit, pre-alarm device and optical-acoustic alarm device for evacuation

REMARK:

Testing is carried out at safety extra-low voltage of 24 Vdc output by power supply unit and battery included in the panel.

TECHNICAL SPECIFICATIONS:

- Painted metallic framework with fore panel of insulating material
- Quick connections via safety leads and terminals (Ø 4 mm)
- 1 electronic control unit with 4 fire alarm lines and manual alarms, self-powered by buffer batteries (2 x 12 Vdc). Power supply: 230 Vac. Output: 24 Vdc
- 1 manual pushbutton of fire warning with micro-switch enabled by the breaking of glass; it also includes a device for simulating the ON state without breaking the glass
- 1 optical smoke sensor
- 1 electronic temperature sensor
- 4 resistors for balancing input lines
- 1 sound alarm device with electronic two-tone siren; sound power at 1 metre: 93-95 dB; power supply of 24 Vdc
- 1 flashing alarm device, powered with 24 Vdc
- 1 board-type power plug (2P + earth) with 1 cable 3x0.75 mm² and two-pole switch of 250 V – 6 A
- 1 key switch for excluding batteries at the end of the class to prevent them from running down completely

Dimensions: 810 x 520 x 120 mm
Net weight: 18 kg

SUPPLIED ACCESSORIES:

- set of 20 cables with safety plugs (Ø 4 mm)

POWER SUPPLY:

Single-phase 230 V - 50-60 Hz - 100 VA

THEORETICAL-EXPERIMENTAL HANDBOOKS

Application handbook with exercises.

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EXPERIMENTAL PANEL
ANTI THEFT SYSTEMS
Mod. L-II/EV

INTRODUCTION

This panel is wholly independent and it includes actual apparatuses for testing anti theft systems that can be applied in residential, business and production sectors.
This panel is powered with safety extra-low voltage of 24 Vdc to ensure the highest operation safety; it also includes a buffer battery that powers the circuits even when the line voltage is missing (like in actual installations). Tests and installations are carried out on the panel quickly via leads with safety plugs of 4 mm supplied with the equipment, and without the use of any working tool. All the devices are available in the fore panel of insulating material and are represented by international electric symbols. The special construction shape of this panel enables its use on a working top, in both horizontal and vertical positions according to the available space and/or to operator's needs.

EXPERIMENTS PROGRAM:

- Functions carried out by the electronic anti theft control unit
- System performance levels, NC circuits, single / double balanced circuits
- Detection, perimeter and volumetric sensors, operating and management remote control keys and keyboards
- Indoor / outdoor sound alarm devices
- 1-zone anti theft alarm system featuring: electronic control unit, IR + microwave presence sensor, operating / programming keyboard and additional siren
- 1-zone anti theft alarm system featuring: electronic control unit, passive infrared presence sensor, remote control key and additional siren
- 2-zone anti theft alarm system featuring: electronic control unit, magnetic detector, vibration detector, operating / programming keyboard and additional siren
- 3-zone anti theft alarm system featuring: electronic control unit, passive infrared presence sensor, magnetic micro-contacts, vibration detector, operating / programming keyboard, additional siren and self-powered outdoor siren
- 4-zone anti theft alarm system featuring: electronic control unit, passive infrared presence sensor, IR + microwave presence sensor, magnetic micro-contacts, vibration detector, operating / programming keyboard, remote control key, additional siren and self-powered outdoor siren

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TECHNICAL SPECIFICATIONS:

- Painted metallic framework with fore panel of insulating material
- Quick connections via safety leads and terminals (Ø 4 mm)
- 1 electronic control unit with programmable functions featuring: 4 NC alarm lines programmable between NC - NO - single or double alarm - 24h alarm circuit, access via programming keyboard, inlet and outlet times programmable from 0 to 255 s, alarm time programmable from 0 to 20 min., alarm relay with potential free contacts of 2 A, protection fuses, specific outputs for powering detectors and charging external batteries and controlling self-powered sirens, LEDs for signalling the operation state / anomalies in the control unit, power supply of 230 Vac – 50-60 Hz, power supply unit for charging internal battery and lead battery of 12 Vdc – 2 Ah
- 1 volumetric sensor of double (infrared and microwave) technology, protected against masking, power supply of 9-16 Vdc, horizontal covering of 83°, operating range up to 15 m, transmission frequency of 10 GHz, max. transmitted power of 10 mW
- 1 vibration detector with NC contact and 24h line, screw for adjusting sensitivity
- 1 magnetic detector with NC contact and 24h line
- 1 self-protected and self-powered outdoor siren; power supply of 13.8-14.1 Vdc; protection against tampering (24h line); max.sound power at 1 m: 117 dB; frequency of 1600-2700 Hz,; flashing frequency of 1 Hz; including lead battery of 12 Vdc – 2 Ah
- 1 indoor two-tone siren, powered with 9-14 Vdc; sound power at 1 m adjustable from 80 dB to max. 113 dB; frequency of 1600-2900 Hz; modulation frequency: 2-3 Hz
- 1 remote electronic key; functions on / off / part. of control unit; power supply of 12 Vdc; 3 status LEDs; contactless electronic key system
- 1 board-type power plug (2P + earth) with 1 cable 3x0.75 mm^2 and two-pole switch of 250 V – 6 A
- 1 key switch for excluding batteries at the end of the class to prevent them from running down completely

Dimensions: 800 x 400 x 120 mm
Net weight: 15 kg

REMARK:

Testing is carried out at safety extra-low voltage of 12-24 Vac output by power supply unit and battery included in the panel.

SUPPLIED ACCESSORIES:

- set of 30 cables with safety plugs (Ø 4 mm)

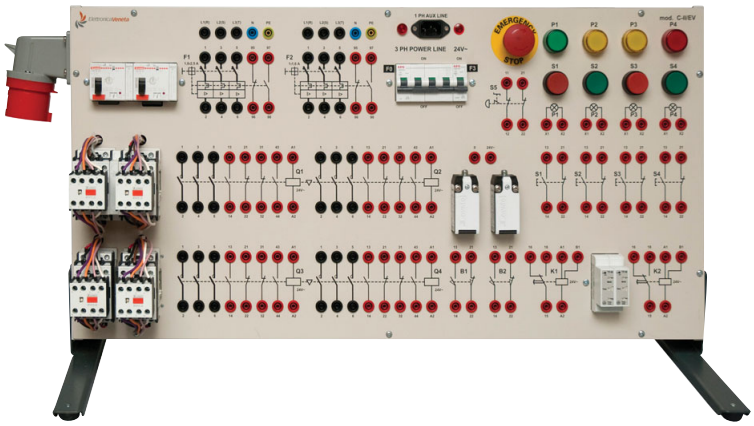
POWER SUPPLY:

Single-phase 230 V - 50-60 Hz - 50 VA

THEORETICAL-EXPERIMENTAL HANDBOOKS

Application handbook with exercises.

EXPERIMENTAL PANEL
INDUSTRIAL INSTALLATIONS
(CONTACTORS)
Mod. C-II/EV



INTRODUCTION

This panel is wholly independent and it includes actual electromagnetic devices for testing direct and sequence starting system of motors in handicraft-industrial sector. The control section of this panel is powered with safety extra-low voltage of 24 Vdc; whereas the power section is powered with the line voltage of 230-400 V (as it occurs in actual installations); these two supply voltages can be applied separately: thus the control section can be tested, in the first phase, and then also the power section will be tested.

Tests and installations are carried out on the panel quickly via leads with safety plugs of 4 mm supplied with the equipment, and without the use of any working tool. All the devices are available in the panel of insulating material and are represented by international electric symbols. This panel also includes the protection devices against short-circuits (they limit the dangerous effects) that can be provoked by wrong connections during the tests.

Some electric rotating machines (AC motors) with power up to 1.5 kW – 400 V, and their relevant starting accessories can be connected with this experimental panel to make the exercise more "actual".

This panel is used for testing in wired logic and it can directly be applied to a PLC for programmable logic systems.

The special construction shape of this panel enables its use on a working top, in both horizontal and vertical positions according to the available space and/or to operator's needs.

EXPERIMENTS PROGRAM:

- Controlling a contactor from a point
- Impulse control of a contactor
- Separate control of two contactors
- Contactor starter for three-phase asynchronous cage motor
- Remote control reverser for three-phase asynchronous cage motor
- Remote control reverser for three-phase asynchronous cage motor with block on the pushbuttons
- Remote control reverser for three-phase asynchronous cage motor with limit switches
- Remote control reverser for three-phase asynchronous cage motor with delay
- Star-delta starter for three-phase asynchronous cage motor
- Remote control reverser, star-delta starter for three-phase asynchronous cage motor
- Starting with rotor resistances for three-phase asynchronous cage motor
- Starting with autotransformer for three-phase asynchronous cage motor
- Starting with rotor resistances for three-phase asynchronous wound-rotor motor
- Remote controlled pole-change switch for 2-winding three-phase asynchronous cage motor
- Remote controlled pole-change switch for three-phase asynchronous Dahlander motor
- Counter-current braking of a 3-ph squirrel cage motor.
- Sequence starting of 3 three-phase asynchronous motors
- Contactor starter for single-phase asynchronous motor
- Remote control reverser for single-phase asynchronous motor

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TECHNICAL SPECIFICATIONS:

- Painted metallic framework with fore panel of insulating material
- Quick connections via safety leads and terminals (Ø 4 mm)
- 1 three-pole overload cut-out breaker with auxiliary NO and NC contact; In adjustable from 1.6 A to 2.4 A
- 1 three-pole overload cut-out breaker with auxiliary NO and NC contact; In adjustable from 1 A to 1.62.4 A
- 4 four-pole contactors of 25 A; excitation of 24 V; with 2 NO contacts and 2 NC contacts
- 2 mechanical interlocks that can be inserted/removed from two contactors according to needs
- 1 red mushroom-head emergency button with 2 auxiliary NC contacts
- 2 flush-mounted green start buttons with auxiliary NO and NC contact
- 4 monobloc light indicators of various colours with warning light of 24 V – 2 W
- 2 multi-function (TON, TOFF, PULSE), multi-range (from 0.1 s to 10 days) timers
- 2 position limit switches with 1 NO contact and 1 NC contact
- 1 magneto-thermal automatic circuit breaker – 1 pole C 2 A
- 1 magneto-thermal automatic circuit breaker – 4 poles C 4 A
- 1 single-phase transformer – 115-230 / 24 V – 100 VA
- 1 board-type power plug (2P + earth) with 1 cable 3x0.75 mm^2
- 3-ph/N/PE power cord 5x2,5 mm^2 with IEC 309 5-pole socket and plug

Dimensions: 800 x 400 x 120 mm
Net weight: 18 kg

RELATED UNITS (NOT INCLUDED)

To automate the starting of AC motors:

- **C-IIA/EV:** Electronically controlled industrial installations (logic module *Schneider*)
- **C-IIB/EV:** Electronically controlled industrial installations (logic module *LOGO* with KNX interface)
- **C-IID/EV:** Electronically controlled industrial installations (PLC *S7-1200* + touch panel)

To automate the starting and the speed control system of DC motors:

- **C-IIDC/EV**: DC motor starting and control systems

SUPPLIED ACCESSORIES:

- set of 70 cables with safety plugs (Ø 4 mm)

POWER SUPPLY:

Single-phase 230 V - 50-60 Hz - 100 VA
Three-phase 3 x 230 o 400 V 2 kVA
Control circuits are powered by Protection Extra-Low Voltage (PELV) of 24 Vac output by a transformer included in the panel.

THEORETICAL-EXPERIMENTAL HANDBOOKS

Application handbook with exercises.

MACHINES AND ACCESSORIES USED WITH THE EXPERIMENTS:

Compact and *Power* electrical machines and accessories (not included) recommended to complete the training program of the panel mod. C-II/EV.

"Compact" line

M-4/EV	Three-phase asynchronous cage motor	230/400 V – 500 W	2 poles
M-4A/EV	Three-phase asynchronous cage motor	400/690 V – 500 W	2 poles
M-5/EV	Three-phase asynchronous wound-rotor motor	230/400 V – 500 W	2 poles
M-6/EV	Three-phase asynchronous "Dahlander" cage motor	400 V – 500-350 W	2-4 poles
M-7/EV	Three-phase asynchronous two-winding cage motor	400 V – 500-200 W	2-6 poles
M-8/EV	Single-phase asynchronous motor with starting capacitor	230 V – 500 W	2 poles
RC3-9T	2-step stator and rotor starting rheostat – 3 x (50 Ω - 500 W)		
SA-M/EV	Three-phase autotransformer for starting three-phase motor – 500 W		
VST-1/EV	Inertial flywheel for "M"series motors		

"Power" line

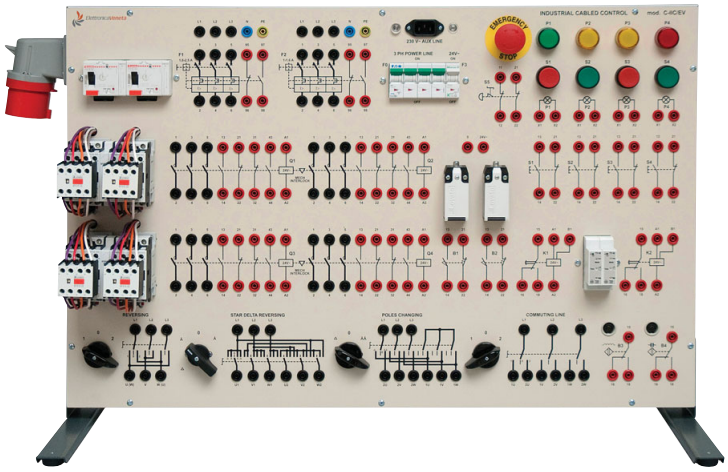
P-4/EV	Three-phase asynchronous cage motor	230/400 V – 1000 W	2 poles
P-4A/EV	Three-phase asynchronous cage motor	400/690 V – 1000 W	2 poles
P-5/EV	Three-phase asynchronous wound-rotor motor	230/400 V – 1000 W	2 poles
P-6/EV	Three-phase asynchronous "Dahlander" cage motor	400 V – 1000-700 W	2-4 poles
P-7/EV	Three-phase asynchronous two-winding cage motor	400 V – 1000-400 W	2-6 poles
P-8/EV	Single-phase asynchronous motor with starting capacitor	230 V – 1000 W	2 poles
RP3f	2-step stator and rotor starting rheostat – 3 x (35 Ω - 500 W)		
SA-P/EV	Three-phase autotransformer for starting three-phase motor – 1000 W		
VST-2/EV	Inertial flywheel for "P"series motors		
BP/EV	Base for coupling "P"series motors		

MACHINES AND ACCESSORIES / EXPERIMENTS	*Compact* 300-500 W rotating machines and accessories									*Power* 1000 W rotating machines and accessories								
	M-4/EV	M-4A/EV	M-5/EV	M-6/EV	M-7/EV	M-8/EV	RC3-9T	SA-M/EV	VST-1/EV	P-4/EV	P-4A/EV	P-5/EV	P-6/EV	P-7/EV	P-8/EV	RP3f	SA-P/EV	VST-2/EV BP/EV
CONTACTOR STARTER FOR 3-PH MOTOR	X	X							*	X	X							#
REMOTE CONTROL REVERSER FOR 3-PH MOTOR	X	X							*	X	X							#
STAR-DELTA STARTER		X							*		X							#
REMOTE CONTROL REVERSER, STAR-DELTA STARTER		X							*		X							#
STARTING WITH STATOR RESISTANCE	X	X					X		*	X	X					X		#
STARTING WITH AUTOTRANSFORMER	X	X						X	*	X	X						X	#
STARTING WITH ROTOR RESISTANCES			X				X		*			X				X		#
REMOTE CONTROLLED POLE-CHANGE SWITCH FOR 2-WINDING MOTOR					X				*					X				#
REMOTE CONTROLLED POLE-CHANGE SWITCH FOR DAHLANDER MOTOR				X					*				X					#
REVERSE CURRENT BRAKING FOR 3-PH MOTOR	X	X					X		*	X	X					X		#
SEQUENCE STARTING OF 3-PH ASYNCHRONOUS MOTOR	3 motors selected among these models								*	3 motors selected among these models								#
CONTACT STARTER FOR SINGLE-PH MOTOR						X			*						X			#
REMOTE CONTROL REVERSER FOR SINGLE-PH MOTOR						X			*						X			#

* Using inertial flywheel VST-1/EV will emphasize the necessary times and currents of starting phase.

\# Using inertial flywheel VST-2/EV will emphasize the necessary times and currents of starting phase. This inertial flywheel can be coupled to a motor of "P" series only through coupling base BP/EV.

EXPERIMENTAL PANEL
INDUSTRIAL INSTALLATIONS
(CONTACTORS AND SWITCHES)
Mod. C-IIC/EV



INTRODUCTION

This Panel, complete with switches and electromagnetic devices, is the main unit for the practical learning of cabled direct and sequenced starting of single and 3-ph AC motors.
The control (or command) circuits work with 24 VAC (PELV); the power circuits work with mains at 230 or 400 V; both power supplies are independent and protected with automatic thermomagnetic switches. This design allow to test first the command circuit, and later the power circuits.
The panel, made of insulation material, includes the international symbols of all the devices. The connections are done in an easy and fast way via cables (supplied) with 4 mm safety terminals.
Not any tool is required for the development of the exercises.
To perform the exercises in a "realistic" way, different types of AC motors and starting devices are supplied.
The panel can be used in different positions over the table, according to the client requirements of service and room.

TRAINING PROGRAM

- Control of a contactor: start, stop and jogging.
- Independent control of two contactors.
- Starting of a 3-ph squirrel cage motor with contactor.
- Forward and reverse starting of a 3-ph squirrel cage motor, with pushbuttons lock, with limit switches, proximity switches, capacitive switches, with timer.
- Star-delta starting of a 3-ph squirrel cage motor, manual and contactors circuits.
- Stator resistance starting of a 3-ph asynchronous motor.
- Rotor resistance starting of a 3-ph slip-ring asynchronous motor.
- Contactor circuits for controling a 3-ph 2-windings and Dahlander motors.
- Counter-current braking of a 3-ph squirrel cage motor.
- Sequenced-starting of 3-ph asynchronous motors.
- Single-ph motor starting and reversing contactors circuits
- Starting and reversing a 3-ph squirrel cage motor with drum switch (reverser).
- Y/D starting and reversing of a 3-ph squirrel cage motor with Y/D drum switch.
- 3-ph Dahlander motor starting with changeover switch.
- Two-windings asynchronous motor starting with changeover switch.
- Single-ph motor starting with manual switch.

TECHNICAL SPECIFICATIONS

- Painted metal structure with wide front panel made of insulation material
- Fast connections with 4 mm safety cables and jumpers
- 1 3-poles In 16 A - 400 VAC reversing switch
- 1 Y/D In 16 A - 400 VAC starter-reversing switch
- 1 Poles changeover switch for Dahlander motor, In 16 A - 400 VAC
- 1 Poles changeover switch for two-windings motor, 16 A - 400 VAC
- 1 3-poles thermomagnetic switch, with adjustable In 1,6-2,4 A with NO / NC auxiliary contact.
- 1 3-poles thermomagnetic switch, with adjustable In 1-1,6 A with NO / NC auxiliary contact.
- 4 3-poles 25 A contactor, coil 24 VAC, with 2NO+ 2 NC auxiliary contacts
- 2 mechanical interlocks, mountable/demountable, to be used between 2 contactors.
- 1 red emergency pushbutton, 2 NC contacts
- 2 green leveled start pushbuttons with NO & NC auxiliary contacts
- 2 red protruding stop pushbuttons with NO & NC auxiliary contacts
- 4 monoblock 24 V LED pilot lamps, several colors.
- 2 multifunction multiscale timers TON, TOFF, PULSE, 0,1 s to 10 h
- 2 limit switches, with NO & NC auxiliary contacts
- 1 inductive sensor, 24 VDC, relay interface output with changeover contact.
- 1 capacitive sensor, 24 VDC, relay interface output with changeover contact.
- 1 single-pole C 3 A automatic thermomagnetic switch.
- 1 4-pole C 6 A automatic thermomagnetic switch.
- 1 single-ph transformer 115-230 / 24 V – 96 VA
- 1 panel socket 3P +N + G
- 3 m cable 5 x 1,5 mm^2 with socket and plug, 5 poles, IEC 309 type.
- 1 panel feeding socket 2P + G
- 1 single-ph feeding cable 3 x 0,75 mm^2 with French-German type socket.
- Set of 70 cables with 4 mm safety terminals

Dimensions: 800 x 520 x 100 mm
Weight: 22 kg

RELATED UNITS (NOT INCLUDED)

To automate the starting of AC motors:

- **C-IIA/EV:** Electronically controlled industrial installations (logic module *Schneider*)
- **C-IIB/EV:** Electronically controlled industrial installations (logic module *LOGO* with KNX interface)
- **C-IID/EV:** Electronically controlled industrial installations (PLC *S7-1200* + touch panel)

To automate the starting and the speed control system of DC motors:

- **C-IIDC/EV**: DC motor starting and control systems

SUPPLIED ACCESSORIES

Set of 70 cables with safety plugs (Ø 4 mm)

POWER SUPPLY:

Single ph.230 V - 50-60 Hz - 100 VA;
Three-phase 3 x 230 or 400V - 3 kVA, to be supplied separately.

THEORETICAL-EXPERIMENTAL HANDBOOKS

Application handbook with exercises

MACHINES AND ACCESSORIES USED WITH THE EXPERIMENTS:

Compact and *Power* electrical machines and accessories (not included) recommended to complete the training program of the panel mod. C-IIC/EV.

"Compact" line

M-4/EV	Three-phase asynchronous cage motor	230/400 V – 500 W	2 poles
M-4A/EV	Three-phase asynchronous cage motor	400/690 V – 500 W	2 poles
M-5/EV	Three-phase asynchronous wound-rotor motor	230/400 V – 500 W	2 poles
M-6/EV	Three-phase asynchronous "Dahlander" cage motor	400 V – 500-350 W	2-4 poles
M-7/EV	Three-phase asynchronous two-winding cage motor	400 V – 500-200 W	2-6 poles
M-8/EV	Single-phase asynchronous motor with starting capacitor	230 V – 500 W	2 poles
RC3-9T	2-step stator and rotor starting rheostat – 3 x (50 Ω - 500 W)		
SA-M/EV	Three-phase autotransformer for starting three-phase motor – 500 W		
VST-1/EV	Inertial flywheel for "M"series motors		

"Power" line

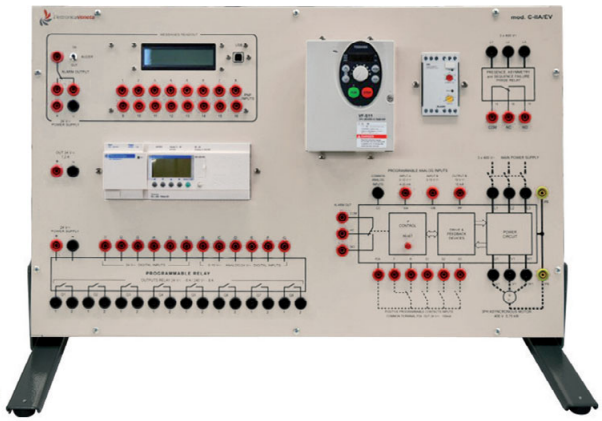
P-4/EV	Three-phase asynchronous cage motor	230/400 V – 1000 W	2 poles
P-4A/EV	Three-phase asynchronous cage motor	400/690 V – 1000 W	2 poles
P-5/EV	Three-phase asynchronous wound-rotor motor	230/400 V – 1000 W	2 poles
P-6/EV	Three-phase asynchronous "Dahlander" cage motor	400 V – 1000-700 W	2-4 poles
P-7/EV	Three-phase asynchronous two-winding cage motor	400 V – 1000-400 W	2-6 poles
P-8/EV	Single-phase asynchronous motor with starting capacitor	230 V – 1000 W	2 poles
RP3f	2-step stator and rotor starting rheostat – 3 x (35 Ω - 500 W)		
SA-P/EV	Three-phase autotransformer for starting three-phase motor – 1000 W		
VST-2/EV	Inertial flywheel for "P"series motors		
BP/EV	Base for coupling "P"series motors		

MACHINES AND ACCESSORIES / EXPERIMENTS	*Compact* 300-500 W rotating machines and accessories									*Power* 1000 W rotating machines and accessories								
	M-4/EV	M-4A/EV	M-5/EV	M-6/EV	M-7/EV	M-8/EV	RC3-9T	SA-M/EV	VST-1/EV	P-4/EV	P-4A/EV	P-5/EV	P-6/EV	P-7/EV	P-8/EV	RP3f	SA-P/EV	VST-2/EV BP/EV
CONTACTOR STARTER FOR 3-PH MOTOR	X	X							*	X	X							#
REMOTE CONTROL REVERSER FOR 3-PH MOTOR	X	X							*	X	X							#
STAR-DELTA STARTER		X							*		X							#
REMOTE CONTROL REVERSER, STAR-DELTA STARTER		X							*		X							#
STARTING WITH STATOR RESISTANCE	X	X					X		*	X	X					X		#
STARTING WITH AUTOTRANSFORMER	X	X						X	*	X	X						X	#
STARTING WITH ROTOR RESISTANCES			X				X		*			X				X		#
REMOTE CONTROLLED POLE-CHANGE SWITCH FOR 2-WINDING MOTOR					X				*					X				#
REMOTE CONTROLLED POLE-CHANGE SWITCH FOR DAHLANDER MOTOR				X					*				X					#
REVERSE CURRENT BRAKING FOR 3-PH MOTOR	X	X					X		*	X	X					X		#
SEQUENCE STARTING OF 3-PH ASYNCHRONOUS MOTOR	3 motors selected among these models								*	3 motors selected among these models								#
CONTACT STARTER FOR SINGLE-PH MOTOR						X			*						X			#
REMOTE CONTROL REVERSER FOR SINGLE-PH MOTOR						X			*						X			#

* Using inertial flywheel VST-1/EV will emphasize the necessary times and currents of starting phase.

\# Using inertial flywheel VST-2/EV will emphasize the necessary times and currents of starting phase. This inertial flywheel can be coupled to a motor of "P" series only through coupling base BP/EV.

EXPERIMENTAL PANEL
ELECTRONICALLY CONTROLLED INDUSTRIAL INSTALLATIONS
(*SCHNEIDER* LOGIC MODULE)
Mod. C-IIA/EV



INTRODUCTION

This panel must be used together with panel mod. C-II/EV because it extends the traditional testing on direct and sequence starting systems of motors to typical electronic devices of modern industrial automation processes. Thus integrating the PLC, the PWM drive, the state message display and the release of a phase sequence relay will lead to assemble the starting circuits of single-phase and three-phase asynchronous motors. The micro PLC includes USB connection cable and software for programming via PC; it can also be programmed via its own keyboard. The PWM inverter controls three-phase asynchronous motors of 400 V up to 0.75 kW (1 kW, without load): it can easily be programmed via its own keyboard and display and it can be controlled by external electric signals. The message display can store up to 16 alphanumeric messages that can be retrieved separately or be programmed by PC via USB port. The phase sequence relay tests the quality of the power of three-phase power line. These components can be identified in the panel of insulating material by their international electric symbols; electrical connections are carried out via leads with safety plugs of 4 mm, included in the panel; no working tool is necessary.
The special construction shape of this panel enables its use on a working top, aside panel mod. C-II/EV.

EXPERIMENTS PROGRAM:

- Implementing starting and stop systems with ramps, various speeds, V/f or vector mode, for a three-phase asynchronous motor by PWM electronic drive
- Implementing systems for powering three-phase power consuming devices with phase sequence relay
- Implementing systems with message display for indicating their operating conditions
- Implementing programmable logic automation systems by micro PLC; examples of motor starting that can be carried out:
  - control of a contactor for start, stop, pulses
  - contactor starter for three-phase asynchronous cage motor
  - remote control reverser for three-phase asynchronous cage motor, with block on the pushbuttons, with limit switches, with delay
  - remote control reverser, star-delta starter for three-phase asynchronous cage motor
  - starting with stator resistances, with autotransformer for three-phase asynchronous cage motor
  - starting with rotor resistances for three-phase asynchronous wound-rotor motor
  - remote controlled pole-change switch for Dahlander and 2-winding three-phase asynchronous motors
  - reverse current braking for three-phase asynchronous cage motor
  - contactor starter, remote control reverser for single-phase asynchronous motor
  - sequence starting of 2, 3, 4 three-phase asynchronous motors
  - control of three-phase inverter for forward-backward sequences with ramps an different speeds

TECHNICAL SPECIFICATIONS:

- Painted metallic framework with fore panel of insulating material
- Quick connections via safety leads and terminals (Ø 4 mm)
- 1 PWM inverter for three-phase asynchronous motors of 400 V up to 0.75 kW (1 kW, without load); input 3 x 400 V; V/f, constant-torque or vector output; it includes display and programming keys; 6 programmable digital inputs; 2 programmable analog inputs 0-10 Vdc / 0-4-20 mAdc;
- 1 presence, asymmetry and sequence phase relay – 3 x 400 Vac
- 1 electronic message display; capacity of 16 alphanumeric texts with digital inputs from 5 to 24 Vdc; alarm signalling by output relay with exchange contact 250 Vac – 10 A and disconnectable sound signal
- 1 micro PLC 20I/O, with 6 digital inputs of 24 Vdc and 6 analog/digital inputs of 0-10 Vdc, 8 digital relay outputs of 24 Vdc / 240 Vac – 8 A max.; programming via PLC keyboard and via PC (software and PC connection cable included)
- 1 power supply unit of 24 Vdc – 1 A, with input of 100-240 Vac, for powering PLC and message display
- 1 board-type power plug (2P + earth) and single-phase cable with German/French plug

Dimensions: 650 x 400 x 120 mm
Net weight: 10 kg

SUPPLIED ACCESSORIES:

- Set of 20 cables with safety plugs (Ø 4 mm)

POWER SUPPLY:

Single-phase 230 V 50-60 Hz 100 VA
Three-phase 3x400 V 50-60 Hz for AC servomechanism

THEORETICAL-EXPERIMENTAL HANDBOOKS

Application handbook with exercises.

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EXPERIMENTAL PANEL
ELECTRONICALLY CONTROLLED INDUSTRIAL INSTALLATIONS
(*LOGO* LOGIC MODULE WITH KNX INTERFACE)
Mod. C-IIB/EV

INTRODUCTION

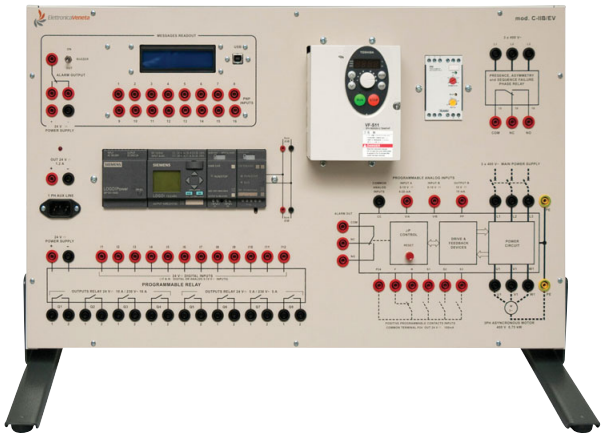
This panel must be used together with panel mod. C-II/EV because it extends the traditional testing on direct and sequence starting systems of motors to typical electronic devices of modern industrial automation processes. Thus integrating the PLC, the PWM drive, the state message display and the release of an asymmetry and phase sequence relay will lead to assemble the starting circuits of single-phase and three-phase asynchronous motors. Logic module LOGO! by Siemens is equipped with EIB/KNX interface and it includes connection cable and software for programming via PC; it can also be programmed via its own keyboard. The PWM inverter controls three-phase asynchronous motors of 400 V up to 0.75 kW (1 kW, without load): it can easily be programmed via its own keyboard and display and it can be controlled by external electric signals. The message display can store up to 16 alphanumeric messages that can be retrieved separately or programmed by PC via USB port. The asymmetry and phase sequence relay tests the quality of the power of three-phase power line.

These components can be identified in the panel of insulating material by their international electric symbols; electrical connections are carried out via leads with safety plugs of 4 mm, included in the panel; no working tool is necessary.

The special construction shape of this panel enables its use on a working top, aside panel mod. C-II/EV.

EXPERIMENTS PROGRAM:

- Implementing starting and stop systems with ramps, various speeds, V/f or vector mode, for a three-phase asynchronous motor by PWM electronic drive
- Implementing systems for powering three-phase power consuming devices with presence and phase sequence relay
- Implementing systems with message display for indicating their operating conditions
- Implementing programmable logic automation systems by logic module; examples of motor starting that can be carried out:
  - control of a contactor for start, stop, pulses
  - contactor starter for three-phase asynchronous cage motor
  - remote control reverser for three-phase asynchronous cage motor, with block on the pushbuttons, with limit switches, with delay
  - remote control reverser, star-delta starter for three-phase asynchronous cage motor
  - starting with stator resistances, with autotransformer for three-phase asynchronous motor
  - starting with rotor resistances for three-phase asynchronous wound-rotor motor
  - remote controlled pole-change switch for Dahlander and 2-winding three-phase asynchronous motors
  - reverse current braking for three-phase asynchronous cage motor
  - contactor starter, remote control reverser for single-phase asynchronous motor



  - sequence starting of 2, 3, 4 asynchronous motors
  - control of three-phase inverter for forward-backward sequences with ramps an different speeds
  - interaction between EIB/KNX BUS systems (home automation) and automation systems with micro PLC (electronically controlled industrial installations)

TECHNICAL SPECIFICATIONS:

- Painted metallic framework with fore panel of insulating material
- Quick connections via safety leads and terminals (Ø 4 mm)
- 1 PWM inverter for three-phase asynchronous motors of 400 V up to 0.75 kW (1 kW, without load); input 3 x 400 V; V/f, constant-torque or vector output; it includes display and programming keys; 6 programmable digital inputs; 2 programmable analog inputs 0-10 Vdc / 0-4-20 mAdc; 1 relay for alarm outputs
- 1 presence, asymmetry and sequence phase relay – 3 x 400 Vac
- 1 electronic message display; capacity of 16 alphanumeric texts with digital inputs from 5 to 24 Vdc; alarm signalling by output relay with exchange contact 250 Vac – 10 A and disconnectable sound signal
- 1 micro PLC 20I/O, with 12 digital inputs of 24 Vdc of which 4 are also analog 0-10 Vdc and 4 fast inputs up to 5 kHz, 4 digital relay outputs of 24 Vdc / 230 Vac – 10 A max. + 4 digital relay outputs of 24 Vdc / 230 Vac – 5 A max.; programming via PLC keyboard and via PC (software and PC connection cable included)
- 1 power supply unit of 24 Vdc – 1.3 A, with input of 100-240 Vac, for powering PLC and message display
- 1 board-type power plug (2P + earth) and single-phase cable with plug

Dimensions: 650 x 400 x 120 mm
Net weight: 10 kg

SUPPLIED ACCESSORIES:

- set of 20 cables with safety plugs (Ø 4 mm)

POWER SUPPLY:

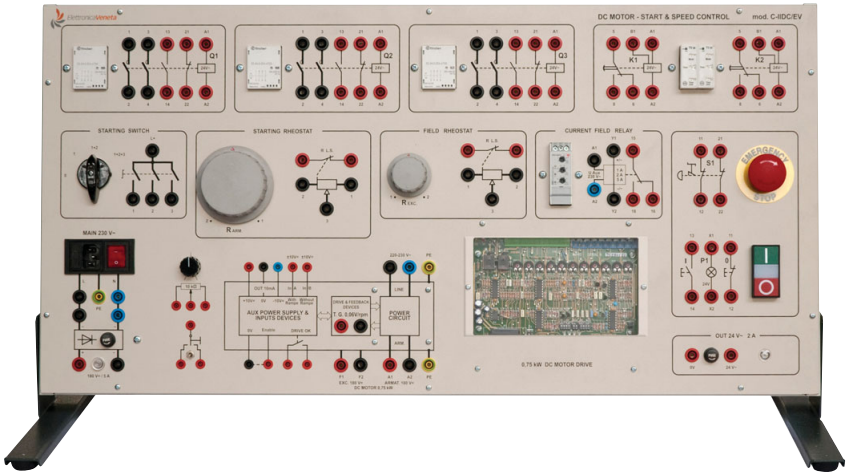
Single-phase 230 V 50-60 Hz 100 VA
Three-phase, 3 x 400 V – 50-60 Hz - 3 kVA

THEORETICAL-EXPERIMENTAL HANDBOOKS

Application handbook with exercises.

INDUSTRIAL INSTALLATIONS / ADVANCED LOGIC

EXPERIMENTAL PANEL
DC MOTOR STARTING AND CONTROL SYSTEMS
Mod. C-IIDC/EV



INTRODUCTION

This panel can be used as an independent trainer, or together with the panels mod. C-II, C-IIA and CII-B/EV to improve the practices of DC motors starting and control circuits.
The DC motor starting circuits included are: starting with step rheostats with manual exclusion or automated exclusion, with linear rheostats and with electronic drives.
The panel includes a power supply suitable for DC motors (permanent magnets or separated excitation) up to 500 W.
Over the front side, made of insulating material, are placed all the components with their international electrical symbols. All the electrical connections are carried out with cables (a set is supplied) and terminals of 4 mm safety type; not any tool is required for the connections or the use of the panel.
The table-top construction and the tilting support allow the use in horizontal, vertical or in angular positions.

EXPERIMENTS PROGRAM:

- DC motor starting circuit: constant field and step rheostat armature, manual exclusion with rotative commutator.
- DC motor starting circuit: constant field and linear rheostat armature.
- DC motor starting circuit: partially controllable field, field excitation relay and armature with step rheostat with timed automatic exclusion.
- DC motor speed control circuit with electronic drive at constant field. Speed closed loop with armature voltage or tachogenerator feedback.
- DC motor inversion and speed control with 4-Q electronic drive, with constant field and armature voltage or tachogenerator feedback. With programmable starting and braking ramps.

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TECHNICAL SPECIFICATIONS:

- Table-top painted metal structure. Front panel made of insulating material
- Fast connections with terminals and cables with 4 mm safety connectors
- 1 4-Q bidirectional electronic drive for DC motors up to 500 W, with separated excitation. Input power 230 VAC, armature and field output: 170 VDC. It works with armature voltage or tachogenerator (0,06 V/turn) feedback. Analog input ±10 VDC for external potentiometer control with ramps, 4 on-board trimmers for programming the ramps. Analog input ±10 VDC for external control with no ramps. Digital input for drive enabling. Tachogenerator input: 60VDC/1000RPM. Relay with NO contact for alarm output
- 1 Potentiometer, 10 k Ω for the drive speed control
- 1 Lever selector 6 A- 250 VAC for the drive STAND-BY and RUN modes
- 1 180 VDC - 5 A power supply, input 230 VAC, protected against overload and short circuit with fast fuses, bipolar switch and spy lamp
- 1 R120 linear toroidal rheostat for the field circuit, 0-300 Ω, In 0,65 A with microswitch at Rmin position
- 1 R175 linear toroidal rheostat for the armature circuit 0-40 Ω, In 2,1 A with microswitch at Rmax position
- 3 Relays, 2 poles, 25 A, 24 VAC coil, with 1 NO + 1 NC auxiliary contacts
- 1 3-step 1 way adder-type switch, 25 A, for manual starting of the DC motor
- 1 programmable electronic relay for min/max AC/DC current, auxiliary input 230 VDC, selectable current ranges 1, 2, 5 A, NO-COM-C auxiliary contact
- 1 monoblock pushbutton, RUN key with NO contact, STOP key with NC contact, spy lamp 24 V
- 1 red emergency pushbutton, manual unlocking, with 2 NC contacts
- 2 multifunction multivoltage timers, TON, TOFF, PULSE, multiscale 0,1 s to 10 days
- 1 24 VAC PELV output with single-ph transformer, 115/230 V / 24 V - 50 VA, 50-60 Hz. Protected with 2 A fast fuse
- 1 panel feeding socket 2P + G and 5 x 20 10 A fuse
- 1 single-ph feeding cable with French-German plug

Dimensions: 800 x 400 x 100 mm
Weight: 21 kg

SUPPLIED ACCESSORIES:

- Set of Ø 4 mm-40 cables with safety terminals
- Set of Ø 2 mm-6 cables
- DC motor, 500 W, 170 VDC armature and separated excitation, mod. M-1G/EV

RECOMMENDED ACCESSORIES:

- Tachogenerator mod. M-16/EV, K= 0,06 V / turn

POWER SUPPLY:

230 V single-phase 50-60 Hz - 1000 VA

THEORETICAL-EXPERIMENTAL HANDBOOKS

Application handbook with exercises.

INDUSTRIAL INSTALLATIONS / ADVANCED LOGIC

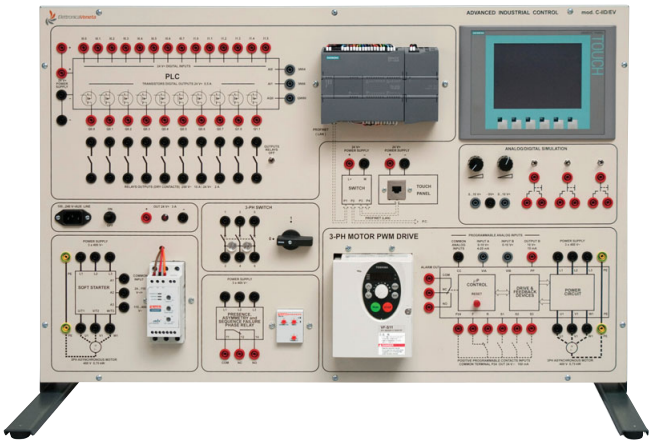
EXPERIMENTAL PANEL
ELECTRONICALLY CONTROLLED INDUSTRIAL INSTALLATIONS
(PLC *S7-1200* + HMI TOUCH PANEL)
Mod. C-IID/EV

INTRODUCTION

This panel should be used together with panel mod. C-IIC/EV because it extends the direct and sequenced drive circuits developed with cabled logics.

The possible circuits include:
- V/f or vector PWM drive,
- Soft-start,
- PLC for sequence controls
- User panel (HMI Touch screen)
- Relay for presence - symmetry - phase sequence for three phase line.

The components can be identified in the panel of insulating material by their international electric symbols; electrical connections are carried out via leads with safety plugs of 4 mm, included in the panel; not any working tool is necessary.
The special construction shape of this panel enables its use on a working top, aside panel mod. C-IIC/EV.



TRAINING PROGRAM

- Gradual starting and stop TAM circuits (Three-phase Asynchronous Motor).
- Implementing starting and stop systems with ramps, various speeds, V/f or vector mode, for a threephase asynchronous motor by PWM electronic drive.
- Implementing circuits for three phase services power supply, with presence and control relays and correct phase sequence.
- Implementing programmable logics automation circuits with PLC, examples of possible circuits:
  - Control of a contactor for start, stop, pulses.
  - Contactor starter for three-phase asynchronous squirrel cage motor.
  - Control reverser for three-phase asynchronous squirrel cage motor, with block on the pushbuttons, with limit switches, with delay.
  - Control reverser, star-delta starter for three-phase asynchronous squirrel cage motor.
  - Starting with stator resistances, with autotransformer for three-phase asynchronous squirrel cage motor.
  - Starting with rotor resistances for three-phase asynchronous wound-rotor motor.
  - Controlled pole-change switch for Dahlander and 2-winding three-phase asynchronous motors.
  - Reverse current braking for three-phase asynchronous squirrel cage motor.
  - Contactor start, control reverse for single-phase asynchronous motor.
  - Sequence starting of 2, 3, 4 asynchronous motors.
  - Control of three-phase inverter for forward/backward sequences with ramps and different speeds.
  - Connection of circuits via PLC and the signaling panel to indicate the operating status of a machine.

The experiments described above can be singularly carried out or coordinated with each other to implement circuits of increasing complexity.

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TECHNICAL SPECIFICATIONS

- Painted metallic framework with fore panel of insulating material.
- Quick connections via safety leads and terminals (Ø 4 mm).
- 1 PWM inverter for 230/400 V TAM and 0,75 kW (1 kW without load) power. 3 x 400 V (or 3 x 220 V upon request) power supply, V/f, constant torque and vector operating modes, it includes display and programming keys; 6 programmable digital inputs, 2 programmable analog inputs 0-10 Vdc / 4-20 mAdc, 1 relay for alarm outputs.
- 1 soft start for TAM 3 x 400 V (or 3 x 220 V upon request) max. Power 1 kW, starting and stop with external electrical signals control.
- 1 presence, sequence and symmetry phase relay – 3 x 400 Vac (or 3 x 220 V upon request) with free terminals
- 1 PLC Siemens S7 1200 CPU 1214 C, 14 digital inputs of 24 Vdc, of which 6 fast inputs (100 kHz), 2 analog inputs of 0…10 Vdc, 10 digital output with transistor 24 Va - 0.5A, including relay interface with 10 A dry contacts, 1 analog output 0÷10 Vdc.
- 1 HMI touch screen user panel with function keys, LCD-TFT 5,7" - 256 colors display.
- 1 24 Vdc – 2,5 A power supply, with input of 120…230 Vac, for powering PLC and HMI panel.
- 1 Board-type power plug (2P + earth) and singlephase cable with plug

Dimensions: 800 x 520 x 100 mm
Weight: 18 kg

SUPPLIED ACCESSORIES

- Set of 38 cables with safety plugs (Ø 4 mm)
- 3 patch cords for LAN connections
- Original software TIA Simatic STEP 7 Basic
- CD with software "PLC applications"

RELATED UNITS (NOT INCLUDED)

- **Mod. C-IIC/EV**: Electrical control and switching applications experimental panel

Electrical motors and accessories:

- **M-4A/EV**: 3-ph squirrel cage motor 400/690 V - 500 W 2 poles
- **VST-1/EV**: experimental flywheel with 3 different moments of inertia

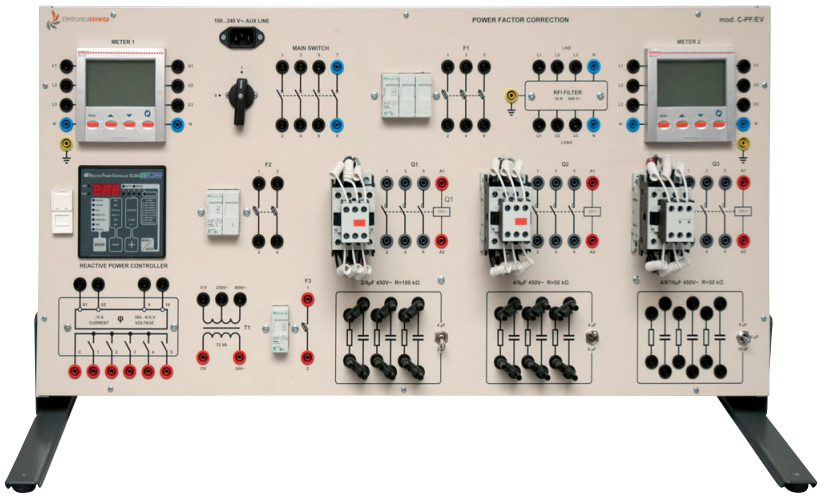
POWER SUPPLY:

Single phase 120…230 V - 50-60 Hz - 100 VA;
Three-phase 3 x 400 V - 1 kVA, to be supplied separately.

THEORETICAL-EXPERIMENTAL HANDBOOKS

Application handbook with exercises

EXPERIMENTAL PANEL
AUTOMATIC POWER FACTOR CORRECTION SYSTEMS
Mod. C-PF/EV



INTRODUCTION

This panel is designed to test industrial systems with electronic devices for control of power factor correction in low-voltage power consuming devices (voltage of 400 V).
The panel is used to assemble automatic power correction circuits with different capacitive steps managed by electronic control unit. Two energy analyzers measure voltages, currents, active, reactive and apparent powers and the power factor.
These instruments are configured in single-phase or three-phase systems with or without neutral conductor; their use is free in the circuit such as power supply line, electric power consumer device, capacitive battery, etc…

Components can be identified in the panel of insulating material by their international electric symbols; electrical connections are carried out via leads with safety plugs of 4 mm, included in the panel; no working tool is necessary.

The electric power consuming devices with different values of active-inductive apparent power can easily be reproduced in laboratory with the combined use of variable resistive-inductive loads.
An optimum testing will require a value of active-inductive apparent power ranging between 1300 and 1900 W + 1300-1900 VAR, with adjustment in 5…7 steps.

It is recommended to use the variable loads mod. RL-2/EV + IL-2/EV, mod. RL-3/EV + IL-3/EV or RL-2K/EV.

EXPERIMENTS PROGRAM:

- Measurements of Apparent, Active and Reactive powers and relations among them
- Local power factor correction system of electric single-phase power consuming devices
- Local power factor correction system of electric three-phase power consuming devices
- Discharging the power stored in capacitors
- Central power factor correction systems with 1-2-3 equal steps
- Central power factor correction systems with 1-2-3 steps (one double of the other)
- Filtering harmonic currents in capacitors

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TECHNICAL SPECIFICATIONS:

- Painted metallic framework with fore panel of insulating material
- Quick connections via safety leads and terminals (Ø 4 mm)
- 1 automatic microprocessor controller of power factor, with rated voltage of 380-415 V – 50-60 Hz
  - ammeter input with forward current up to 5 A (sensitivity range 0, 125 … 6 A)
  - setting power factor: 0.8 ind … 0.8 cap., reconnection time: 5 … 240 s
  - sensitivity range: 5…600 s/step
  - 5 relay outputs with contacts of 5 A – 250 Vac
  - setting parameters manually from display-assisted keyboard
- 2 multi-function instruments; auxiliary power supply 115-230V; LCD display, 128x80 pixel
  - measurements of voltages, currents, active, reactive and apparent powers, and power factor in single-phase and three-phase systems
  - accuracy rating for currents and voltages: ± 1%
  - measuring range: 5 A – 850 V max.
- 1 four-pole rotary switch of operation – 16 A – 400 V
- 1 set of three fuse holders with gl-type fuses 10.3x38 of 6 A
- 1 pair of fuse holders with gl-type fuses 10.3x38 of 2 A
- 1 fuse holder with gl-type fuse 10.3x38 of 4 A
- 1 noise suppression filter for three-phase line with neutral conductors – Vn 440 V; In 10 A; inductance of 0.4 mH, current-carrying capacity of 0.1 µF
- 3 three-pole contactors for power factor correction – Ith (AC1) 25 A (7.5 kvar at 400 V) with transient limiting devices at the connection, excitation of 24 Vac – 50-60 Hz
- 1 single-phase transformer with primary winding of 230-400 V and secondary winding of 24 V, power of 72 VA
- 1 battery of three-phase capacitors of 450 V~ with selection switch between 2 and 4 µF and relevant discharging resistors of 100 kΩ - 5 W
- 1 battery of three-phase capacitors of 450 V~ with selection switch between 4 and 8 µF and relevant discharging resistors of 50 kΩ - 10 W
- 1 battery of three-phase capacitors of 450 V~ with selection switch among 4 8, and 16 µF and relevant discharging resistors of 50 kΩ - 10 W

All batteries of capacitors can be connected in single-phase or three-phase star-delta configuration; they enable to assemble automatic power factor correction systems up to 3 equal steps (4+4+4 µF), up to 3 steps (one double of the other, of 2, 4, 8 µF, or of 4, 8, 16 µF); connecting the various batteries in parallel will lead to further combinations.

Dimensions: 805 x 405 x 100 mm
Net weight: 25 kg

SUPPLIED ACCESSORIES:

Set of 67 cables and 20 jumpers with Ø 4 mm safety plugs

OPTION:

Programming software and cable (accessories available on demand, separately). Applying the programming software via RS232 port (or USB port, with a converter) will enable to carry out setting and simultaneous display of all measures (current power factor, set power factor, weekly average power factor, voltage, current, reactive power of system) in the automatic power factor controller to obtain a whole view of power factor correction system. Furthermore, the elapsed time and the number of tripping operations from the setting at work of the system is indicated for each step, for preliminary service of contactors.

POWER SUPPLY:

Single-phase 230 V - 50-60 Hz - 50 VA
Three-phase 3 x 400 V - 50-60 Hz -3 kVA

THEORETICAL-EXPERIMENTAL HANDBOOKS

Application handbook with exercises.

INDUSTRIAL INSTALLATIONS / ADVANCED LOGIC

EXPERIMENTAL PANEL
MONITORING ELECTRIC POWER CONSUMPTION WITH SCADA NETWORKS
(Supervisory Control And Data Acquisition)
Mod. PRMCE-1/EV

INTRODUCTION

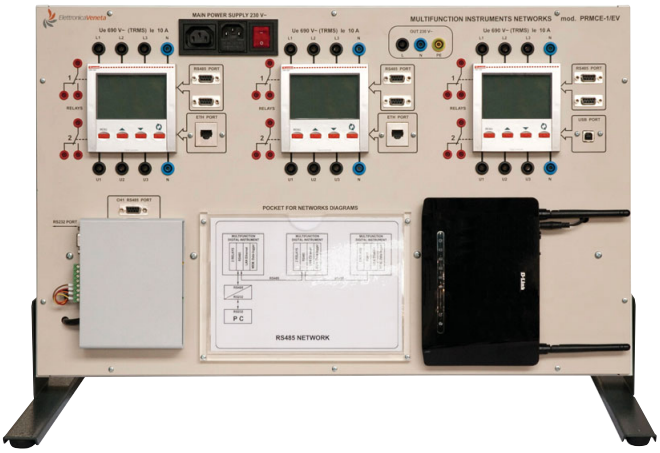
Panel specifically designed for the study of electrical monitoring networks (SCADA).
In this context, "electrical monitoring networks" describes the different modes the collected data can be transferred.
These networks can be used, for example, to differentiate between the consumption levels of different users (lighting, electrical power etc.) or between specific factory departments or laboratories. By so doing, it is possible to precisely cost each section derived from a global cost.
Another interesting application can be active and reactive power recording, so as to correctly design the Power Factor correction units.

The current trend in electrical instruments is concentrating in a single box, the so called "digital multifunctional instruments or energy analyzers".
These instruments have many advantages if compared with traditional ones (analog and digital), each one dedicated to the measurement of only one parameter. Some of the advantages are:

- they are microprocessor controlled digital instruments.
- they enable the measurement of a great number of electrical parameters with a minimum of cabling.
- they have displays that enable the observation of several parameters simultaneously on a single screen.
- they usually are of a high precision class (0.5 ~ 0.2).

Referring to high end instruments, other extra features are included:

- the instruments include TRMS measurement and harmonic analysis.
- the instruments can be programmed according to user requirements.
- complex functions (Boolean) are available within the preset limits of the measured parameters.
- it is possible to configure alarms from the preset limits of the measured parameters and also from the Boolean functions.
- they usually include dry contacts, activated by the alarms.
- they have a wide range of additional accessories, such as different communication modules, memories to record and save the trend of the measured parameters which can subsequently be downloaded to a PC in the form of tables or graphs.



On the basis of the above, the panel covers two important subjects:

- the knowledge and programming of a high end multifunctional instrument
- the study of the communication networks that can be configured with such instruments.

The instruments included in the panel are highly flexible and can be used in single and 3-ph lines, with/without neutral.

The proposed monitoring networks include RS485, LAN (Ethernet) and W-LAN (wireless / Wi-Fi).
The instruments are located on the front panel made of insulating material and representing the international electrical symbols. The instruments have free terminals that can be connected to real loads.
A holder containing the various synoptic diagrams of the different networks can also be found on the front panel.
The electrical power connections are carried out via cables (supplied in different colours and lengths) with 4 mm safety connectors. Network connections (RS485, Ethernet) are carried out via cables (also supplied) of different connector diameters.
To be noted that all exercises can be performed without the need of any tools.

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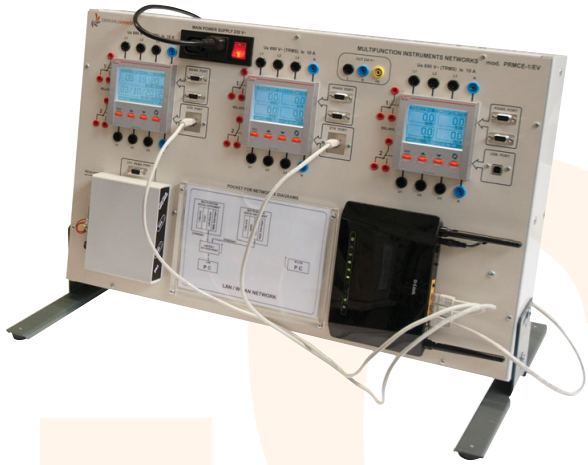
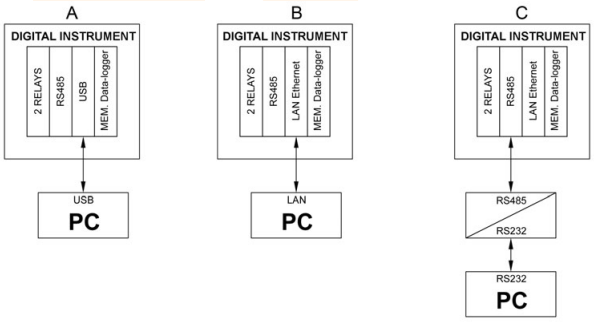
EDUCATIONAL PROGRAMME & CONNECTING MODES:



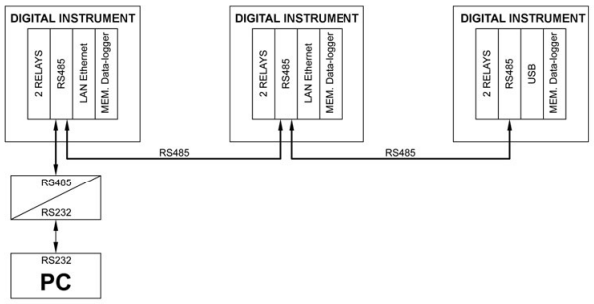
Connection of one instrument

A Connection of a digital instrument with a PC via USB port for data acquisition and specific control software.
B Connection of a digital instrument via LAN-Ethernet port for data acquisition and control software.
C Connection of a digital instrument with a remote PC via RS485 serial port and RS485/ RS232 interface box.



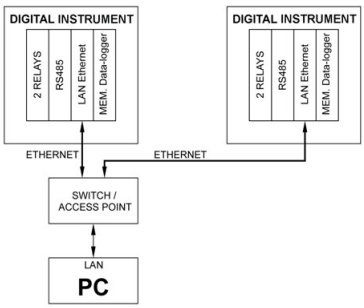
PC - Instrument local connections

D ***Connection of 3 digital instruments with a PC via RS485 serial port and RS485/ RS232 interface box.***



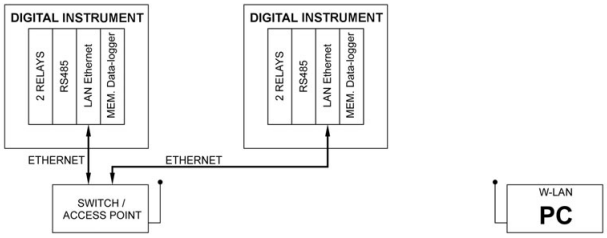
PC - Instruments RS485 connection

E1 ***Connection of 2 digital instruments with a switch / access point. Data access via PC.***



PC - Instruments LAN-Ethernet connection

E2 ***Connection wireless of 2 instruments to a remote PC.***



PC - Instruments W-LAN connection

CONFIGURATION:

The Panel mod. PRMCE-1/EV includes:

- 3 high end digital multifunctional instruments for the analysis of electrical power.
- 1 interface RS232 / RS485
- 1 Wireless Router
- 1 remote control software
- 1 software for data-logger management

Technical Characteristics - Digital instruments

- Digital instruments for single & 3-ph electrical parameters.
- Auxiliary feeding 110…250 VDC/VAC - 50-60 Hz.
- LCD graphic display, 128 x 80 pixel, backlit, 4 levels of grey.
- With 4 keys for visualizing and settings. Measurement of more than 300 TRMS electrical parameters in single and 3-ph systems: voltages, currents, active / reactive / apparent powers, power factor (cosϕ), frequency, harmonic analysis for voltages & currents up to the 31° harmonic, total and partial imported / exported active energy, total and partial inductive / capacitive reactive energy, total and partial apparent energy.
- Precision class for currents and voltages: ± 0,2 %. Range: 10 A (with 10/5 A internal CT) – max 830 V ph-ph – frequency range: 45…66 Hz.
- Possibility to create up to 4 programmable pages, each one with 4 selectable parameters.
- The instruments also include the following options:

INSTRUMENT/OPTION	LEFT	CENTER	RIGHT
OUTPUTS: 2 Relay	yes	yes	yes
Interface RS485	yes	yes	yes
ETHERNET Interface	yes	yes	---
USB Interface	---	---	yes
Memory + RTC	yes	yes	yes

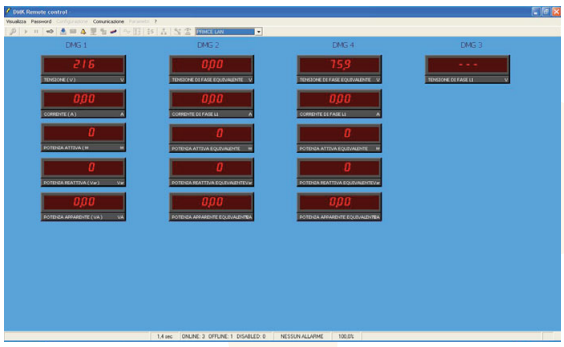
Technical Characteristics - RS232 / RS485 interface

RS232 / RS485 interface to create the RS485 communication network.

Technical Characteristics - Wireless Router

Switch 4 ports 100/10 Mbit Ethernet LAN to create the communication network with TCP/IP protocol and wireless connection.

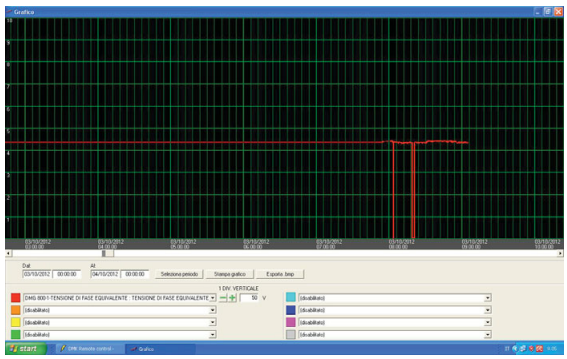
DMK SW remote control software



The DMK SW remote control software enables to:

- Visualize the measured values in virtual mode.
- Perform user defined measurements and save them in several formats (MS-Access, text ASCII, MS-Excel).
- Trace graphs of the desired parameters.
- Set alarm limits to the desired parameters.
- Save to disk the alarms and events sequence of the instruments network.
- Visualize and modify the set parameters, save, edit and print them.
- Visualize the harmonic content graph of voltage and current.
- Program the measurement pages, including flags associated to them, background images, labels and pushbuttons.
- Change the menus and command language (Italian, English, French, Spanish and Portuguese are available).

DMK SW 10 data-logger software



The DMK SW 10 data - logger software enables the configuration and management of the data collected in the memory module. Specifically, it is possible to:

- Set the desired parameters and the time elapsed for the data collection.
- Visualize the data from the DMK-DMG instruments in MS-Access format.
- Convert the MS-Access tables into ASCII text or MS-Excel formats.
- Trace graphs of the selected parameters.

PC System requirements

- Operative System Windows 95 / 98 / 2000 / XP / Vista / 7
- Graphic board 1024 x 768 or higher
- One RS232 serial standard interface (COM:)
- 64 MB RAM
- 'Pentium' processor or higher
- CD-ROM drive

SUPPLIED ACCESSORIES:

- 1 USB cable, 2 m, with A / B connectors
- 3 Cable 1 m with 9 terminals connectors, for the RS485 connection.
- 1 Cable 2 m with 9 terminals connectors, for the RS485 / RS232 connection
- 3 Cables Ethernet RJ 45, 1 m cat. 5
- 16 Cables 1 m with 4 mm safety terminals for the power connections.
- 1 Polysnap feeder, input C14 connector, output C13 plug, and 2-pole switch and pilot light.
- 1 Cable single-ph with Unel male connector and C13 plug.
- 1 Cable single-ph with C14 male connector and C13 plug.
- 4 Film pack synoptic diagrams of the proposed networks.

Dimensions: 650 x 400 x 120 mm
Net weight: 15 kg

SUGGESTED ACCESSORIES

To set and monitor variable electrical loads:

- 1 single/ 3-ph variable resistive load, mod. RL-2/EV
- 1 single/ 3-ph variable inductive load, mod. IL-2/EV

POWER SUPPLY:
Single-phase 230 V 50-60 Hz, 3000 VA

THEORETICAL-EXPERIMENTAL HANDBOOKS
Application handbook with exercises.

23-C

ELECTRICAL ENGINEERING

EDUCATIONAL HOUSE

EDUCATIONAL HOUSE FOR ELECTRICAL INSTALLATIONS AND TESTING Mod. CD/EV MS 89

 ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

EDUCATIONAL HOUSE FOR ELECTRICAL INSTALLATIONS AND TESTING

Mod. CD/EV

INTRODUCTION

The educational house for electrical installations has been designed to apply the assembling and testing techniques of electrical installations in buildings of residential, business and service sectors. This equipment complies with what stated by the technical regulations of Comitato Elettrotecnico Italiano (CEI) and by the international IEC standards. This system is used to apply the installation techniques according to standards, and in particular, to the safety of electrical installations as explained in the regulations in force. This equipment emphasizes the aspects concerning electrical testing including "visual examination" without any need of "instrumental tests" for checking the installation efficiency.

This equipment represents a small size building for residential use designed to analyze the correct assembling and testing procedures of electrical installations according to Italian law ("Rules for safety of electrical installations").

Educational house mod. CD/EV complies with Italian (CEI) and international (IEC) standards; it is suitable to measure insulation, fault loop impedance and voltage drops, and to carry out continuity tests and checks of protection devices on already wired and operating circuits, besides enabling to carry out changes and transformations on already existing installations.

BASIC TRAINING PROGRAM:

This program includes the analysis of installations such as:

- Lighting and EMF distribution systems with energy counter (kWh)
- Staircase lighting system
- Interphone system
- Earthing and equipotential system
- TV antenna system
- Telephone distribution system
- Gas and CO alarm system
- Anti theft system

ADDITIONAL TRAINING PROGRAM THAT CAN BE IMPLEMENTED:

- Video interphone system
- Consumption optimization system
- Automatic lighting system with sensor
- Telephone system
- Electric separation with isolation transformer
- Home automation systems with PLC
- Lighting control with intelligent BUS systems.

TECHNICAL SPECIFICATIONS:

This unit is made of welded sheet steel and sections, chemically treated and painted with several coats of epoxy varnish. Each one of the 4 available walls is provided with a panel including junction boxes housing the components of the concerned system.
The whole framework is laid on a movable wheeled base.

Wall 1 (main entrance):

- 1 main power supply of 230 V – 16 A
- 1 single-phase energy meter of 230 V – 20 A
- 1 branch exchange with 2 differential circuit breakers and 3 magneto-thermal circuit breakers
- 1 antenna control unit with mixer amplifier, 4-output divider and 7 TV sockets
- 1 TV antenna installed on the roof (III – IV – V band)
- 1 interphone power supply unit with changeover switch for excluding the outdoor unit
- 1 two-button interphone porter
- 1 electric lock
- 1 lighting nameplate with pushbutton
- 1 earth collector for connecting earthing plates and equipotential node
- 4 earthing connections with resistance of 1 Ω and breaking terminals
- 1 two-zone anti theft control unit
- 1 electronic self-powered siren

Wall 2 (living room and kitchen):

- 1 lighting system with two incandescent lamps of 230 V controlled by two pushbuttons and switch relay
- 2 sockets of 230 V 16 A for power consumer devices of living room
- 1 incandescent lamp of 230 V with controller of luminous intensity
- 1 telephone jack
- 2 TV sockets for living room
- 1 electronic two-tone ringer
- 1 chronothermostat (living area)
- 1 electronic smoke/heat detector
- 1 infrared presence detector
- 1 lamp of low power consumption controlled by two two-way switches
- 3 sockets of 230 V 16 A for electric household appliances
- 2 TV sockets for kitchen
- 1 self-powered emergency lamp of 230 V
- 1 wall-type interphone communicating with outdoor unit and intercommunicating with indoor unit
- 1 ringer of 12 V for calls from bedrooms
- 1 buzzer of 12 V for emergency calls from bathrooms
- 1 buzzer for remote gas alarm
- 1 gas leak detector
- 1 micro contact for anti theft system

Wall 3 (bedroom and bathroom):

- 1 incandescent lamp controlled by two two-way switches and by an inverter
- 1 socket of 230 V 16 A for electric household appliances
- 1 single-phase socket of 230 V 10 A for lights
- 1 incandescent lamp of 230 V with controller of luminous intensity
- 1 TV socket
- 1 telephone jack
- 1 electronic two-tone ringer
- 1 electronic thermostat (sleeping area)
- 2 pushbuttons for service calls
- 1 halogen lamp of extra-low voltage controlled by a switch
- 1 pushbutton for emergency call from bathroom
- 1 electro-mechanical thermostat (bathrooms)
- 1 socket of 230 V 16 A for water heater, with magneto-thermal circuit breaker of 10 A
- 1 socket for electric shaver with transformer, controlled by switch

Wall 4 (study, stairwell and boiler room):

- 3 lamps with portable coded radio control and 2 separate dimmers
- 1 telephone jack
- 2 TV sockets
- 1 socket of 230 V 16 A for electric household appliances
- 1 single-phase socket of 230 V 10 A for lights
- 1 interphone communicating with outdoor unit and intercommunicating with kitchen
- 1 micro contact for anti theft system
- 3 incandescent lamps of 230 V with two LED pushbuttons and timing relay
- 1 microwave presence detector
- 1 socket of 230 V 16 a for heating control unit
- 3 warning lights (simulating the pumps of heated zones)
- 1 gas cutoff solenoid valve

Dimensions: 1300 x 1300 x 1800 mm
Net weight: 250 kg

ADDITIONAL SYSTEMS THAT CAN BE INSTALLED ON DEMAND:

- 1 single-family video interphone system including:
  - 1 wall-type video interphone for indoor communications
  - 1 electronic power supply
  - 1 camera module for outdoor unit
- System for optimizing consumptions:
  - 1 electronic control unit
  - 2 peripheral ON/OFF actuators
- Automatic lighting system:
  - 1 lamp controlled by presence sensor coupled to a twilight switch and to a timer
- Home automation systems:
  - 1 PLC with 20-point I/O simulator
- Telephone system:
  - 1 branch exchange with 1 exchange line and 4 extensions
  - 3 bistandard telephone sets
- Electric separation with transformer
  - isolation transformer 230/230 V - 3000 VA
- Lighting control with intelligent BUS systems:
  - 1 power supply unit of 640 mA including anti-noise coil; modular assembly on omega-shaped guide outputting and controlling the voltage for Bus system of 24 Vdc (SELV: Safety Extra-Low Voltage), provided with overvoltage suppressor for Bus line of 24 V. Input power supply: 120…230 Vac, 50/60 Hz
  - 1 USB interface for connection with personal computer, of modular assembly on omega-shaped guide including Bus coupler
  - 1 eight-channel binary output for controlling power consuming devices or groups of power consuming devices separately, with rated load of 230 V – 8 A; modular assembly on omega-shaped guide including Bus coupler
  - 4 pushbuttons connected with a 4-channel Bus coupler. This Bus coupler is assembled so that it can be inserted in control boxes

ACCESSORIES RECOMMENDED FOR ELECTRICAL TESTS ON THE EDUCATIONAL HOUSE:

- Instrument for measurements of isolation and continuity tests of protection and equipotential conductors
- Instrument for testing the functionality of differential circuit breakers
- Instrument for analyzing the fault loop and the presumed short-circuit current
- Digital current probe for measuring rated and stray currents
- 1 digital autoranging multimeter

POWER SUPPLY:

230 V /PE 50-60 Hz
Max. absorption: 3 kVA

THEORETICAL-EXPERIMENTAL HANDBOOKS

Application handbook with exercises.

23-C

23-C

LABORATORY OF ELECTRIC MACHINES

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INTRODUCTION TO ELECTRIC MACHINES

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SET OF MODULAR ELECTRIC MACHINES

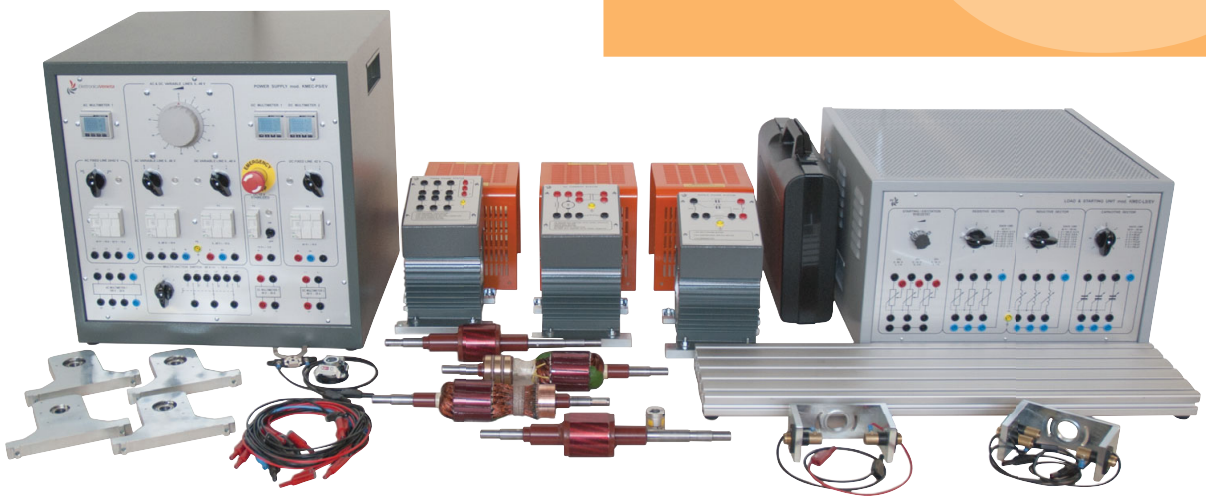
Mod. KMEC-1/EV

INTRODUCTION

This set of modular machines is proposed as "first approach" in a Laboratory of Electric Machines; it has been designed to assembly and test a large number of electrical machine (motors and generators) using few base components. In fact, with this set it is possible to study:

- the components of each type of machine,
- the mechanical assembly of these components,
- the electric connections of these components,
- the power supply of the various windings; and
- applying the measurement instruments to detect the most important parameters;

Further experiments can be developed by using real electrical machines of industrial type, with the relative instrumentation (such as our machines of "COMPACT" and "POWER" lines by Elettronica Veneta), and using the our computer-aided measurement systems such as system mod. CEM-U/EV.



TRAINING PROGRAM

This set enables to expound the following training program on the machines of the table included in this leaflet:

- Measurement of the resistance of windings and correction for temperature
- Mechanical assembly of the various machines of the list with the proper care for alignments and the respect of the air gap
- Electrical connections of the machines of the list. In detail, as regards DC machines, the connections with separate, shunt, series, additive compound and subtractive compound excitation will be examined
- Influence of the position of brushes on DC motors
- For all the motors, when the brake is provided, detection of electromechanical characteristics: Torque, RPM and efficiency of motors
- Detection and measurement of the characteristics of DC generators and calculation of the output power
- The same for the three-phase alternators, with R-L-C load. Measurement of power factor. The "Prime Mover" unit is recommended to drive the generators

COMPONENTS OF THE SET (see summary table)

The components of this set are "multi-purpose" (that is, a component is valid for different machines). This set includes:

- **1 Universal power supply unit** with instrument for electrical parameters, mod. KMEC-PS/EV
- **1 Universal Load / starter** mod. KMEC-LS/EV
- **1 Universal base with protections**, mod. KMEC/EV
- A **set of cables** of different lengths and colours, with safety terminals of 4 mm
- **Set of components** used to assemble the following machines:
  - **Three-phase squirrel-cage motor:** consisting of Stator and Rotor
  - **Three-phase wound-rotor motor:** consisting of Stator, Rotor and of slip ring holder
  - **Three-phase synchronous motor:** consisting of Stator, Rotor and of slip ring holder
  - **Three-phase Dahlander motor:** consisting of Stator and Rotor
  - **Three-phase reluctance motor:** consisting of Stator and specific Rotor
  - **Single-phase split-phase motor:** consisting of Stator and Rotor
  - **Single-phase motor with centrifugal circuit breaker:** consisting of Stator, Rotor and of circuit breaker holder
  - **DC motors** (separate, shunt, series and compound excitation): consisting of Stator, Rotor and of brush holder
  - **Universal motor:** consisting of Stator, Rotor and of brush holder
  - **Repulsion motor:** consisting of Stator and Rotor
  - **Three-phase generator (alternator):** consisting of Stator, Rotor and of slip ring holder.
  - **DC generator (dynamo):** consisting of Stator, Rotor and of brush holder.
  - **Single-phase generator:** consisting of Stator and Rotor.

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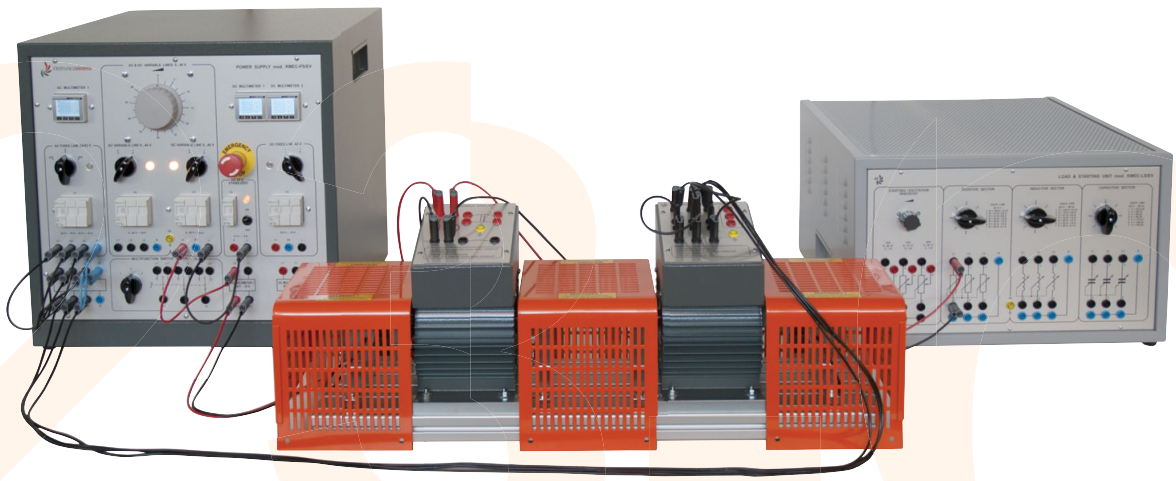


TECHNICAL SPECIFICATIONS:

POWER SUPPLY UNIT WITH DIGITAL INSTRUMENTS MOD. KMEC-PS/EV

This unit is universal for all the KMEC machines and it can output all the necessary AC and DC voltages. Moreover it is provided with the necessary electric instruments for the measurements of the parameters of the machines: a multifunction instrument for AC (V, I, W, VAr, VA, Frequency, Power Factor, THD% etc..., per phase, and equivalent for the three phases) – 20 A max., and 2 instruments for DC (V, I, W) – 20 A max. Output voltages:
- 0-48 VAC/10 A
- 0-48 VDC/10 A
- 24/42 VAC - 16/10 A
- 21-0-21 VDC/10 A

Protections with TMCB + overall ELCB and fuses on the very low voltage outputs, Safety terminals of 4 mm; with 3 single-phase universal sockets of 230 V – 10/16 A and a 3ph universal socket of 3x400 V/N/PE - 16 A

Supply voltage: 3 x 400 V-50/60 Hz

LOAD / STARTER MOD. KMEC-LS/EV

This unit is the variable R-L-C load for the generators. This separate unit enables the step variation of the load. Capacitors for single-phase motors are included.
It also includes a three-phase rheostat for starting DC motors, the wound-rotor motor and for the start with stator resistance.
Resistive load: 7 steps with max. 260 W (possibility of star, delta and AC/DC single-phase connections)
Inductive load: 7 steps with max. 260 VA at 50 Hz (possibility of star, delta and single-phase connections)
Capacitive load: 7 steps with max. 260 VA at 50 Hz (possibility of star, delta and single-phase connections). 22-45-68-90-113-136-160 µF (per phase) can be applied to single-phase motors, with possibility of doubling and tripling these values by the parallel connection of 2 or 3 phases.
Starting rheostat: three-phase rheostat 0...30 Ω / 3...1 A per phase.

BASE WITH PROTECTIONS MOD. KMEC/EV

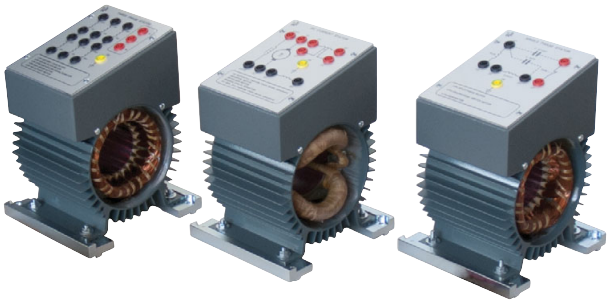
Over this base, common to all set, it is possible to place up to two machines with the related mechanical protections. This base of anodized aluminium is provided with slides to simplify the assembly of the components, the coupling between the machines and the application of the protections for the couplings.
Dimensions: 800 x 200 x 320 (h) mm

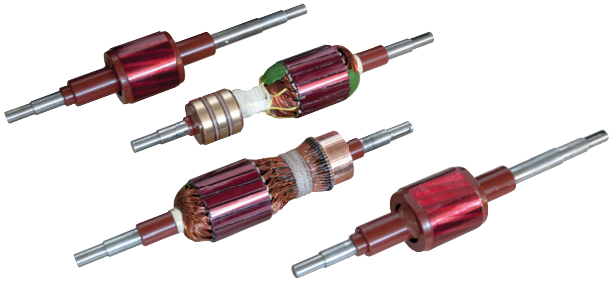
SET OF COMPONENTS including (refer to the table):
Stators: three-phase, DC, single-phase
Rotors: cage, wound, DC, reluctance
Holders:
- 2 pairs of holders for rotors with pads
- Brush holder for slip ring rotor
- Brush holder for DC rotor with adjustable neutral plane
- Centrifugal circuit breaker

Average power of the machines: 200 W.
Voltages of the machines: 42 Vdc, or 42 Vac
RPM: 3000, rated value for DC machines. AC machines have 2 and 4 poles.

ACCESSORIES INCLUDED IN THE SET:

This set includes the connecting cables (of different lengths and colours: red, black, blue and yellow) with safety terminals of 4 mm.





OPTIONAL ACCESSORIES

PRIME MOVER Mod. KMEC-PM/EV (suggested for generators)
This unit drives the generators of the list, supplying a constant speed, variable continuously from 0 to 3600 RPM. This separate unit consists of a three-phase squirrel-cage motor powered by a microprocessor inverter with vector control mode to keep its speed constant with any load. The motor can be easily and quickly coupled to the generators.
Inverter: 750 VA - 230 Vac
Three-phase squirrel-cage motor: 500 W - 2 poles
Power supply: 230 V - 50 Hz - 1000 W

BRAKE Mod. KMEC-B/EV (suggested for motors)
This unit is a variable mechanical load for the motors. This separate unit includes an **eddy current brake**, its power supply unit and the instruments and accessories (RPM and force probes) for measuring the Torque and RPM. Starting from these data the unit can calculates the actual mechanical power output by the motor.
Torque max: 1.5 Nm @ 3600 RPM
Power supply: 230 V - 50 Hz - 700 W

CUSTOMIZED CONFIGURATIONS

Upon customer request we can also supply single machines. **In this case, the Power Supply Unit and the Support + Protections must always be included.**

THEORETICAL–EXPERIMENTAL HANDBOOKS

Handbook including the theory of the KMEC machines, instructions for their assembly, coupling and the electrical connections, as well as a series of exercises for each machine.

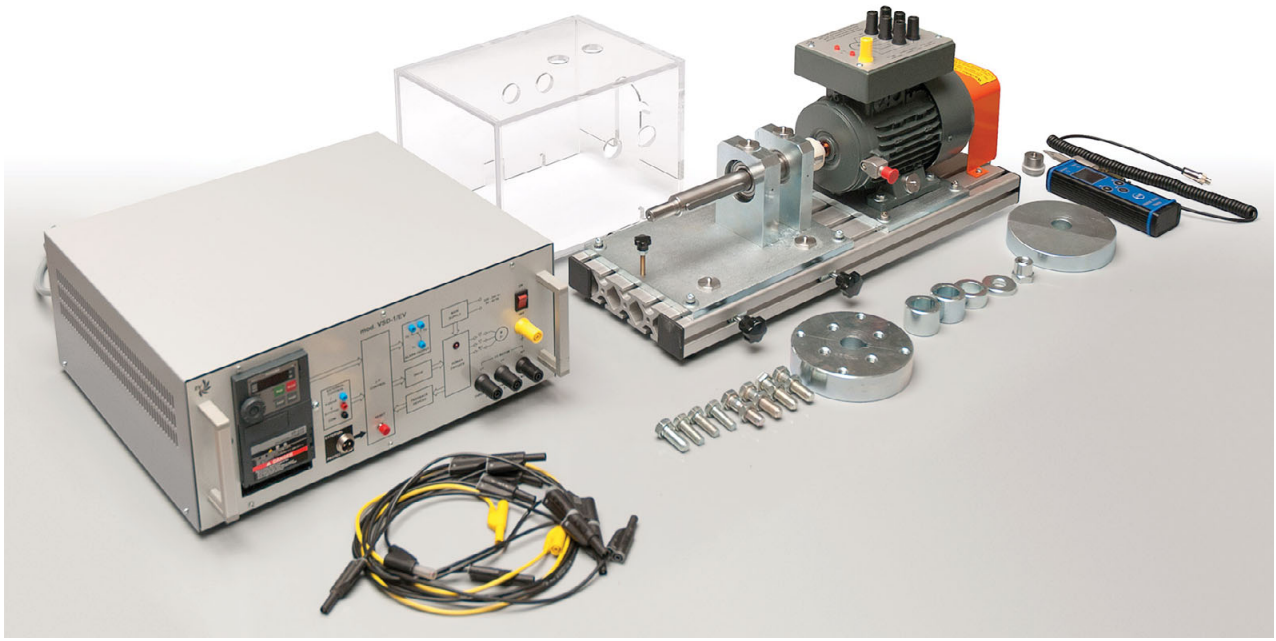
KMEC-1/EV MACHINES - SUMMARY TABLE

MACHINE	STATORS			ROTORS				HOLDERS			RLC LOAD KMEC-LS	OPTIONAL	
	THREE-PHASE	DC	SINGLE-PHASE	CAGE	WOUND	DC	RELUCT	RING	BRUSH.	C.SWIT		PRIME MOVER KMEC-PM	BRAKE KMEC-B
SQUIRREL-CAGE MOTOR	X			X									X
WOUND ROTOR MOTOR	X				X			X					X
SYNCHRONOUS MOTOR	X				X			X					X
DAHLANDER MOTOR	X			X									X
RELUCTANCE MOTOR	X						X						
SPLIT-PHASE MOTOR			X	X							C		X
CENTRIFUGAL SWITCH MOTOR			X	X						X	C		X
DC MOTORS (all)		X				X			X				X
UNIVERSAL MOTOR		X				X			X				
REPULSION MOTOR		X				X			X				
TRADITIONAL 3-PHASE GENERATOR	X				X			X			X	X	
INVERSE 3-PHASE GENERATOR (1)		X			X			X			X	X	
DC GENERATORS (all)		X				X			X		X	X	
SINGLE-PHASE GENERATOR			X		X						X	X	

(1): Stator-excited alternator C: includes capacitors for single-phase motors

TRAINER FOR THE STUDY OF MECHANICAL VIBRATIONS

Mod. VBR-01/EV



INTRODUCTION

Vibration diagnosis is a technique for checking the condition of rotating machines (e.g. mechanical).
By performing this procedure regularly, you will be informed in advance about potential failures before the machine reaches the breakdown condition (that is, before having to apply corrective maintenance).
This is of a great advantage for large motors and generators, avoiding expensive overhauls. It is also very important for those critical machines (sometimes even low power machines) that can stop a complex and costly industrial process.
The periodical measurement, recording the values and evaluating the collected data performs one of the most important functions of PREVENTIVE MAINTENANCE.
Briefly, with the information supplied by this technique, you decide the optimum moment to stop the machine for repairs; you control the situation, instead of being "controlled" by the machine condition.

Vibration diagnostic measurements means:

- Diagnosis of bearings condition and their lubrication,
- Diagnosis of mechanical faults (axes misalignment, unbalance of rotating masses, detection of machine looseness and the dangerous mechanical resonances).

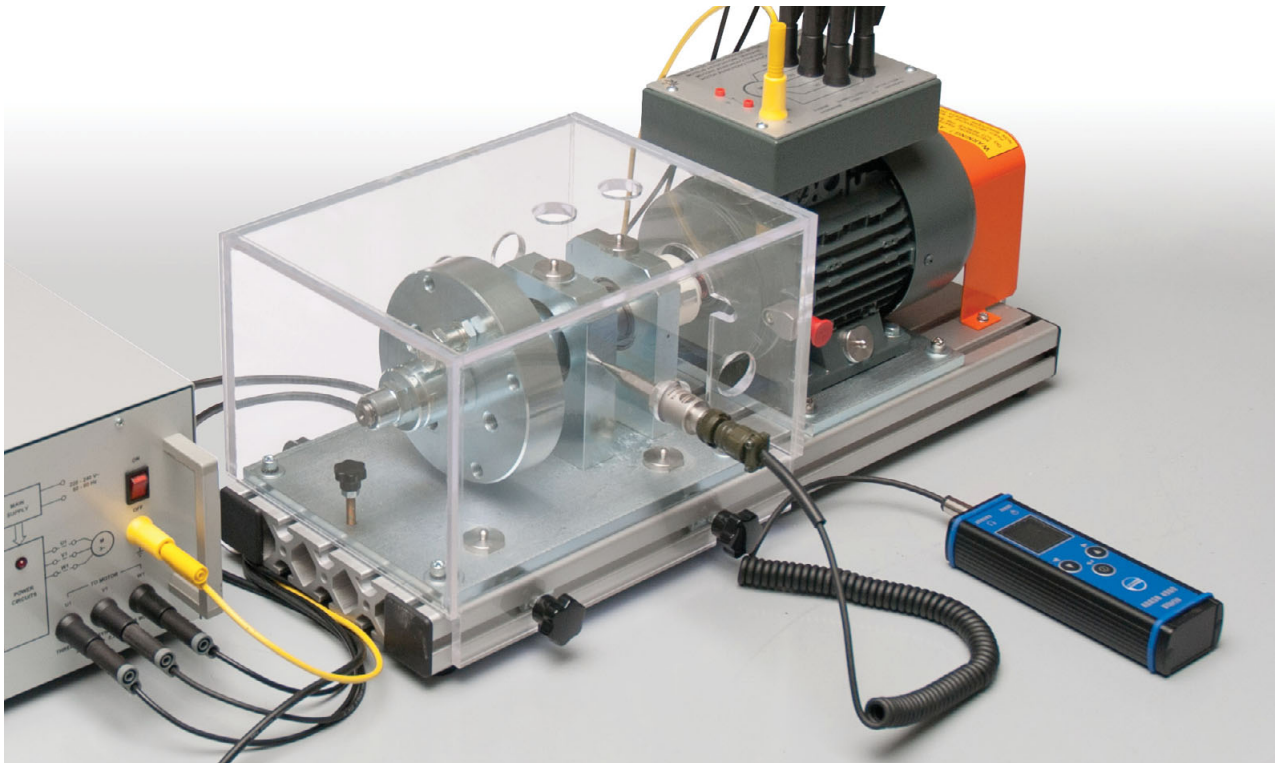
This technique can be applied in:

- The machine manufacturing stage, to check the design,
- Factories, at the production stage, to improve the performance of the rotating parts.
- Maintenance, to keep machines under control
- Workshops, to control the repaired rotating parts.

COMPOSITION:

The proposed system is composed by:

- A **Machines Set**, including:
  - A 3-ph asynchronous motor
  - An electronic drive for the motor, to vary the motor speed, and therefore, to examine the effect of this parameter over the vibration analysis.
  - A set of mechanical loads, modified to simulate the "failures" to be measured with the Vibration Measurement Instrument.
  - A support base for the motor and the mechanical load. The base has been designed to insert some "failures" to be measured with the Vibration Measurement Instrument.
  - The motor, the mechanical load, and the base includes the measuring points; these points are ready to apply the vibration sensor.
- A **Vibration Measurement Instrument.**



TRAINING PROGRAM:

- The importance of vibration measurement.
- Study of the factors that can cause vibration of the rotating parts.
- The vibration measuring parameters used in industry: overall RMS and PEAK velocity, overall RMS and PEAK acceleration, overall RMS and PEAK displacement, bearings fault detection, acceleration enveloping measurement.
- Influence of the RPM on the measured parameters.
- Selecting the optimum machine points for the vibrations checks.
- Preparing the surface of the measuring points. Precautions to be taken.
- The vibration measurement instrument: input sensors, outputs, measured parameters.
- Classical industrial measures on rotating machines related with mechanical vibrations: unbalanced masses, axis misalignment, machine looseness.
- Evaluation of the collected data and further actions to be taken.

TECHNICAL SPECIFICATIONS:

The MACHINES SET includes:

- 3-ph asynchronous motor with drive, with the following technical characteristics:
  - Motor: 3-phase squirrel-cage asynchronous motor; 3x230 V; synchronous speed: 3000 RPM (2 poles machine), power: 0.5 kW. Double end shaft, with orange safety cover in the back end.
  - Drive: microprocessor-controlled, bi-directional speed, for max. 0.75 kW 3-ph squirrel cage motor. Speed set-point through potentiometer. Digital display (7 segments, 4 figures) with programmable parameters. Power supply: 230 V single-phase. Max. power: 1.8 kVA. Freq. Limits: 0.5 to 400 Hz, with settable freq. limits. Power section: 3-phase inverter with 6 * IGBT transistors; sinusoidal PWM modulation. Control modes: V/f constant, variable torque, vectorial control, Programmable acceleration / deceleration ramp times (0 to 3600 sec).. Protections: over/under current, over temperature, short-circuit. Including the braking resistance and the respective clamping circuit. The drive has a safety control connected to the limit switch in the load support base.
- Set of Mechanical Loads, with the following technical characteristics:
  - One inertia heavy disk, to be coupled to the motor above. This disk has two concentric set of holes to screw bolts at different positions and angles to simulate low unbalances on a rotating mass.
  - One inertia heavy disk partially bevelled to simulate a heavy unbalanced load.
  - Support base, with the shaft to couple the heavy disks. The shaft is coupled to the motor. The base is ready to insert different "axes misalignments" between the motor and the mechanical Load.
  - Transparent, heavy plastic cover, with the holes to insert the instrument sensor. The safety limit switch placed in the base makes mandatory the use of this cover to run the motor drive.
  - The base includes the little metal pads to apply the instrument sensor.

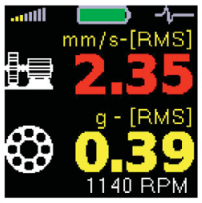
The VIBRATION MEASUREMENT INSTRUMENT:

- Instrument following ISO 10816 standard.
- It is a lightweight, manual portable instrument, designed to be a standard for plant engineers and maintenance staff.
- Despite being a powerful instrument, it is of easy use, a great advantage for educational purposes, mainly when dealing with beginners.
- The instrument automatically performs multiple measurements: determining the bearings condition, including insufficient lubrication; finding and measuring the level of rotating unbalanced masses, machine looseness and axis misalignment;
- **Measuring ranges:**

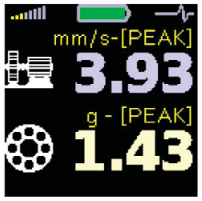
DETECTION	UNIT	FREQUENCY RANGE	DISPLAY
RMS	mm/s, ips	10-1000 Hz	0-999
PEAK	mm/s, ips	10-1000 Hz	0-999
RMS	g	500-16000 Hz	0-999
RMS	g	1500-16000 Hz	0-999
RMS	g	5000-16000 Hz	0-999
RMS	um, mil	2-200 Hz	0-999
PEAK u	m, mil	2-200Hz	0-999
Time Signal	g	500-16000 Hz	0-999
Spectrum (200 lines)	mm/s, ips	4-200Hz	0-999
Temperature	°C, °F		0-380°C (32-716°F)

- Display: color OLED display 128 x 128 pixels, diagonal 1.5" (38mm)
- Sensor: 1x external piezoelectric accelerometer; input: 60g PEAK with standard 100mV/g sensor
- Further functions: LED stroboscope (0.17 Hz – 300 Hz, equivalent to 10 RPM – 18000 RPM), LED torch
- Audible output: 1x AC signal 8 Ω / 0,5 W for external headphones.
- Power: 2 x AA 1.5V batteries (alkaline, NiMH, LiFe)
- Temp: Operating: -5 to 50, Storage: -20 to 65 (Degrees Celsius)
- Dimensions: 150 x 60 x 35 mm; Weight: 350 g including batteries (without cable, sensor and magnet). 540 g including batteries, cable, sensor and magnet
- Uses metric and English units.
- Only three keys for programming all the functions.

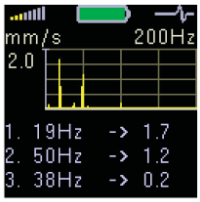
Some displays of the instrument



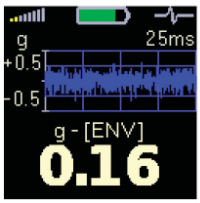
Overall RMS values



Overall PEAK values



Spectrum 200 Hz



Time signal for roller bearing diagnosis

SUPPLIED ACCESSORIES:

- For the machine set:
  - Set of 10 cables (different colors and lengths) with 4 mm safety connectors.
- For the instrument:
  - vibration sensor with coiled cable,
  - magnetic base,
  - earphones,
  - recording cable with 3.5 mm jacks,
  - measuring tip for manual pressure on the sensor,
  - 1.5V alkaline batteries, transport case, CD with the manual

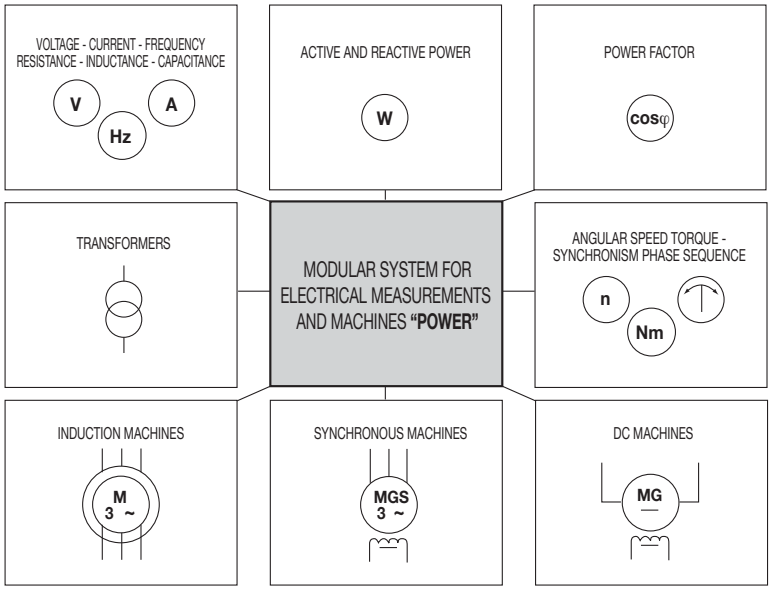
THEORETICAL-EXPERIMENTAL HANDBOOKS

Application handbook with exercises.

MODULAR SYSTEM FOR ELECTRIC MEASUREMENTS AND MACHINES - "POWER" LINE

"POWER" ELECTRIC MACHINES

MODULAR SYSTEM FOR ELECTRIC MEASUREMENTS AND MACHINES "POWER" LINE



INTRODUCTION

This system has been designed to supply students with the possibility of assembling a wide range of circuits for the measurement of general electric quantities and of the characteristics of electric static and rotating machines with power of 1 kW.
The modular characteristics of this system ensures the highest flexibility. Different solutions are available for: electric power supply, park of electric machines, measurement instruments, accessories. Here is an example of configuration: Bench mod. 2390/EV or bench mod. 2385/EV, set of electric machines mod. „P" and starting/excitation rheostats, instruments for electric measurements and measurements on machines, variable loads RL-IL-CL-2/EV.

The training program covers the following topics:

- Measurements of voltage, current and frequency
- Measurements of resistance, inductance, capacitance
- Measurements of active and reactive power and of power factor
- Measurements of torque and angular velocity
- Detecting no-load, load and short-circuit characteristics of direct-current, synchronous, asynchronous and special machines
- Detecting no-load, load and short-circuit characteristics of transformers

TRAINING PROGRAM:
GENERAL ELECTRIC MEASUREMENTS

- Preliminary exercises for adjusting rheostats in series and in parallel: reading exercises on voltmeter and on ammeter
- Measurement of resistances: voltmeter-ammeter method, voltmeter method
- Measurements of power: measurement of DC power, measurement of single-phase power and determination of power factor
- Measurement of frequency
- Measurements of capacitance and of inductance by voltmeter-ammeter method
- Determination of phase sequence: phase sequence indicator with lamps
- Measurement of three-phase active power: Aron measuring circuit and determination of phase sequence - determination of reactive power by Aron measuring circuit, measurement of three-phase power in 4-wire systems (with symmetrical voltages)
- Measurement of power factor: determination of power factor in single-phase circuits, determination of power factor in symmetrical and balanced or unbalanced three-phase circuits, measurements of power factor by single-phase or three-phase cosphimeter

MEASUREMENTS ON ELECTRIC MACHINES:

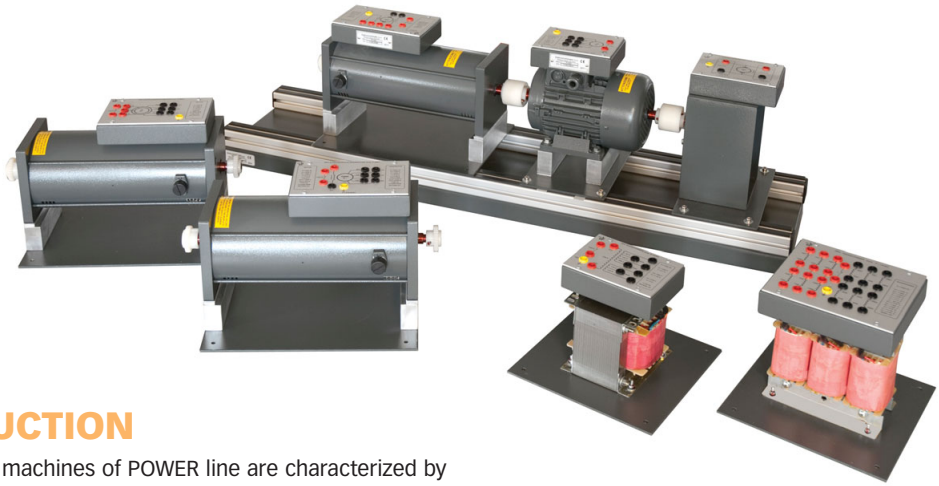
- **Tests on synchronous machines**
  - measurement of resistance in stator and rotor windings
  - no-load test, short-circuit test
  - determination of a point of no-load characteristic
  - determination of load characteristic by various methods
  - determination of efficiency by direct – indirect method
  - control of waveforms and distorsions
  - parallel with mains and plotting „V"-shaped curves
- **Tests on DC machines**
  - determination of resistance in windings
  - magnetization characteristic with separate excitation
  - external characteristic for shunt, separate and compound excitation
  - control characteristics for shunt, separate and compound excitation
  - determination of mechanical and iron losses of DC generator operating as motor
  - determination of efficiency of DC generator by direct method
- **Tests on DC dynamometer**
  DC dynamometer is an efficient device for measuring the mechanical power of the motors coupled to it.
  However all the typical tests of direct-current machines can be carried out on DC dynamometer
- **Tests on asynchronous slip-ring motors**
  - measurement of resistance in stator and rotor windings
  - no-load test, short-circuit test
  - circular diagram and motor operation characteristic
  - direct detection of the main characteristics by DC dynamometer
- **Tests on asynchronous cage motors**
  - measurement of resistance in stator windings
  - no-load test, short-circuit test
  - circular diagram and motor operation characteristic
  - direct detection of the main characteristics by DC dynamometer
- **Tests on single-phase and three-phase transformers:**
  - measurement of resistance in primary and secondary windings
  - measurement of no-load transformation ratio
  - no-load test, short-circuit test, load test

- R.p.m. control of a three-phase asynchronous motor by drive

- R.p.m. control of a DC motor by drive

- Operation and r.p.m. control of a brushless motor by drive

"POWER" ELECTRIC MACHINES



INTRODUCTION

Electric rotating machines of POWER line are characterized by the same height and by the same diameter of shaft sticking out of both ends.
Shafts are provided with joint for the coupling of a machine to any other machine of the same series without any mechanical tool. The feet of the machine of standardized measure enable to assemble the group of machines having to be tested, on the proper base.

These machines of solid industrial construction also include a panel with silk-screen-printed schematic diagram showing the wiring diagram and the names of windings on standardized safety terminals. The rating plate is printed directly on the schematic diagram, for immediate reference.

BASE FOR SUPPORTING AND COUPLING "POWER" ELECTRIC MACHINES Mod. BP/EV

This base is common for all the rotating machines of POWER line and it enables to couple the machines to each other and fastens them very quickly.
This base is also provided with safety covers that can be applied over the coupling joints to prevent any access to moving parts. Another accessory of this base locks the shaft of the machine for the tests with locked rotor (short-circuit).

Dimensions: 1200 x 260 x 80 mm

DIRECT-CURRENT MOTOR /GENERATOR WITH SEPARATE/ COMPOUND EXCITATION Mod. P-1/EV

- Power: 1000 W
- Armature voltage: 220 Vdc
- Excitation voltage: 220 Vdc
- R.p.m.: 3000 (*)
- It also operates as DC motor
- Form of construction: IM B3
- Protection: IP 22
- This unit also includes thermal protector
- Dimensions: 500 x 200 x 300 mm
- Weight: 48 kg

(*) other RPM values are available on demand

DIRECT-CURRENT MOTOR / GENERATOR WITH SEPARATE / COMPOUND / SERIES EXCITATION Mod. P-2/EV

- Power: 1000 W
- Armature voltage: 220 Vdc
- Separate excitation voltage 220 Vdc
- R.p.m.: 3000 (*)
- It also operates as DC motor
- Form of construction: IM B3
- Protection: IP 22
- This unit also includes thermal protector
- Dimensions: 500 x 200 x 300 mm
- Weight: 50 kg

(*) other RPM values are available on demand

THREE-PHASE ASYNCHRONOUS CAGE MOTOR Mod. P-4/EV

- Power: 1000 W
- Voltage: 230/400 V 50 Hz (*)
- R.p.m.: 2900 (*) (2 poles)
- Delta-star connection
- Form of construction: IM B3
- Protection: IP 44
- This unit also includes thermal protector
- Dimensions: 400 x 200 x 300 mm
- Weight: 22 kg

(*) other values of voltage, frequency and r.p.m. are available on demand

THREE-PHASE ASYNCHRONOUS TWO-POLE (DAHLANDER) CAGE MOTOR Mod. P-6/EV

- Power: 1000/700 W
- Voltage: 400 V 50 Hz (*)
- R.p.m.: 2850/1400 (*) (2/4 poles)
- Form of construction: IM B3
- Protection: IP 44
- This unit also includes thermal protector
- Dimensions: 400 x 200 x 300 mm
- Weight: 22 kg

(*) other values of voltage, frequency and r.p.m. are available on demand

THREE-PHASE SYNCHRONOUS MOTOR / GENERATOR WITH ASYNCHRONOUS STARTING Mod. P-3/EV

- Power: 1000 VA
- Voltage: 230/400 V 50 Hz (*)
- R.p.m.: 3000 (*) (2 poles)
- Excitation voltage: 220 Vdc
- It also runs as synchronous motor with induction starting
- Delta-star connection
- Form of construction: IM B3
- Protection: IP 22
- This unit also includes thermal protector
- Dimensions: 450 x 200 x 300 mm
- Weight: 40 kg

(*) other values of voltage, frequency and r.p.m. are available on demand

THREE-PHASE ASYNCHRONOUS WOUND-ROTOR MOTOR Mod. P-5/EV

- Power: 1000 W
- Voltage: 230/400 V 50 Hz (*)
- R.p.m.: 2850 (*) (2 poles)
- Rotor voltage 400 V
- Delta-star connection
- Form of construction: IM B3
- Protection: IP 22
- This unit also includes thermal protector
- Dimensions: 500 x 200 x 300 mm
- Weight: 32 kg

(*) other values of voltage, frequency and r.p.m. are available on demand

THREE-PHASE ASYNCHRONOUS TWO-POLE TWO-WINDING CAGE MOTOR Mod. P-7/EV

- Power: 1000/500 W
- Voltage: 400 V 50 Hz (*)
- R.p.m.: 2850/900 (*) (2/6 poles)
- Form of construction: IM B3
- Protection: IP 44
- This unit also includes thermal protector
- Dimensions: 400 x 200 x 300 mm
- Weight: 22 kg

(*) other values of voltage, frequency and r.p.m. are available on demand

SINGLE-PHASE ASYNCHRONOUS MOTOR WITH STARTING CAPACITOR Mod. P-8/EV

- Power: 1000 W
- Voltage: 230 V 50 Hz (*)
- R.p.m.: 2800 (*) (2 poles)
- Form of construction: IM B3
- Protection: IP 44
- This unit also includes thermal protector
- Dimensions: 400 x 200 x 300 mm
- Weight: 2 kg

(*) other values of voltage, frequency and r.p.m. are available on demand

ELECTRODYNAMOMETER – DC DYNAMOMETER Mod. P-12/EV

Besides being a typical DC motor/generator, this machine also includes some devices making it particularly suitable to carry out the function of electrodynamometer for measuring the torque output by the motors coupled to it.

- Power: 1000 W
- Armature voltage: 220 Vdc
- Excitation voltage: 220 Vdc
- R.p.m.: 3000 (*)
- Braking torque: 4 - 0 – 4 Nm
- It also runs as DC motor
- Mechanical device of torque measurement
- Form of construction: IM B3
- Protection: IP 22
- This unit also includes thermal protector
- It is also prearranged to be connected with digital torque meter mod. UM-G1/EV
- Dimensions: 550 x 200 x 300 mm
- Weight: 55 kg

(*) other RPM values are available on demand

THREE-PHASE TRANSFORMER Mod. P-14/EV

- Power: 1000 VA
- Voltage of primary winding: 230/400/346V 50 Hz (*)
- Delta/star/zigzag connection
- Voltage of secondary winding: 230/400/346V (*)
- Delta/star/zigzag connection
- Protection: IP 22
- This unit also includes thermal protector
- Dimensions: 360 x 200 x 300 mm
- Weight: 27 kg

(*) other values of supply voltage and frequency are available on demand

TACHOGENERATOR Mod. P-16/EV

This tachogenerator is used to measure the speed of rotation of "P" electric machines. The output signal can be converted into r.p.m. by tachometer voltmeter mod. AZ-73. It is used for DC motor drive mod. CV-2/EV in closed-loop configuration.

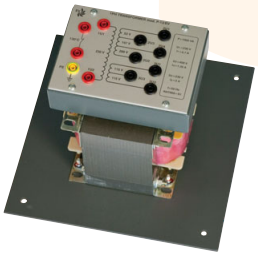
- Output voltage: 0,06 V per revolution
- R.p.m.: 5000 max.
- Output voltage 1 300 Vdc at 5000 r.p.m.
- Output voltage 2 10 Vdc at 5000 r.p.m.
- Protection: IP 44
- Dimensions: 260 x 260 x 300 mm
- Weight: 10 kg

SINGLE-PHASE ASYNCHRONOUS MOTOR WITH STARTING CAPACITOR AND CENTRIFUGAL CIRCUIT BREAKER Mod. P-9/EV

- Power: 1000 W
- Voltage: 230 V 50 Hz (*)
- R.p.m.: 2800 (*) (2 poles)
- Form of construction: IM B3
- Protection: IP 44
- This unit also includes thermal protector
- Dimensions: 400 x 200 x 300 mm
- Weight: 22 kg

(*) other values of voltage, frequency and r.p.m. are available on demand

SINGLE-PHASE TRANSFORMER Mod. P-13/EV



- Power: 1000 VA
- Voltage of primary winding: 230 V 50 Hz (*)
- Voltage of secondary winding 1: 0-53-200-400V (*)
- Voltage of secondary winding 2: 0-115-230 V
- Protection: IP 22
- This unit also includes thermal protector
- Dimensions: 360 x 200 x 300 mm
- Weight: 21 kg

(*) other values of supply voltage and frequency are available on demand

EDDY CURRENT BRAKE Mod. P-15/EV

- Braking power: 1000 W
- Supply voltage: 0-220 Vdc
- R.p.m.: 3000 - 1500
- Braking torque: 4-0-4 Nm - 8-0-8 Nm
- Bidirectional operation
- Mechanical device of torque measurement
- Cooling by fan
- Auxiliary power supply: 230 V 50-60 Hz
- Protection: IP 22
- This unit also includes thermal protector
- It is also prearranged to be connected with digital torque meter mod. UM-G1/EV
- Dimensions: 400 x 250 x 300 mm
- Weight: 45 kg

THEORETICAL-EXPERIMENTAL HANDBOOKS

Application handbook with exercises.

MAGNETIC POWDER BRAKE & ELECTRONIC CONTROL

Mod. AFC-2D/EV

INTRODUCTION

This brake enables the measure of the mechanical and electrical characteristics of electrical motors and allows plotting the Torque = f (RPM) curve and calculating the real Pmec(W) developed by the motor.
The unit includes a built-in an electrical programmable instrument (see the Technical Features for the details) that calculates (and displays) the supplied electrical power Pel (W). With Pmec and Pel, the AFC-2D/EV supplies automatically the Efficiency. All these parameters are calculated at any measure.
The unit is suitable in experimental program as an **alternative to the Electrodynamometer mod. P-12/EV or to the Eddy Currents Brake mod. P-15/EV.**
The system is composed by two units:
- The Magnetic Powder Brake (to be coupled to the motor under test).
- The Electronic Control Board, that supplies the power and the control commands to the brake, and processes the brake input/output signals.

TECHNICAL SPECIFICATIONS:

MAGNETIC POWDER BRAKE

- Braking torque range: up to 30 Nm. With max torque limiter.
- Speed range: up to 6000 RPM. With min speed limiter.
- Power range: from 0,75 to 1.5 KW
- Integrated thermal protector and fan
- Includes the RPM probe and the bidirectional Torque probe.
- The unit is ready to be directly coupled to the "POWER" motors line (1 kW), over the same support base mod. BP/EV (not included).

Dimensions: 400 x 260 x 300 mm
Weight: 30 kg

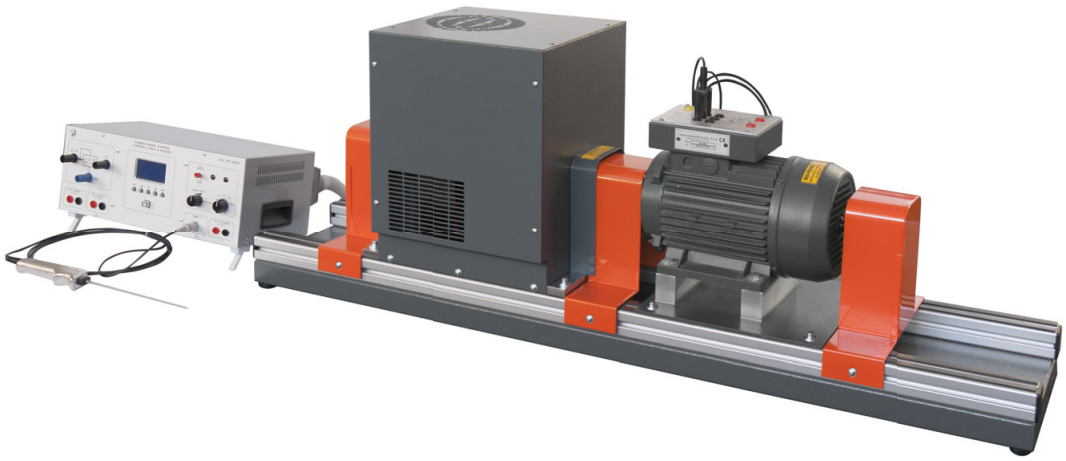
ELECTRONIC CONTROL BOARD

- Supplies the power to the Brake unit and processes the signals of the RPM, Torque and Temperature probes.
- Braking Modes: EXTERNAL, MANUAL, AUTO (with 4 selectable braking curves):
  a) Constant Torque vs. RPM. It is the MANUAL mode, with T = k1 , being k1: a constant that can be set at different values. This curve is typical of elevators and cranes, conveyor belts etc.
  b) Linear Torque vs. RPM (T = k2 * n (RPM), being k2: a constant that can be set at different values). This curve is typical of calenders, used in textile , paper and metallurgy industries.
  c) Quadratic Torque vs. RPM (T = k3 * n^2 (RPM), being k3: a constant that can be set at different values). This curve is typical of centrifugal pumps, centrifugal fans etc.
  d) Inverse Torque vs. RPM (T = k4 / n (RPM), being k4: a constant that can be set at different values). This curve is typical of lathes, cutting machines, reel-type machines etc.
- The braking time is settable, to define constants k2, k3 and k4.
- For each braking mode, it is possible to set the UNDER SPEED and OVER TORQUE limiters for safe tests. One 3-states LED for signaling: READY, RUN and OVERTEMPERATURE.
- The unit supplies 2 * 0-10 VDC analog outputs (both programmable among any internal measured or calculated parameter): for example, one can be proportional to RPM and the second proportional to Torque. These signals can be used as inputs for other instruments (our CEM-U/EV Computerized Measurement Unit, or any already existing instrument).
- Possibility of external control with a 0-10 V D.C signal.

- On-board programmable multifunction instrument. It can be selected for:
  a) AC (single-ph or 3-ph balanced): measures V, I, W, VAr, VA, frequency and Power Factor.
  b) DC: measures V, I W
- Backlit digital display and keyboard for programming the instrument and to show the set / measured / calculated parameters, such as: Torque (Nm), RPM, Pmec (W), Pel (W), Efficiency etc.

Dimensions: 400 x 160 x 250 mm
Weight: 7 kg

EXAMPLE OF CONNECTION BETWEEN BRAKE AND MOTOR, WITH SUPPORT BASE mod. BP/EV (motor and base not included)



POWER SUPPLY:
230 V / PE - 50-60 Hz

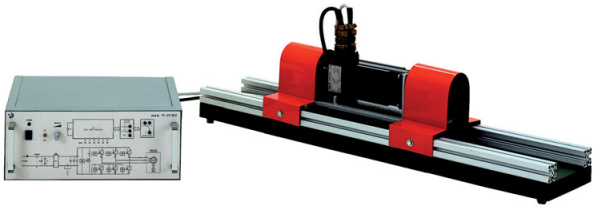
THEORETICAL-EXPERIMENTAL HANDBOOKS
Technical handbook.

BRUSHLESS MOTOR PROVIDED WITH SERVO DRIVE

Mod. P-17/EV

INTRODUCTION

Brushless motors are synchronous machines whose rotor consists of a permanent magnet; then they have not any brushes. Mechanical and electrical characteristics of these motors are higher than those of traditional direct-current and alternating-current motors. Brushless motors are normally used in applications with power of some kW for heat pumps, fans and compressors. They are managed by specific drives.



This system mainly consists of:

- a bidirectional industrial drive for AC brushless motor
- an AC brushless motor whose form of construction is compatible with the machines of POWER line.

TECHNICAL SPECIFICATIONS:

The drive is available in a tabletop metallic box with controls and signalling indicators on the fore panel of schematic diagram.
The motor includes a position transducer of resolver type. The drive is connected with the motor via a cable equipped with connectors.

- Rated power: 1000 W
- RPM control range: ± 2000 r.p.m.
- IGBT power stage
- Resolver feedback
- Control: bidirectional, 4 quadrants with double RPM-current loop

Dimensions of drive: 400 x 400 x 240 mm
Net weight of drive: 17 kg

Dimensions of motor: 400 x 260 x 300 mm
Net weight of drive: 25 kg

POWER SUPPLY:
Three-phase 400 V / PE 50-60 Hz
Max. absorption.: 2 kVA

THEORETICAL-EXPERIMENTAL HANDBOOKS
Application handbook.

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

BENCH FOR TESTING ELECTRIC MEASUREMENTS AND MACHINES

Mod. 2390/EV

INTRODUCTION

This equipment is designed for the operation and control of various types of electric machines and for the distribution and control of the necessary supply voltages for the testing of electric measurements.

This bench is divided into two main sections:

- a desk with universal power supply
- a distribution board

The desk outputs the necessary supply voltages for all the tests of the programme; whereas the distribution board enables a quick connection of measurement instruments required by the tests.

This equipment is also provided with safety devices against malfunctions and accidental electric contacts.

TRAINING PROGRAM:

- Measurements of DC and AC voltage or current
- Measurements of resistance
- Measurements of DC and single-phase power
- Measurements of frequency, capacitance and inductance
- Measurements of active and reactive three-phase power
- Measurements of power factor
- Measurements on DC machines
- Measurements on synchronous machines
- Measurements on asynchronous machines
- Measurements on transformers

TECHNICAL SPECIFICATIONS:

This bench is made of press-formed sheet steel and sections, chemically treated and painted with several coats of epoxy varnish. The working top is of chipboard coated with bonded laminate. Two drawers with flush-mounted handles and key locks are fixed under the working top. The desks available on the fore part of the bench can be opened from the rear side for inspection and service. The described electric components are included in the desks. The control, protection and testing devices are mounted on the silk-screen-printed fore plate of aluminium alloy.

23C-E-MS-2390-0

ELECTRICAL CHARACTERISTICS:

- **Main control device of electro-magnetic type,** with key switch, high-sensitivity magneto-thermal differential circuit breaker and stop/emergency pushbutton
- **Service line** with two single-phase sockets of 230 V and three-phase output 400 / N / PE with safety terminals, protected by four-pole magneto-thermal differential circuit breaker of 10 A
- **Regulated power supply unit of 12 Vdc – 15 A,** with electronic output protection against short-circuits and overloads, automatic reset, safety terminals
- **Three-phase / Neutral line of 230 V – 10 A,** protected by fuses, electro-magnetic control device and light signalling, safety terminals
- **Three-phase / Neutral line of 400 V – 6 A,** protected by fuses, electro-magnetic control device and light signalling, safety terminals
- **DC line of 0-220 V – 5 A,** with magneto-thermal protection and digital voltmeter for the reading of output voltage, safety terminals
- **Fixed line of 220 Vdc – 15 A,** protected by fuses, electro-magnetic control device and light signalling, safety terminals
- **Variable three-phase line of 0-430 Vac / 0-500 Vdc – 5 A,** protected by fuses, electro-magnetic control device and separate digital instruments for measuring AC and DC output voltages, safety terminals

DISTRIBUTION BOARD:

- **Three-phase interconnection line** (not electrified)
- **DC interconnection line** (not electrified) These lines can connect various benches via safety terminals to carry out special tests
- **Three-phase line** (not electrified) that may be separate or connected with the variable three-phase line of power supply desk via a circuit breaker: it can be used through a set of safety terminals
- **DC line** (not electrified) that may be separate or connected with the variable three-phase line of power supply desk via a circuit breaker: it can be used through a set of safety terminals
- **Two three-pole circuit breakers** for enabling excitation circuits, load circuits, etc… of the machines under test, connected via safety terminals

Dimensions: 2000 x 1000 x 880 + 600 mm (console)
Net weight: 200 kg

POWER SUPPLY:

3 x 400 V / N / PE 50-60 Hz
(3 x 220V/ N / PE other voltages on demand).
Max. absorption: 6 kVA

BENCH FOR GROUP TESTING OF ELECTRIC MEASUREMENTS AND MACHINES

Mod. 2385/EV

INTRODUCTION

The electrical and mechanical characteristics of this bench of "universal" type enable to use this equipment in laboratories of electrical engineering for the implementation of experimental programs of electric measurements and machines; it is an alternative solution of bench mod. 2390/EV.

The main characteristic of this bench is its wide working top and a power supply unit of reduced size that can be positioned indifferently on its longer or smaller side; that supplies the bench with a working capacity for 4-5 students. The power supply unit is sized to carry out general electric measurements and measurements on the electric machines of "POWER" modular system.

ELECTRIC CHARACTERISTICS:

- **Main control device of electro-magnetic type,** with key switch, high-sensitivity magneto-thermal differential circuit breaker and stop/emergency pushbutton
- **Service line** with two single-phase sockets of 230 V and three-phase output 400 / N / PE with safety terminals, protected by four-pole magneto-thermal differential circuit breaker of 10 A
- **Variable three-phase line of 0-430 Vac / 0-500 Vdc – 5 A**, protected by fuses, electro-magnetic control device and separate digital instruments for measuring AC and DC output voltages, safety terminals
- **AC-DC extra-low voltage line – 6-12-24-48 V – 4 A**, protected by fuses, safety terminals
- Control switch, protection fuses, terminals of use are prearranged for a regulated power supply unit of 12 V – 15 A

Dimensions: 2000x1000x880 + 1000x450x350 mm (console)
Net weight: 128 kg

TRAINING PROGRAM:

- Measurements of DC and AC voltage or current
- Measurements of resistance
- Measurements of DC and single-phase power
- Measurements of frequency, capacitance and inductance
- Measurements of three-phase active and reactive power
- Measurements of power factor
- Measurements on DC machines
- Measurements on synchronous machines
- Measurements on asynchronous machines
- Measurements on transformers

TECHNICAL SPECIFICATIONS:

This bench is made of press-formed sheet steel and sections, chemically treated and painted with several coats of epoxy varnish. The working top is of chipboard coated with bonded laminate. Two drawers with flush-mounted handles and key locks are fixed under the working top. The desk, that can be positioned on the longer or smaller side of the bench, can be opened from the rear side for inspection and service.
The described electric components are included in the desk. The control, protection and testing devices are mounted on the silk-screen-printed fore plate of aluminium alloy.

OPTIONAL ACCESSORY:

- Regulated power supply unit of 12 Vdc – 15 A, with electronic protection against short-circuits and overloads, and automatic reset

POWER SUPPLY:

3 x 400 V / N / PE 50-60 Hz
(3 x 220V/ N / PE other voltages on demand).
Max. absorption: 6 kVA

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TABLETOP POWER SUPPLY UNIT FOR ELECTRIC MEASUREMENTS AND MACHINES

Mod. AV-4/EV

INTRODUCTION

This power supply unit is the ideal solution for the implementation of experimental programs of general electric measurements and of measurements applied to electric machines.

TECHNICAL SPECIFICATIONS:

Mechanical characteristics:
Box made of sheet steel and sections, chemically treated and painted with epoxy varnish; silk-screen-printed fore plate of aluminium alloy with flush-mounted handles for transport.

Electric characteristics:
Main control device
of electro-magnetic type, with extra-low voltage (24 Vac) and possibility of including external protection devices such as thermal protectors and speed limiters of motors. Magneto-thermal differential circuit breaker of high sensitivity in class A, In = 16 A; Idn = 30 mA. Key selector, emergency pushbutton and LED for signalling unit powered by the mains.

Service line with three-phase and single-phase socket
protected by four-pole magneto-thermal differential circuit breaker (In = 10 A), 5 safety terminals for plugs with diameter of 4 mm, universal (Unel and 2-pin) single-phase socket with neutral conductor and earth (standard IEC 309 or EEC socket) and LED for signalling unit powered by the mains.

Fixed line of 220 Vdc – 20 A,
with voltage rectified by double three-phase bridge, AC residue of 4.2%. Line protected by three-pole magneto-thermal circuit breaker and by fuses in bridge output, 2 safety terminals for plugs with diameter of 4 mm and LED for signalling unit powered by the mains.

Variable three-phase line with neutral conductor of 0-430 Vac 8 A / 0-500 Vdc 8 A
Three-phase voltage regulator with input of 400 V and variable output of 0-430 V, rated current of 8 A, selector of AC / DC output and LED for signalling unit powered by the mains. AC line variable from 0 to 450 V, protected by fuses, 5 safety terminals for plugs with diameter of 4 mm. DC line variable from 0 to 500 V, rectified by double three-phase bridge, AC residue of 4.2%, 2 safety terminals for plugs with diameter of 4 mm.

Dimensions: 600 x 500 x 500 mm
Net weight: 50 kg

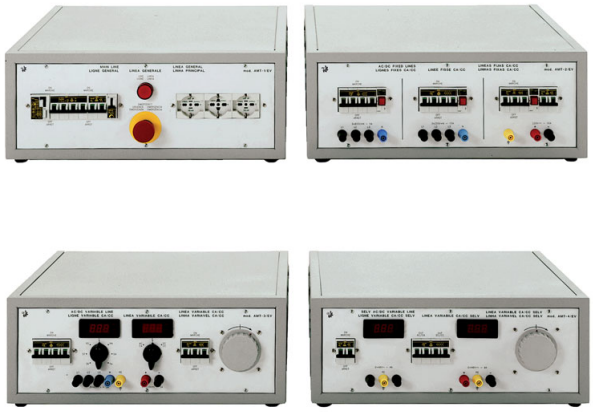
POWER SUPPLY:
3 x 400 V / N / PE, 50-60 Hz, absorption 6 kVA.

MODULAR TABLETOP POWER SUPPLY UNITS FOR ELECTRIC MEASUREMENTS AND MACHINES

Mod. AMT-1,2,3,4/EV

INTRODUCTION

The modular structure of this "system" of tabletop power supply units meets the requirements of a modern laboratory of electric measurements and of measurements on electric machines. It consists of a basic unit provided with general protections and with emergency stop device that can become a unit outputting AC and DC fixed three-phase/single-phase voltages, or a unit outputting AC and DC variable three-phase/single-phase voltages, or a unit outputting AC and DC variable single-phase extra-low voltage; furthermore this basic unit can be customized on a specific demand of users (fixed and/or variable regulated DC voltages).
This system can be used to equip new laboratories (compatible with "POWER" line) and to update laboratories already existing, but lacking in structures and/or having to comply with safety standards (safe workstation).
All the installed protection devices are automatic. Fuses are not used because they could easily be removed by students. The basic unit is a system that outputs the electric power supply besides including an (optional) three-phase isolation transformer to separate the whole workstation electrically.
Superposing the various power supply units will lead to assemble different configurations.



MODULAR TABLETOP POWER SUPPLY UNIT Mod. AMT-1/EV

This is the basic unit for assembling a workstation in the laboratory of general electric measurements and measurements on electric machine.
Power supply unit mod. AMT-1/EV includes the devices of general protection and of emergency stop, besides service sockets for powering electric accessories; it outputs the three-phase and single-phase supply voltages for the expansion units that can be connected.
Furthermore this unit can include a three-phase isolation transformer for the protection system with electric separation of the whole workstation.

TRAINING PROGRAM:

The training program is that of general electric measurements and of measurements on electric machines.

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TECHNICAL SPECIFICATIONS:

Mechanical characteristics
Box made of sheet steel, chemically treated and painted with epoxy varnish; silk-screen-printed fore plate of aluminium alloy with flush-mounted handles for transport.

Electric characteristics
- Main control device with high-sensitivity magneto-thermal differential circuit breaker of (A) type, suitable for sinusoidal and unidirectional fault currents with DC offset
- Four-pole magneto-thermal differential circuit breaker for the protection against overcurrents (overload and short-circuit)
- Minimum-voltage release device to avoid any ill-timed restart
- Emergency pushbutton
- 3 universal single-phase (2-pin and UNEL) sockets.

Two three-phase sockets of IEC 309 type (EEC) 400 V / N / PE 16 A and a single-phase socket of IEC 309 type (EEC) 230 V / PE 16 A, available on the rear side, enable to connect the additional units to extend the system.

Dimensions: 525 x 500 x 250
Net weight: 20 kg
(70 kg with three-phase isolation transformer)

OPTIONAL ACCESSORY:

- Three-phase isolation transformer of 230-400 V / 230-400 V 7 kVA

SUGGESTED ADDITIONAL UNITS:

- MODULAR TABLETOP POWER SUPPLY UNIT OF FIXED VOLTAGES mod. AMT-2/EV
- MODULAR TABLETOP POWER SUPPLY UNIT OF VARIABLE VOLTAGES mod. AMT-3/EV
- MODULAR TABLETOP POWER SUPPLY UNIT OF VARIABLE EXTRA-LOW VOLTAGE mod. AMT-4/EV
- TABLE mod. TOP/EV for completing the workstation

POWER SUPPLY:

3 x 400 V / N / PE 50-60 Hz
(3 X 220-230 V, with the optional isolation transformer)
Max. absorption.: 7 kVA

MODULAR TABLETOP POWER SUPPLY UNIT OF FIXED VOLTAGES Mod. AMT-2/EV

This power supply unit is an expansion of unit mod. AMT-1/EV. Its modular structure enables to supply the laboratory of electric measurements and measurements on electric machines with fixed AC and DC single-phase/three-phase voltages, protected against overcurrents and accessible on educational safety terminals of 4 mm.
It is the natural extension of the basic power supply unit from which it receives the supply voltage protected by the high-sensitivity differential circuit breaker and by the emergency stop device.
When used separately, this unit must be connected with a voltage source protected by high-sensitivity differential circuit breaker.

TECHNICAL SPECIFICATIONS:

Mechanical characteristics
Box made of sheet steel, chemically treated and painted with epoxy varnish; silk-screen-printed fore plate of aluminium alloy with flush-mounted handles for transport.

Electric characteristics
- Three-phase autotransformer of 400 / 230 Vac – 220 Vdc
- **Three-phase fixed line 3 x 230 V – 10 A,** protected by magneto-thermal circuit breaker, lamp socket with warning light, safety terminals
- **Three-phase fixed line 3 x 400 V – 5 A**, protected by magneto-thermal circuit breaker, lamp socket with warning light, safety terminals
- **Fixed line of 220 Vdc – 10 A** (three-phase voltage rectified by 6-diode bridge) AC residue of 4.2%; line protected by magneto-thermal circuit breakers, lamp socket with warning light, safety terminals

Dimensions: 525 x 500 x 250
Net weight: 50 kg

POWER SUPPLY:

Coming directly from unit mod. AMT-1/EV,
or 3 x 400 V / N / PE 50-60 Hz, including high-sensitivity differential circuit breaker of (A) type.

MODULAR TABLETOP POWER SUPPLY UNIT OF VARIABLE VOLTAGES Mod. AMT-3/EV

This power supply unit is an expansion of unit mod. AMT-1/EV. Its modular structure enables to supply the laboratory of electric measurements and measurements on electric machines with variable AC and DC single-phase/three-phase voltages, protected against overcurrents and accessible on educational safety terminals of 4 mm.
This unit includes a three-phase voltage regulator and the protection devices against overcurrents. It is the natural extension of the basic power supply unit from which it receives the supply voltage protected by the high-sensitivity differential circuit breaker and by the emergency stop device. When used separately, this unit must be connected with a voltage source protected by high-sensitivity differential circuit breaker.

TECHNICAL SPECIFICATIONS:

Mechanical characteristics
Box made of sheet steel, chemically treated and painted with epoxy varnish; silk-screen-printed fore plate of aluminium alloy with flush-mounted handles for transport.

Electric characteristics
- Three-phase voltage regulator of 5 A, AC/DC selector
- Three-phase variable line of 0-430 V – 5 A (single-phase, 0-250 V), protected by magneto-thermal circuit breaker, digital 3-digit voltmeter with voltmeter switch for phase-phase and phase-neutral connection, safety terminals
- Variable line of 0-500 Vdc – 6 A (three-phase voltage rectified by 6-diode bridge) AC residue of 4.2%; line protected by magneto-thermal circuit breakers, digital 3-digit voltmeter, safety terminals

Dimensions: 525 x 500 x 250
Net weight: 38 kg

POWER SUPPLY:

Coming directly from unit mod. AMT-1/EV,
or 3 x 400 V / N / PE 50-60 Hz, including high-sensitivity differential circuit breaker of (A) type.

MODULAR TABLETOP POWER SUPPLY UNIT OF VARIABLE EXTRA-LOW VOLTAGE Mod. AMT-4/EV

This power supply unit is an expansion of unit mod. AMT-1/EV. Its modular structure enables to supply the laboratory of electric measurements and measurements on electric machines with variable AC and DC single-phase/three-phase voltages, protected against overcurrents and accessible on educational safety terminals of 4 mm.
This unit includes a single-phase voltage regulator and the protection devices against overcurrents. It is the natural extension of the basic power supply unit from which it receives the supply voltage protected by the high-sensitivity differential circuit breaker and by the emergency stop device. When used separately, this unit must be connected with a voltage source protected by high-sensitivity differential circuit breaker.

TECHNICAL SPECIFICATIONS:

Mechanical characteristics
Box made of sheet steel, chemically treated and painted with epoxy varnish; silk-screen-printed fore plate of aluminium alloy with flush-mounted handles for transport.

Electric characteristics
- Single-phase voltage regulator of 1.2 A, and safety transformer
- **Variable line of 0-48 V – 4 A,** protected by magneto-thermal circuit breaker, digital 3-digit voltmeter, safety terminals
- **Variable line of 0-48 Vdc – 4 A** (single-phase voltage rectified by 4-diode bridge); line protected by magneto-thermal circuit breakers, digital 3-digit voltmeter, safety terminals

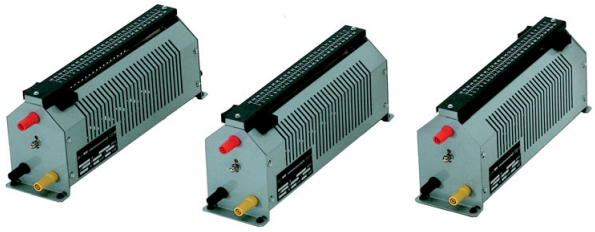
Dimensions: 525 x 500 x 250
Net weight: 25 kg

POWER SUPPLY:

Coming directly from unit mod. AMT-1/EV,
or 3 x 400 V / N / PE 50-60 Hz, including high-sensitivity differential circuit breaker of (A) type.

TABLETOP SLIDE VARIABLE RHEOSTATS

Mod. RP1 a-b-c-d-e/EV
Mod. RP3f/EV



INTRODUCTION

These laboratory rheostats are wound on tubular cylinders of porcelain. Resistive Constantan alloy is anchored onto the collar-shaped ends, slider with copper-silver contacts connected with safety terminals (Ø 4 mm). Protection against indirect contacts by pierced sheet steel with protection degree IP 20. Rheostats of RP-1 line have only one resistor, whereas rheostat mod. RP3f/EV includes three resistors.

SHUNT FIELD RHEOSTAT GENERATOR Mod. RP1a/EV

- Rheostat with differentiated sections of loops
- Power: 500 W
- Resistance value: 5000 Ω
- Terminals: 3
- Dimensions: 550 x 100 x 150 mm
- Weight: 3.5 kg
- Suitable for machines mod. P-1/EV, P-2/EV, P-12/EV

EXCITATION RHEOSTAT ALTERNATOR Mod. RP1b/EV

- Rheostat with differentiated sections of loops
- Power: 500 W
- Resistance value: 3000 Ω
- Terminals: 3
- Dimensions: 550 x 100 x 150 mm
- Weight: 3.5 kg
- Suitable for machines mod. P-3/EV

SHUNT EXCITATION RHEOSTAT MOTOR Mod. RP1c/EV

- Linear rheostat
- Power: 500 W
- Resistance value: 500 Ω
- Terminals: 3
- Dimensions: 550 x 100 x 150 mm
- Weight: 3.5 kg
- Suitable for machines mod. P-1/EV, P-2/EV, P-3/EV, P-12/EV

SERIES FIELD RHEOSTAT Mod. RP1d/EV

- Linear rheostat
- Power: 500 W
- Resistance value: 16 Ω
- Terminals: 3
- Dimensions: 550 x 100 x 150 mm
- Weight: 3.5 kg
- Suitable for machines mod. P-2/EV

D.C. STARTING RHEOSTAT Mod. RP1e/EV

- Linear rheostat
- Power: 500 W
- Resistance value: 35 Ω
- Terminals: 3
- Dimensions: 550 x 100 x 150 mm
- Weight: 3.5 kg
- Suitable for machines mod. P-1/EV, P-2/EV, P-12/EV

ROTOR STARTING – STATOR STARTING RHEOSTAT Mod. RP3f/EV

- Linear rheostat
- Power: 3 x 500 W
- Resistance value: 3 x 35 Ω
- Terminals: 9
- Dimensions: 550 x 300 x 150 mm
- Weight: 3.5 kg
- Suitable for machines mod. P-4/EV, P-5/EV

THEORETICAL-EXPERIMENTAL HANDBOOKS

Technical handbook.

VARIABLE LOADS

Mod. RL-2/EV
Mod. RL-2A/EV
Mod. IL-2/EV
Mod. CL-2/EV

INTRODUCTION

These loads are assembled in a painted tabletop metallic box with silk-screen-printed fore panel of aluminium alloy and graphic representation of components.

VARIABLE RESISTIVE LOAD Mod. RL-2/EV

- 3 separate ohmic sectors
- 21 values of DC or single-phase active power
- 7 values of three-phase active power
- Safety terminals and protection by fuses
- AC power supply: 230/400 V (*)
- DC power supply: 220 V (*)
- Maximum active power: 2700 W
- Dimensions: 525 x 500 x 200 mm
- Weight: 22 kg

VARIABLE RESISTIVE LOAD Mod. RL-2A/EV

- 3 separate ohmic sectors
- 21 values of DC or single-phase active power
- 7 values of three-phase active power
- Safety terminals and protection by fuses
- AC power supply: 230/400 V (*)
- DC power supply: 220 V (*)
- Maximum active power: 1350 W
- Dimensions: 525 x 500 x 200 mm
- Weight: 22 kg

VARIABLE INDUCTIVE LOAD Mod. IL-2/EV

- 3 separate inductive sectors
- 21 values of single-phase reactive power
- 7 values of three-phase reactive power
- Safety terminals and protection by fuses
- Power supply: 230/400 V 50 Hz (*)
- Maximum apparent power: 1350 VA
- Dimensions: 525 x 500 x 200 mm
- Weight: 85 kg

VARIABLE CAPACITIVE LOAD Mod. CL-2/EV

- 3 separate capacitive sectors
- 21 values of single-phase reactive power
- 7 values of three-phase reactive power
- Safety terminals and protection by fuses
- Power supply: 230/400 V 50 Hz (*)
- Maximum apparent power: 1350 VA
- Dimensions: 525 x 500 x 200 mm
- Weight: 16 kg

(*) other values of supply voltage and frequency are available on demand

Accessories supplied with each load:
Set of 9 cables with safety plugs (Ø 4 mm)

THEORETICAL-EXPERIMENTAL HANDBOOKS

Technical handbook.

THREE-PHASE VARIABLE LOAD

Mod. RLC-4/EV

INTRODUCTION

This equipment is a very versatile system for carrying out laboratory tests concerning the flows of both single-phase and three-phase active and reactive power for a total apparent power of 4 kVA.

TECHNICAL SPECIFICATIONS:

- Variable load contained in a wheeled steel framework (4 wheels, 2 of which with brakes)
- All control, protection and measurement instruments are installed on the fore panel with schematic diagram
- The three separate load sectors (R, L, C) are continuously adjusted
- Possibility of interconnecting the load sectors in (Star – Delta) configuration via a STAR/DELTA switch
- Possibility of balancing/unbalancing the load:
  - separate unbalance for each sector (R, L, C) and for each load phase
- Maximum resistive power: 0-3 kW (DC and single-phase/three-phase use)
- Maximum inductive power: 0-3 kvar (single-phase/three-phase)
- Maximum capacitive power: 0-3 kvar (single-phase/three-phase)
- This unit is equipped with all the connection and safety terminals (Ø 4 mm) and with cables

Instruments and other devices included in the equipment:

- 3 ammeters: range of 0-10 A
- 1 wattmeter: 0-5 kW
- 1 AC voltmeter: 0-500 v, with selector for phase-to-phase and phase-to-neutral voltages
- 1 cosphimeter: 0-1, with a switch for LAG-LEAD measurements
- Key switch, Start-Stop/emergency button
- The equipment includes all the necessary fuses for a full protection of circuits
- It also includes a protection thermal relay
- Warning lights: 2, one for FAN and one for SERVICE LOAD (energized load)
- Switches for internal/external selection
- On-off switch with protection fuse included in the equipment

Dimensions: 1050 x 730 mm
(upper fore panel with schematic diagram)
Height: 950 mm, including 4 wheels

Net weight: 120 kg

POWER SUPPLY:

Auxiliary line 230 V / PE 50-60 Hz
Power line 230/400V 50-60 Hz (*)
*other values of supply voltage and frequency are available on demand

THEORETICAL-EXPERIMENTAL HANDBOOKS

Technical handbook.

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D.C. MOTOR DRIVE

Mod. CV-2/EV

INTRODUCTION

This system applies the operating principle of a half controlled unidirectional single-phase thyristor converter.
It can be used for RPM control of DC motors in closed-loop and open-loop regulation. It ensures automatic RPM control and current limitation via armature reaction.
This converter can also operate with an RPM signal output by a tachogenerator (mod. P-16/EV, not included in the equipment) that must be coupled to the motor having to be driven. This equipment is recommended for the connection with DC machines (motors) of "POWER" line.

TECHNICAL SPECIFICATIONS:

This equipment is inserted in a tabletop metallic box with schematic diagram silk-screen-printed on the fore panel.
Some test points are available for system optimization with the connection of measurement instruments.
It is suitable for DC motors with:

- power: 1.5 kW (max.)
- armature voltage: 220 Vdc
- excitation voltage: 220 Vdc

Dimensions: 400 x 395 x 240 mm
Net weight: 25 kg

RECOMMENDED MOTOR:

DIRECT-CURRENT MOTOR mod. P-1/EV

POWER SUPPLY:

230 V / PE 50-60 Hz Max. absorption.: 2 kVA

THEORETICAL-EXPERIMENTAL HANDBOOKS

Application handbook.

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THREE-PHASE MOTOR DRIVE

Mod. VSD-2/EV

INTRODUCTION

This equipment applies the operating principle of a microprocessor-controlled transistor inverter of high technology.
It can carry out the main functions indicated here below:

- control system: sine wave, PWM-vector
- function of impulse run for discontinuous control and operation
- start and stop functions for mechanical brake
- electronic thermal relay included in the equipment to protect the motor from overload
- digital display for an easy reading of fault cause / frequency, acceleration/deceleration time, V/f mode, input signal level of voltage/current and r.p.m.

This equipment is recommended especially for the connection with three-phase motors of "POWER" line

TECHNICAL SPECIFICATIONS:

This equipment is inserted in a tabletop metallic box with schematic diagram silk-screen-printed on the fore panel.
It is suitable for three-phase asynchronous motors with:
- power: 1.5 kW (max.)
- rated voltage: 3 x 230 V
- output frequency: 0 to 500 Hz

Dimensions: 400 x 395 x 240 mm
Net weight: 17 kg

RECOMMENDED MOTOR:

THREE-PHASE ASYNCHRONOUS MOTOR mod. P-4/EV

POWER SUPPLY:

230 V / PE 50-60 Hz Max. absorption.: 2 kVA

THEORETICAL-EXPERIMENTAL HANDBOOKS

Application handbook.

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MODULAR SYSTEM FOR ELECTRIC MEASUREMENTS AND MACHINES - "COMPACT" LINE

"COMPACT" ELECTRIC MACHINES

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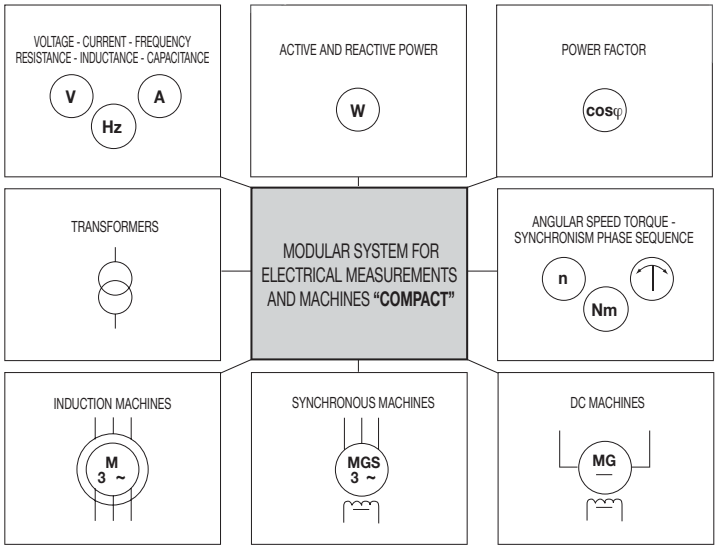
MODULAR SYSTEM FOR ELECTRIC MEASUREMENTS AND MACHINES "COMPACT" LINE



INTRODUCTION

This system has been designed to supply students with the possibility of assembling a wide range of circuits for the measurement of general electric quantities and of the characteristics of electric static and rotating machines of fractional power (0.3-0.5 kW). This system uses power supply units, machines and accessories of low power and instruments of medium accuracy (1.5).
The modular characteristics of this system ensures the highest flexibility. Different solutions are available for: electric power supply units, park of electric machines, measurement instruments, accessories. Here is an example of configuration: Compact bench mod. 399/EV or tabletop power supply unit mod. AV-1/EV, set of electric machines mod. „M" and starting/excitation rheostats, modules for electric measurements and measurements on machines mod. MGE/EV, variable loads RL-IL-CL-1/EV.

The training program covers the following topics:

- Measurements of voltage, current and frequency
- Measurements of resistance, inductance, capacitance
- Measurements of active and reactive power and of power factor
- Determination of power factor
- Measurements of torque and angular velocity
- Detecting no-load, load and short-circuit characteristics of direct-current, synchronous, asynchronous and special machines
- Detecting no-load, load and short-circuit characteristics of transformers

TRAINING PROGRAM:

GENERAL ELECTRIC MEASUREMENTS

- Measurement of DC and AC voltages by moving iron instruments
- Measurement of direct and alternating currents by moving iron instruments
- Assembling circuits with ammeter, voltmeter and rheostats and reading the indications of instruments
- Measurement of resistance by voltmeter-ammeter method – measurement of impedance
- Measurement of DC power
- Measurement of single-phase active power
- Three-phase alternator
- Measurement of frequency
- Measurements of capacitance
- Measurement of inductance
- Determination of phase sequence by phase sequence indicator
- Measurement of three-phase active power - Aron measuring circuit and determination of phase sequence
- Determination of reactive power by Aron measuring circuit
- Measurement of three-phase active power on symmetrical and balanced loads by single-phase wattmeter and actual and fictitious star center
- Measurement of single-phase reactive power
- Measurement of reactive power in symmetrical and balanced three-phase systems
- Determination of power factor in single-phase circuits
- Determination of power factor in symmetrical and balanced three-phase circuits
- Measurements of power factor by single-phase or three-phase cosphimeter

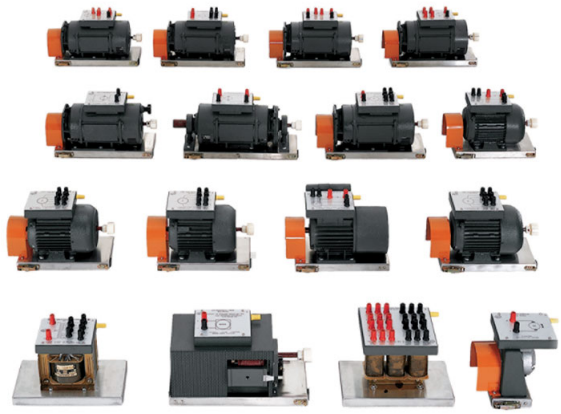
MEASUREMENTS ON ELECTRIC MACHINES

- DC generator with separate excitation
- DC generator with shunt excitation
- DC generator with series excitation
- DC generator with compound excitation
- Parallel coupling of two DC generators with shunt excitation (self-excited)
- Parallel coupling of two DC generators with compound excitation
- DC motor with shunt excitation
- DC motor with series excitation
- DC motor with compound excitation, differential long and short shunt
- DC motor with compound excitation, additional long and short shunt
- Ward Leonard system
- Determination of neutral plane
- Three-phase transformers in parallel
- Three-phase alternator with resistive, inductive and capacitive load
- Parallel of two alternators
- Synchronous motor
- Lead-lag operation of a synchronous machine with unit power factor
- Synchronous compensator
- Asynchronous three-phase cage motor
- Asynchronous three-phase cage motor operating with two voltages
- Asynchronous three-phase cage motor operating at two speeds by change of the pole number
- Asynchronous three-phase slip-ring motor
- Controlling starting and RPM of an asycnronous wound-rotor three-phase motor
- Controlling a self-synchronous motor
- Asynchronous single-phase motor with (single/two-phase) capacitor
- Asynchronous single-phase motor with starting capacitor
- Universal motor
- Single-phase repulsion motor
- Single-phase transformer
- Polarity of single-phase transformer
- Single-phase transformer with resistive, inductive and capacitive load
- Single-phase transformers in parallel
- Autotransformer
- Three-phase transformer
- Polarity of three-phase transformer
- Transformation ratio of three-phase transformer
- Three-phase transformer with resistive, inductive and capacitive load
- Star/delta connection in a three-phase transformer
- T (or Scott) connection
- RPM control of an asynchronous three-phase motor by drive
- RPM control of a DC motor by drive
- Operation and RPM control of a brushless motor by drive

"COMPACT" ELECTRIC MACHINES

INTRODUCTION

These machines are included in a set of motors and transformers of reduced power; these machines, together with starting and control rheostats and with power supply units enable to determine all the typical operating lines. These machines of solid industrial construction also include a panel with silk-screen-printed schematic diagram showing the wiring diagram and the names of windings on standardized safety terminals.
The machines can easily be handled in the laboratory as they are provided with a base and with a quick coupling system for the connection with machines of the same line; furthermore the rotating machines are also equipped with male-female coupling joints on shaft prongs.
The rating plate is printed directly on the schematic diagram, for immediate reference.



DIRECT-CURRENT MOTOR / GENERATOR WITH SEPARATE / COMPOUND / SERIES EXCITATION Mod. M1-2/EV

- Power: 300 W
- Armature voltage: 220 Vdc
- Separate excitation voltage 220 Vdc
- R.p.m.: 3000 (*)
- It also operates as DC motor
- Form of construction: IM B3
- Protection: IP 22
- This unit also includes thermal protector
- Dimensions: 440 x 160 x 250 mm
- Weight: 16 kg

(*) other RPM values are available on demand

DIRECT-CURRENT MOTOR / GENERATOR WITH SEPARATE / COMPOUND EXCITATION Mod. M-1/EV

- Power: 300 W
- Armature voltage: 220 Vdc
- Excitation voltage: 220 Vdc
- R.p.m.: 3000 (*)
- It also operates as DC motor
- Form of construction: IM B3
- Protection: IP 22
- This unit also includes thermal protector
- Dimensions: 440 x 160 x 250 mm
- Weight: 15 kg

(*) other RPM values are available on demand

DIRECT-CURRENT MOTOR WITH SERIES EXCITATION Mod. M-2/EV

- Power: 300 W
- Armature voltage: 220 Vdc
- R.p.m.: 3000 (*)
- It also operates as DC motor
- Form of construction: IM B3
- Protection: IP 22
- This unit also includes thermal protector
- Dimensions: 440 x 160 x 250 mm
- Weight: 15 kg

(*) other RPM values are available on demand

THREE-PHASE ASYNCHRONOUS CAGE MOTOR Mod. M-4/EV

- Power: 500 W
- Voltage: 230/400 V 50 Hz (*)
- R.p.m.: 2850 (*) (2 poles)
- Delta-star connection
- Form of construction: IM B3
- Protection: IP 44
- This unit also includes thermal protector
- Dimensions: 440 x 160 x 250 mm
- Weight: 10 kg

(*) other values of supply voltage and frequency and of r.p.m. are available on demand

THREE-PHASE ASYNCHRONOUS TWO-POLE (DAHLANDER) CAGE MOTOR Mod. M-6/EV

- Power: 450/300 W
- Voltage: 400 V 50 Hz (*)
- R.p.m.: 2850/1400 (*) (2/4 poles)
- Form of construction: IM B3
- Protection: IP 44
- This unit also includes thermal protector
- Dimensions: 440 x 160 x 250 mm
- Weight: 10 kg

(*) other values of supply voltage and frequency and of r.p.m. are available on demand

THREE-PHASE SYNCHRONOUS MOTOR / GENERATOR WITH ASYNCHRONOUS STARTING Mod. M-3/EV

- Power: 350 VA
- Voltage: 230/400 V 50 Hz (*)
- R.p.m.: 3000 (*) (2 poles)
- Excitation voltage: 220 Vdc
- It also runs as synchronous motor
- Delta-star connection
- Form of construction: IM B3
- Protection: IP 22
- This unit also includes thermal protector
- Dimensions: 440 x 160 x 250 mm
- Weight: 16 kg

(*) other values of supply voltage and frequency and of r.p.m. are available on demand

THREE-PHASE ASYNCHRONOUS WOUND-ROTOR MOTOR Mod. M-5/EV

- Power: 500 W
- Voltage: 230/400 V 50 Hz (*)
- R.p.m.: 2900 (*) (2 poles)
- Rotor voltage: 400 V
- Delta-star connection
- Form of construction: IM B3
- Protection: IP 22
- This unit also includes thermal protector
- Dimensions: 440 x 160 x 250 mm
- Weight: 17 kg

(*) other values of supply voltage and frequency and of r.p.m. are available on demand

THREE-PHASE ASYNCHRONOUS TWO-POLE TWO-WINDING CAGE MOTOR Mod. M-7/EV

- Power: 150/75 W
- Voltage: 400 V 50 Hz (*)
- R.p.m.: 2900/700 (*) (2/8 poles)
- Form of construction: IM B3
- Protection: IP 44
- This unit also includes thermal protector
- Dimensions: 440 x 160 x 250 mm
- Weight: 10 kg

(*) other values of supply voltage and frequency and of r.p.m. are available on demand

ASYNCHRONOUS SINGLE-PHASE MOTOR WITH STARTING CAPACITOR Mod. M-8/EV

- Power: 300 W
- Voltage: 230 V 50 Hz (*)
- R.p.m.: 2900 (*) (2 poles)
- Form of construction: IM B3
- Protection: IP 44
- This unit also includes thermal protector
- Dimensions: 440 x 160 x 250 mm
- Weight: 11 kg

(*) other values of supply voltage and frequency and of r.p.m. are available on demand

REPULSION START INDUCTION SINGLE-PHASE MOTOR Mod. M-10/EV

- Power: 240 W
- Voltage: 230 V 50 Hz (*)
- R.p.m.: 0-3000 (*)
- Form of construction: IM B3
- Protection: IP 22
- This unit also includes thermal protector
- Dimensions: 440 x 160 x 250 mm
- Weight: 16 kg

(*) other values of supply voltage and frequency and of r.p.m. are available on demand

ELECTRODYNAMOMETER – DC DYNAMOMETER Mod. M-12/EV

Besides being a typical DC motor/generator, this machine also includes some devices making it particularly suitable to carry out the function of electrodynamometer for measuring the torque output by the motors coupled to it.

- Power: 450 W
- Armature voltage: 220 Vdc
- Excitation voltage: 220 Vdc
- R.p.m.: 3000 (*)
- Braking torque: 1,5 - 0 - 1,5 Nm
- It also operates as DC motor
- Mechanical device of torque measurement
- Form of construction: IM B3
- Protection: IP 22
- This unit also includes thermal protector
- It is also prearranged to be connected with digital torque meter mod. UM-G1/EV
- Dimensions: 440 x 160 x 250 mm
- Weight: 21 kg

(*) other RPM values are available on demand

ASYNCHRONOUS SINGLE-PHASE MOTOR WITH STARTING CAPACITOR AND CENTRIFUGAL CIRCUIT BREAKER Mod. M-9/EV

- Power: 380 W
- Voltage: 230 V 50 Hz (*)
- R.p.m.: 2900 (*) (2 poles)
- Form of construction: IM B3
- Protection: IP 44
- This unit also includes thermal protector
- Dimensions: 440 x 160 x 250 mm
- Weight: 12 kg

(*) other values of supply voltage and frequency and of r.p.m. are available on demand

UNIVERSAL AC/DC MOTOR Mod. M-11/EV

- Power: 260/330 W
- Voltage: 230 Vac 50 Hz (*) /230 Vdc
- R.p.m.: 3000 (*)
- Form of construction: IM B3
- Protection: IP 22
- This unit also includes thermal protector
- Dimensions: 440 x 160 x 250 mm
- Weight: 15 kg

(*) other values of supply voltage and frequency and of r.p.m. are available on demand

SINGLE-PHASE TRANSFORMER Mod. M-13/EV

- Power: 760 VA
- Voltage of primary winding: 230 V 50 Hz (*)
- Voltage of secondary winding 1: 0-53-200-400V (*)
- Voltage of secondary winding 2: 0-115-230 V
- Protection: IP 22
- This unit also includes thermal protector
- Dimensions: 360 x 160 x 250 mm
- Weight: 11 kg

(*) other values of supply voltage and frequency are available on demand

THREE-PHASE TRANSFORMER Mod. M-14/EV

- Power: 350 VA
- Voltage of primary winding: 230/400/346V 50 Hz (*)
- Delta/star/zigzag connection
- Voltage of secondary winding: 230/400/346V (*)
- Delta/star/zigzag connection
- Protection: IP22
- This unit also includes thermal protector
- Dimensions: 360 x 160 x 250 mm
- Weight: 9 kg

(*) other values of supply voltage and frequency are available on demand

EDDY CURRENT BRAKE Mod. M-15/EV

- Braking power at 3000 r.p.m.: 450 W
- Supply voltage: 0-220 Vdc
- R.p.m.: 3000
- Braking torque: 1,5 - 0 - 1,5 Nm
- Bidirectional operation
- Mechanical device of torque measurement
- Cooling by fan auxiliary power supply: 230 V 50-60 Hz
- Protection: IP 22
- This unit also includes thermal protector
- It is also prearranged to be connected with digital torque meter mod. UM-G1/EV
- Dimensions: 360 x 180 x 250 mm
- Weight: 19 kg

suggested power supply unit: mod. AFP-2/EV (see pag. BK 26)

TACHOGENERATOR Mod. M-16/EV

This tachogenerator is used to measure the speed of rotation of "M" and "M-B" electric machines. The output signal can be converted into r.p.m. by tachometer voltmeter mod. AZ-73. It is used for DC motor drive mod. CV-1/EV in closed-loop configuration.
It can also be connected with digital unit mod. UM-G1/EV to plot the characteristic curves with an X-Y recorder (not included in the equipment).

- Output voltage: 0,06 V per revolution
- R.p.m.: 5000 max.
- Output voltage 1: 300 Vdc at 5000 r.p.m.
- Output voltage 2: 10 Vdc at 5000 r.p.m.
- Protection: IP 44
- Dimensions: 160 x 160 x 250 mm
- Weight: 5 kg

BRUSHLESS MOTOR PROVIDED WITH SERVO DRIVE Mod. M-17/EV

Brushless motors are synchronous machines whose rotor consists of a permanent magnet; then they have not any brushes. Mechanical and electrical characteristics of these motors are higher than those of traditional direct-current and alternating-current motors. Brushless motors are normally used in applications with power of some kW for heat pumps, fans and compressors. They are managed by specific drives.
This system mainly consists of:

- a bidirectional industrial drive for AC brushless motor
- an AC brushless motor whose form of construction is compatible with the machines of "COMPACT" line

TECHNICAL SPECIFICATIONS:

The drive is available in a tabletop metallic box with controls and signalling indicators on the fore panel of schematic diagram. The motor includes a position transducer of resolver type. The drive is connected with the motor via a cable equipped with connectors.

- Rated power: 500 W
- RPM control range: ± 4000 r.p.m.
- IGBT power stage
- Resolver feedback
- Control: bidirectional, 4 quadrants with double RPM-current loop

Dimensions of drive: 485 x 135 x 405 mm
Net weight of drive: 15 kg

Dimensions of motor: 440 x 160 x 250 mm
Net weight of motor: 16 kg

RELUCTANCE MOTOR Mod. M-18/EV

- Power: 450 W
- Voltage: 3 x 400 Vac- 50 Hz (*)
- RPM: 3000 (*) (2 poles)
- Form of construction: IMB3
- Protection: IP44
- This unit also includes thermal protector
- Dimensions: 440 x 160 x 250 mm
- Weight: 10 kg

(*) other values of supply voltage and frequency and of r.p.m. are available on demand

THEORETICAL-EXPERIMENTAL HANDBOOKS

Technical application handbook for each machine.

MAGNETIC POWDER BRAKE & ELECTRONIC CONTROL

Mod. AFC-1D/EV

INTRODUCTION

This brake enables the measure of the mechanical and electrical characteristics of electrical motors and allows plotting the Torque = f (RPM) curve and calculating the real Pmec(W) developed by the motor.
The unit includes a built-in an electrical programmable instrument (see the Technical Features for the details) that calculates (and displays) the supplied electrical power Pel (W). With Pmec and Pel, the AFC-1D/EV supplies automatically the Efficiency. All these parameters are calculated at any measure.
The unit is suitable in experimental program as an **alternative to the Electrodynamometer mod. M-12/EV and M12-B/EV, or to the Eddy Currents Brake mod. M-15/EV**.

The system is composed by two units:
- The Magnetic Powder Brake (to be coupled to the motor under test).
- The Electronic Control Board, that supplies the power and the control commands to the brake, and processes the brake input/output signals.

TECHNICAL SPECIFICATIONS:

MAGNETIC POWDER BRAKE

- Braking torque range: up to 10 Nm. With max torque limiter.
- Speed range: up to 6000 RPM. With min speed limiter.
- Integrated thermal protector and fan
- Includes the RPM probe and the bidirectional Torque probe.
- the unit is ready to be directly coupled to the "COMPACT" motors line (from 0.3 to 0.5 kW). No tools are required for the coupling.

Dimensions: 260 x 180 x 300 mm
Weight: 18 kg

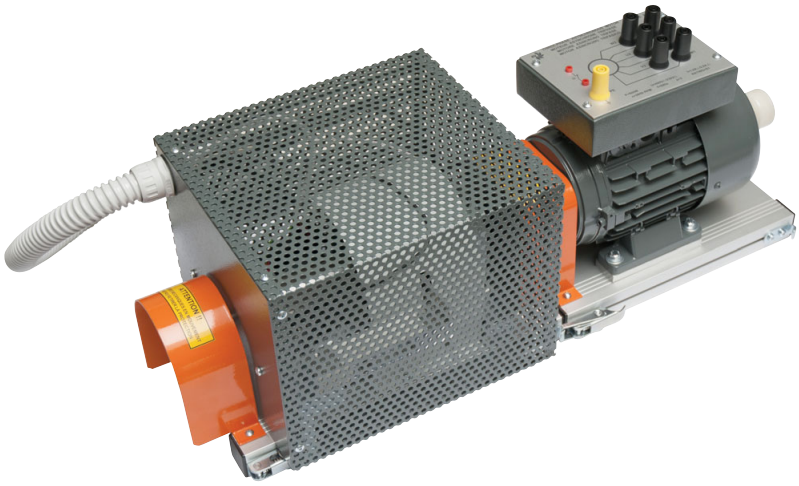
ELECTRONIC CONTROL BOARD

- Supplies the power to the Brake unit and processes the signals of the RPM, Torque and Temperature probes.
- Braking Modes: EXTERNAL, MANUAL, AUTO (with 4 selectable braking curves):
  a) Constant Torque vs. RPM. It is the MANUAL mode, with T = k1 , being k1: a constant that can be set at different values. This curve is typical of elevators and cranes, conveyor belts etc.
  b) Linear Torque vs. RPM (T = k2 * n (RPM), being k2: a constant that can be set at different values). This curve is typical of calenders, used in textile , paper and metallurgy industries.
  c) Quadratic Torque vs. RPM (T = k3 * n^2 (RPM), being k3: a constant that can be set at different values). This curve is typical of centrifugal pumps, centrifugal fans etc.
  d) Inverse Torque vs. RPM (T = k4 / n (RPM), being k4: a constant that can be set at different values). This curve is typical of lathes, cutting machines, reel-type machines etc.
- The braking time is settable, to define constants k2, k3 and k4.
- For each braking mode, it is possible to set the UNDER SPEED and OVER TORQUE limiters for safe tests. One 3-states LED for signaling: READY, RUN and OVERTEMPERATURE.
- The unit supplies 2 * 0-10 VDC analog outputs (both programmable among any internal measured or calculated parameter): for example, one can be proportional to RPM and the second proportional to Torque. These signals can be used as inputs for other instruments (our CEM-U/EV Computerized Measurement Unit, or any already existing instrument).
- Possibility of external control with a 0-10 V D.C signal.

- On-board programmable multifunction instrument. It can be selected for:
  a) AC (single-ph or 3-ph balanced): measures V, I, W, VAr, VA, frequency and Power Factor.
  b) DC: measures V, I W
- Backlit digital display and keyboard for programming the instrument and to show the set / measured / calculated parameters, such as: Torque (Nm), RPM, Pmec (W), Pel (W), Efficiency etc.

Dimensions: 400 x 160 x 250 mm
Weight: 7 kg

EXAMPLE OF CONNECTION BETWEEN BRAKE AND MOTOR (motor not included)



POWER SUPPLY:
230 V / PE - 50-60 Hz

THEORETICAL-EXPERIMENTAL HANDBOOKS
Technical handbook.

SYNCHRONIZATION DEVICE FOR WOUND-ROTOR ASYNCHRONOUS THREE-PHASE MOTOR

Mod. DS-1/EV

INTRODUCTION

This rheostat is designed to start a wound-rotor asynchronous three-phase motor mod. M-5/EV progressively: as soon as rotor resistances have been excluded, it connects its rotor windings with a DC power supply unit.
Adjusting the excitation properly will lead to the operation as synchronous motor.

TECHNICAL SPECIFICATIONS:

Mechanical characteristics

The equipment is contained in a metallic box painted with epoxy varnish and provided with rubber feet so that it can be laid on a table.
The silk-screen-printed fore plate of aluminium alloy shows the symbols of the components.

Electric characteristics

This equipment can be applied to wound-rotor asynchronous three-phase motors with power up to 500 W and rated rotor voltage 3 x 380-400 V.
External direct-current power supply, variable 0-220 Vdc or fixed, with typical excitation rheostat for synchronous motors (recommended rheostat: RC1b – 3000 Ω - 500 W).
Toroidal three-phase rheostat with short-circuit contacts at exclusion end and switching on DC external line, rotating control by knob on fore panel. Educational terminals for safety plugs (Ø 4 mm) for connection with the rotor of the motor having to be synchronized and connection with DC excitation line.
Intermediate resistor in the passage from rotor starting end to synchronization phase with injection of DC power supply.

Dimensions: 200 x 200 x 200 mm
Net weight: 3 kg

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SYNCHRONIZING DEVICE FOR 3-PH SYNCHRONOUS ALTERNATOR

Mod. DS-2/EV

INTRODUCTION

This table-top trainer includes the instruments and a switch to connect a 3-phase synchronous generator to the mains.
The paralleling operations between the generator and the mains are carried out by the user; the instrumentation allows to determine the closing moment of the parallel device.

TECHNICAL SPECIFICATIONS:

Mechanical characteristics

The equipment is contained in a metallic box painted with epoxy varnish and provided with rubber feet so that it can be laid on a table.
The silk-screen-printed fore plate of aluminium alloy shows the symbols of the components. Connections are made via 4 mm safety terminals. The connections of the instruments can be done through jumpers according to the silk screen diagram or can be modified in order to carry out other insertion modes.

Electric characteristics

- This equipment can be applied to 3-phase synchronous generators with power up to some kVA and rated voltage 3 x 380-400 Vac – 50 Hz.
- Double voltmeter 500 VAC (series 96 x 96) for voltage comparison of the paralleling circuits.
- Double frequencymeter 45 ... 55 Hz - 500 VAC (series 96 x 96) for frequency comparison of the paralleling circuits.
- Three-lamps synchronization indicator (synchronoscope) with 400 V voltage.
- Three-poles rotational switch, In 16 A for panel operation.
- 2 sets of 4 mm safety terminals for electrical connections.
- Grounding terminal of the device.

Dimensions: 405 x 405 x 120 mm
Net weight: 5.5 kg

BENCH FOR TESTING ELECTRIC MEASUREMENTS AND MACHINES

Mod. 399/EV

Example of configuration

INTRODUCTION

This equipment and its accessories is the ideal solution for implementing programs of general electric measurements and of measurements applied to electric machines.
A unique framework assembles a vertical frame for fixing the modules, an electric switchboard with fixed and variable supply voltages and a supporting table with a wide working top.
This bench ensures all the necessary supply voltages for implementing the training program of general electric measurements and measurements applied to electric machines.
A unique framework assembles the power distribution console and the support for the modules with the instruments of electric measurements. A compartment where modules and any accessory can be stored is available on the rear part.
This bench is a completely self-powered system and it optimizes design and testing times in the laboratory of electric measurements and of measurements applied to electric machines. This equipment is also provided with safety devices against malfunctions and accidental electric contacts.

TRAINING PROGRAM:

The training program is that of general electric measurements and of measurements on electric machines.

TECHNICAL SPECIFICATIONS:

This bench is made of sheet steel and sections, and painted with epoxy varnish. The working top is coated with bonded laminate and its edges and corners have been rounded off. A compartment for modules provided with sliding doors and key lock is available in the rear side.
The part under the working top can house two drawers with key locks, or two wheeled boxes for electric machines and system accessories.

Dimensions: 2000 x 1000 x 880 mm + 600 mm (desk)
Net weight: 200 kg

ELECTRICAL CHARACTERISTICS:

- **Main control device of electro-magnetic type,** with key switch, high-sensitivity differential circuit breaker and emergency pushbutton with mechanical holding
- **Fixed three-phase line of 400/230 V – 10 A with neutral and earth conductors,** safety terminals, 2-pin and UNEL sockets protected by magneto-thermal circuit breaker
- **Fixed line of 220 Vdc – 3 A**, voltage rectified and protected by fuses, safety terminals
- **Variable three-phase line of 0-430 Vac / 0-500 Vdc – 4 A**, magneto-thermal/fuse protection, separated for measurement of AC/DC output voltages by digital voltmeters, safety terminals
- **Regulated fixed line of 6/12 Vdc – 2 A,** with electronic protection against short-circuits and overloads, safety terminals

RECOMMENDED ACCESSORIES:

Wheeled box Mod. C-3/EV
Made of press-formed sheet steel and sections, chemically treated and painted with several coats of epoxy varnish.
It is provided with sliding doors with key lock, part of accessories can be laid on the internal metallic shelf, whereas the space under this shelf can be used to store electric machines of "COMPACT" modular system.
Two of these boxes arranged under the top of bench mod. 399/EV can store all the electric machines and accessories of "COMPACT" system.
The framework and dimensions of this box are compatible with all the working tables mod. TOP/EV (without drawers and accessories).

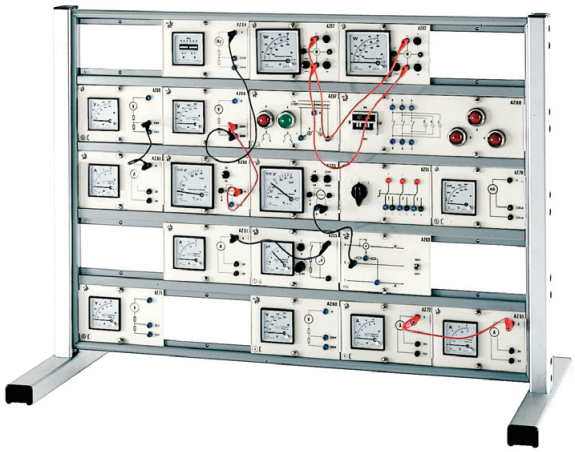
Dimensions: 1650 x 480 x 630 mm
Net weight: 57 kg

POWER SUPPLY:

3 x 400 V / N / PE 50-60 Hz other voltages on demand
Max. absorption: 6 KVA

MODULES FOR ELECTRIC MEASUREMENTS AND MEASUREMENTS ON ELECTRIC MACHINES

Mod. MGE/EV



INTRODUCTION

A set of modules with board-type instruments is available to implement the programs of general electric measurements and measurements on electric machines.
These modules are made of very strong insulating material and they are the support of the necessary instruments for implementing the experimentation program with bench mod. 399/EV or with the Vertical module holder frame mod. TSI/EV, together with power supply unit mod. AV-1/EV (all units mentioned above are supplied separately, on demand).
Modules are fixed to the bench or to the vertical frame by quick-connection devices without the use of any tool.
Connections are easier thanks to standardized educational terminals with high protection degree against accidental contacts.
This system has been designed to supply students with the possibility of assembling a wide range of circuits for the measurement of general electric quantities and of the characteristics of electric static and rotating machines of small power (300-500 W). Each module shows the graphic representation and the electric symbols of the included instrument or accessory for a better understanding and analysis of the circuit to be assembled.

TRAINING PROGRAM:

The training program is that of general electric measurements and of measurements on electric machines.

TECHNICAL SPECIFICATIONS:

The set of modules for implementing the programs of general electric measurements and of measurements on electric machines is enlisted here below:

- 2 Modules AZ-50
  - 1 three-pole switch keyer
- 1 Module AZ-60
  - 1 moving iron voltmeter of 250-500 V – accuracy rating: 1.5
- 3 Modules AZ-61
  - 1 moving iron ammeter of 2-4 A - accuracy rating: 1.5
- 2 Modules AZ-62
  - 2 electro-dynamic wattmeters of 2-4 A 250-500 V - accuracy rating: 1.5
- 1 Module AZ-63
  - 1 resistor box (fictitious star centre) for wattmeter
- 1 Module AZ-64
  - 1 reed frequency-meter – 48 to 62 Hz; 250-500 V - accuracy rating: 1.5
- 1 Module AZ-65
  - 1 galvanometer (central zero microammeter) – 50-0-50 µA
  - accuracy rating: 1.5
- 1 Module AZ-66
  - 1 electro-dynamic three-phase cosphimeter – 2-4 A 250-500 V – range of 0.5-1-0.5 - accuracy rating: 1.5
- 1 Module AZ-67
  - 1 phase sequence indicator with lamps
- 1 Module AZ-68
  - 1 synchronization device for parallel connection of three-phase lines or generators
- 1 Module AZ-69
- - 1 electro-dynamic single-phase cosphimeter – 250 V 2-4 A – range of 0.4-1-0.4 -accuracy rating: 2
- 1 Module AZ-70
  - 1 moving iron milliammeter of 250-500 mA - accuracy rating: 1.5
- 1 Module AZ-71
  - 1 moving iron voltmeter of 25-50 V - accuracy rating: 1.5
- 1 Module AZ-72
  - 1 moving iron ammeter of 10-20 A - accuracy rating: 1.5
- 1 Module AZ-73
  - 1 tachometer voltmeter of 240 Vdc – ranges: 1000/2000/4000 r.p.m. - accuracy rating: 1.5

SUPPLIED ACCESSORIES:

- Set of 25 cables with safety plugs (Ø 4 mm)

POWER SUPPLY:

The value indicated on each module

THEORETICAL-EXPERIMENTAL HANDBOOKS

Application handbook with exercises.

ELECTRICAL MEASUREMENTS MODULES

Mod. MGE-D1/EV

TECHNICAL SPECIFICATIONS:

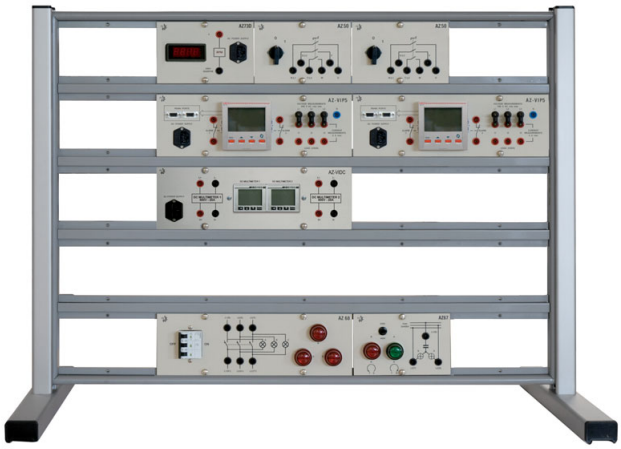
Set of digital instruments modules for general and electrical machines measurements.

Set of devices:

- **2 Modules AZ-50:**
  - 1 three-pole power switch
- **1 Module AZ-67:**
  - 1 phase sequence indicator with lamps
- **1 Module AZ-68:**
  - 1 synchronization device for parallel connection of three-phase lines or generators

Set of digital instruments:

- **1 Module AZ-73D:**
  - 1 tachometer 240 Vdc @ 4000 RPM - accuracy rating: 1%
  - Auxiliary power 110…240 VAC - 50/60 Hz.
- **2 Modules AZ-VIP5/EV**. Each module includes:
  - **Current Measurement:** 5 A max. Included 3 CT 5/5A. The range can be expanded with 3 external CT x/5A; THD Total Harmonic Distortion for currents; Overcurrent: 50A for 1 sec.; Current Accuracy: 0.5%
  - **Voltage Measurement:** 3-ph + N.; 400 V phase to N and 690 V ph. to phase, 45..66 Hz; Voltage Accuracy: 0.5%; THD Total Harmonic Distortion for voltage
  - **Frequency:** 45…66 Hz.
  - **Power Measurement:** 3.5 kVA / kW / kVAr
  - **Other parameters measured:** Power factor, Voltage Asymmetry, Energies meter: kWh / kVAh / kVArh and Counter Hour
  - Other features:
    - Auxiliary power 110…240 VAC - 50/60 Hz.
    - Graphic LCD display, 128 x 80 pixel, backlit, with 4 grey levels.
    - Four keys for parameters visualizing and settings.
    - Possibility to create up to 4 programmable pages, each with 4 selectable measures among the measured parameters.
    - Two programmable relays with max/min alarm functions, selectable among the measured parameters.
    - Graphical Menu and Messages in 5 languages: English, Italian, Spanish, French and Portuguese.
    - Communication port: RS485 for data networking.
    - All connections are provided with safety plugs (Ø 4 mm)



- **1 Module AZ-VIDC/EV**. Each module includes 2 multifunction instruments, with the following features:
  - VDC max.: 600 V; precision: ± 0,2 %
  - IDC max.: 20 A; precision: ± 0,5 %; overload 2 x 20 A (3 min)
  - Power DC max.: 10 kW
  - Displays: visualize V, I, W. LCD, backlit, 3 lines, 4 digit per line. Automatic decimal point. Five levels of illumination.
  - All connections 4 mm Ø safety terminal

The Vertical module holder frame mod. TSI/EV is supplied separately on demand.

POWER SUPPLY:

The value indicated on each module

THEORETICAL-EXPERIMENTAL HANDBOOKS

Application handbook with exercises.

TABLETOP POWER SUPPLY UNIT FOR ELECTRIC MEASUREMENTS AND MACHINES

Mod. AV-1/EV

INTRODUCTION

This power supply unit and its accessories represent the ideal solution for the implementation of experimental programs of general electric measurements and of measurements applied to electric machines.

This power supply unit is an alternative solution to bench for testing electric measurements and machines mod. 399/EV; then it can be used together with frame mod. TSI/EV to implement the same educational program on already existing tables.

TRAINING PROGRAM:

The training program is that of general electric measurements and of measurements on electric machines.

MECHANICAL CHARACTERISTICS:

Box made of sheet steel and sections, painted with epoxy varnish; silk-screen-printed fore panel of aluminium alloy with flush-mounted handles for transport.

ELECTRICAL CHARACTERISTICS:

- **Main control device of electro-magnetic type,** with key switch; magneto-thermal differential circuit breaker of high sensitivity and emergency pushbutton.
- **Service line with three-phase and single-phase** sockets protected by magneto-thermal circuit breaker of 40 A, safety terminals
- **Fixed line of 220 Vdc – 3 A,** with protected and rectified voltage, safety terminals
- **Variable three-phase line of 0 to 430 Vac 3 A / 0 to 500 Vdc 3 A,** with magneto-thermal/fuse protection and separate instruments for measuring AS/DC output voltages with safety terminals
- **Regulated fixed line of 6/12/24 Vdc – 2 A,** with electronic protection against short-circuits and overload

Dimensions: 525 x 500 x 600 mm
Net weight: 50 kg

POWER SUPPLY:

3 x 400 V / N / PE 50-60 Hz
(3 x 220V/ N / PE other voltages on demand).
Max. absorption.: 6 kVA

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TABLETOP SLIDE VARIABLE RHEOSTATS

Mod. RC1a-b-c/EV
Mod. RC3-9T/EV

INTRODUCTION

These laboratory rheostats are wound on tubular cylinders of porcelain. Resistive Constantan alloy is anchored onto the collar-shaped ends, slider with copper-silver contacts connected with safety terminals (Ø 4 mm). Protection against indirect contacts by pierced sheet steel with protection degree IP 20. Rheostats of RC-1 line have only one resistor, whereas rheostat mod. RC3 includes three resistors.

SHUNT FIELD RHEOSTAT GENERATOR Mod. RC1a/EV

- Linear rheostat
- Power: 500 W
- Current: 0.31 A
- Resistance value: 5000 Ω
- Terminals: 3
- Dimensions: 550 x 100 x 150 mm
- Weight: 3,5 kg
- Suitable for machines mod. M-1/EV, M1-2/EV, M-3/EV, M-12/EV

SHUNT FIELD RHEOSTAT MOTOR Mod. RC1b/EV

- Linear rheostat
- Power: 500 W
- Current: 1.58 A
- Resistance value: 200 Ω
- Terminals: 3
- Dimensions: 550 x 100 x 150 mm
- Weight: 3,5 kg
- Suitable for machines mod. M-1/EV, M1-2/EV, M-3/EV, M-12/EV

SERIES FIELD RHEOSTAT MOTOR Mod. RC1c/EV

- Linear rheostat
- Power: 500 W
- Current: 3.16 A
- Resistance value: 50 Ω
- Terminals: 3
- Dimensions: 550 x 100 x 150 mm
- Weight: 3,5 kg
- Suitable for machines mod. M1-2/EV, M-2/EV

D.C. STARTING RHEOSTAT ROTOR STARTING STATOR STARTING Mod. RC3-9T/EV

- Linear rheostat
- Power: 3 x 500 W
- Current: 3 x 3.16 A
- Resistance value: 3 x 50 Ω
- Terminals: 9
- Dimensions: 550 x 300 x 150 mm
- Weight: 3,5 kg
- Suitable for machines mod. M-1/EV, M1-2/EV, M-2/EV, M-4/EV, M-5/EV, M-12/EV

THEORETICAL-EXPERIMENTAL HANDBOOKS

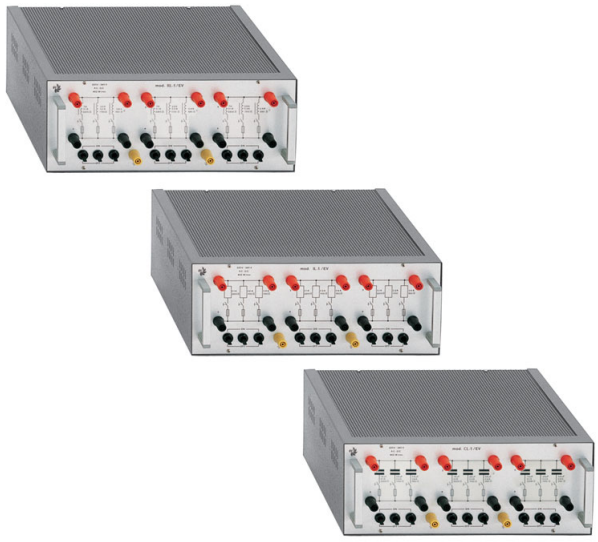
Technical handbook.

VARIABLE LOADS

Mod. RL-1/EV
Mod. IL-1/EV
Mod. CL-1/EV

INTRODUCTION

These loads are assembled in a painted tabletop metallic box with silk-screen-printed fore panel of aluminium alloy and graphic representation of components.



VARIABLE RESISTIVE LOAD Mod. RL-1/EV

- 3 separate resistive sectors
- 21 values of DC or single-phase active power
- 7 values of three-phase active power
- Safety terminals and protection by fuses
- AC power supply: 230/400 V (*)
- DC power supply: 220 V (*)
- Maximum active power: 460 W
- Dimensions: 400 x 395 x 170 mm
- Weight: 11 kg

VARIABLE INDUCTIVE LOAD Mod. IL-1/EV

- 3 separate inductive sectors
- 21 values of single-phase reactive power
- 7 values of three-phase reactive power
- Safety terminals and protection by fuses
- Power supply: 230/400 V 50 Hz (*)
- Maximum apparent power: 460 VA
- Dimensions: 400 x 395 x 170 mm
- Weight: 43 kg

VARIABLE CAPACITIVE LOAD Mod. CL-1/EV

- 3 separate capacitive sectors
- 21 values of single-phase reactive power
- 7 values of three-phase reactive power
- Safety terminals and protection by fuses
- Power supply: 230/400 V 50 Hz (*)
- Maximum apparent power: 460 VA
- Dimensions: 400 x 395 x 170 mm
- Weight: 8 kg

(*) other values of supply voltage and frequency are available on demand

ACCESSORIES SUPPLIED WITH EACH LOAD:
Set of 9 cables with safety plugs (Ø 4 mm)

THEORETICAL-EXPERIMENTAL HANDBOOKS

Technical handbook

VARIABLE UNIVERSAL LOAD UNIT - 1.2 kVA

Mod. CU/EV

INTRODUCTION

This equipment is a very versatile system for carrying out laboratory tests concerning the flows of both single-phase and three-phase active and reactive power for a total apparent power of 1.2 kVA.

TECHNICAL SPECIFICATIONS:

This load is mounted on a wheeled metallic framework with control, adjustment and measurement elements fixed on a silk-screen-printed horizontal panel of aluminium alloy.

Electric characteristics:

- 3 sectors consisting respectively of:
  3 rheostats, 3 coils and 3 capacitors being single-phase and adjustable separately
- Switch for networks (or generators) of 230 V or 400 V (*)
- Switches for separating the 3 available sectors from the internal connections and implementing different exercises
- Power of resistive sector ranging from 0 to 900 W (3 x 300 W)
- Power of inductive sector ranging from 0 to 900 VA (3 x 300 VA)
- Power of capacitive sector ranging from 0 to 900 VA (3 x 300 VA)
- General electro-magnetic key control switch, protected by differential circuits breaker and by fuses, provided with emergency button
- Instruments for measurements of current and voltage
- Safety terminals

Supplied accessories:

- Power cord of auxiliary line with UNEL plug
- Power cord of power line with plugs Ø 4 mm

Dimensions: 850 x 550 x 950 mm
Net weight: 99 kg

POWER SUPPLY:

auxiliary line: 230 V / PE 50-60 Hz
power line: 230/400 V 50 Hz (*)
(*) other values of supply voltage and frequency are available on demand

THEORETICAL-EXPERIMENTAL HANDBOOKS

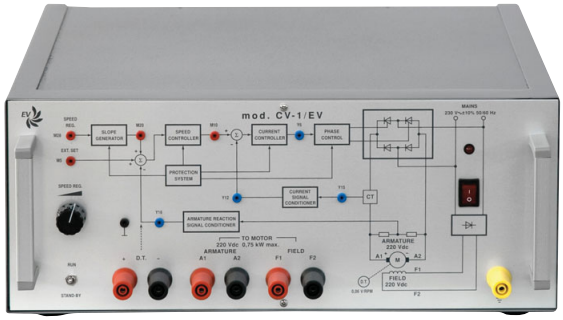
Service handbook

D.C. MOTOR DRIVE

Mod. CV-1/EV

INTRODUCTION

This system applies the operating principle of a half controlled unidirectional single-phase thyristor converter.
It can be used for RPM control of DC motors in closed-loop and open-loop regulation. It ensures automatic RPM control and current limitation via armature reaction.
This converter can also operate with an RPM signal output by a tachogenerator (mod. M-16/EV, not included in the equipment) that must be coupled to the motor having to be driven. This equipment is recommended for the connection with DC machines (motors) of "M" line.



TECHNICAL SPECIFICATIONS:

This equipment is inserted in a tabletop metallic box with schematic diagram silk-screen-printed on the fore panel.
Some test points are available for system optimization with the connection of measurement instruments.
It is suitable for DC motors with:
- power of 0.75 kW (max.)
- armature voltage of 220 Vdc
- excitation voltage of 220 Vdc

Dimensions: 400 x 395 x 170 mm
Net weight: 17 kg

RECOMMENDED MOTOR:

DIRECT-CURRENT MOTOR mod. M-1/EV

POWER SUPPLY:
230 V / PE 50-60 Hz Max. absorption.: 1 kVA

THEORETICAL-EXPERIMENTAL HANDBOOKS
Application handbook

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THREE-PHASE MOTOR DRIVE

Mod. VSD-1/EV

INTRODUCTION

This equipment applies the operating principle of a microprocessor-controlled transistor inverter of high technology.
It can carry out the main functions indicated here below:

- control system: sine wave, PWM-vector
- function of impulse run for discontinuous control and operation
- start and stop functions for mechanical brake
- electronic thermal relay included in the equipment to protect the motor from overload
- digital display for an easy reading of fault cause / frequency, acceleration/deceleration time, V/f mode, input signal level of voltage/current and r.p.m.

This equipment is recommended especially for the connection with three-phase motors of "M" line.

TECHNICAL SPECIFICATIONS:

This equipment is inserted in a tabletop metallic box with schematic diagram silk-screen-printed on the fore panel.
It is suitable for three-phase asynchronous motors with:
- power of 0.75 kW (max.)
- rated voltage: 3 x 230 V
- output frequency: 6 to 120 Hz

Dimensions: 400 x 395 x 170 mm
Net weight: 14 kg

RECOMMENDED MOTOR:

THREE-PHASE ASYNCHRONOUS MOTOR mod. M-4/EV

POWER SUPPLY:

230 V / PE 50-60 Hz Max. absorption.: 1 kVA

THEORETICAL-EXPERIMENTAL HANDBOOKS

Application handbook

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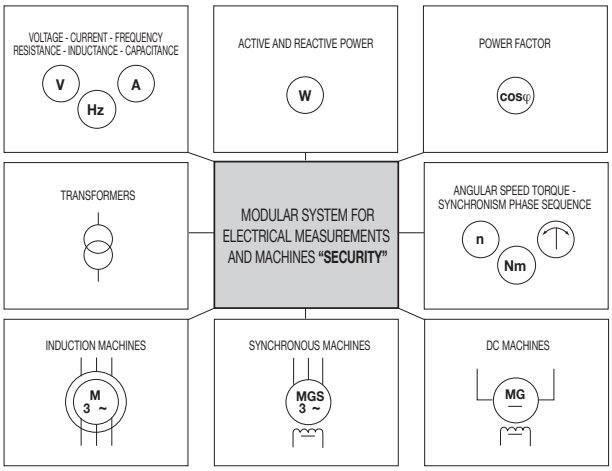
MODULAR SYSTEM FOR ELECTRIC MEASUREMENTS AND MACHINES - "SECURITY" LINE

MODULAR SYSTEM FOR ELECTRIC MEASUREMENTS AND MACHINES "SECURITY" LINE

INTRODUCTION

This system has been designed to ensure the highest safety against the risks of electric current in the implementation of an experimental program of measurements on static and rotating machines of fractional power (200 W). The whole system operates in safety extra-low voltage and uses power supply units, machines and accessories with rated voltage of 24/42 V (SELV type).
The modular characteristics of this system ensures the highest flexibility.
Here is an example of configuration:
Tabletop power supply unit mod. AV-B/EV, set of electric machines mod. „MB…" and starting/excitation rheostats, modules for electric measurements and measurements on machines mod. UM…/EV, variable loads RL-IL-CL-1B/EV.
The training program covers the following topics:

- Measurements of resistance of windings of electric machines, of inductance, capacitance
- Measurements of torque and angular velocity
- Detecting no-load, load and short-circuit characteristics of direct-current, synchronous, asynchronous and special machines
- Detecting no-load, load and short-circuit characteristics of transformers



TRAINING PROGRAM:

Measurement of resistance by voltmeter-ammeter method – measurements of impedance

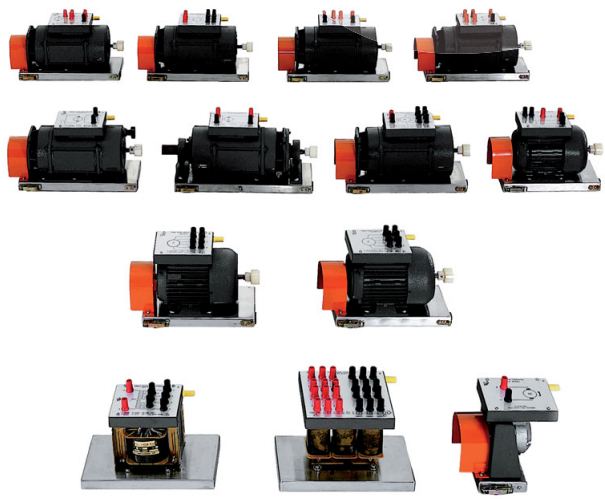
- DC generator with separate excitation
- DC generator with shunt excitation
- DC generator with series excitation
- DC generator with compound excitation
- Parallel coupling of two DC generators with shunt excitation (self-excited)
- Parallel coupling of two DC generators with compound excitation
- DC motor with shunt excitation
- DC motor with series excitation
- DC motor with compound excitation, differential long and short shunt
- DC motor with compound excitation, additional long and short shunt
- Ward Leonard system
- Determination of neutral plane
- Three-phase alternator
- Three-phase alternator with resistive, inductive and capacitive load
- Parallel of two alternators
- Synchronous motor
- Lead-lag operation of a synchronous machine with unit power factor
- Synchronous compensator
- Asynchronous three-phase cage motor
- Asynchronous three-phase cage motor operating with two voltages
- Asynchronous three-phase cage motor operating at two speeds by change of the pole number
- Asynchronous three-phase slip-ring motor
- Controlling starting and RPM of an asycnronous wound-rotor three-phase motor
- Controlling a self-synchronous motor
- Asynchronous single-phase motor with (single/two-phase) capacitor
- Asynchronous single-phase motor with starting capacitorù
- Universal motor
- Single-phase repulsion motor
- Single-phase transformer
- Polarity of single-phase transformer
- Single-phase transformer with resistive, inductive and capacitive load
- Single-phase transformers in parallel
- Autotransformer
- Three-phase transformer
- Polarity of three-phase transformer
- Transformation ratio of three-phase transformer
- Three-phase transformer with resistive, inductive and capacitive load
- Three-phase transformers connected in parallel
- Star/delta connection in a three-phase transformer
- T (or Scott) conenction

"SECURITY" ELECTRIC MACHINES

INTRODUCTION

These machines are included in a set of motors and transformers of reduced power; these machines, together with starting and control rheostats and with power supply units enable to determine all the typical operating lines, by the use of reduced voltages to ensure the highest safety against electric contacts. These machines of solid industrial construction also include a panel with silk-screen-printed schematic diagram showing the wiring diagram and the names of windings on standardized safety terminals.

The machines can easily be handled in the laboratory as they are provided with a base and with a quick coupling system for the connection with machines of the same line; furthermore the rotating machines are also equipped with male-female coupling joints on shaft prongs.
The rating plate is printed directly on the schematic diagram, for immediate reference.



DIRECT-CURRENT MOTOR / GENERATOR WITH SEPARATE / COMPOUND EXCITATION Mod. M-1B/EV

- Power: 200 W
- Armature voltage: 42 Vdc
- Excitation voltage: 42 Vdc
- R.p.m.: 3000 (*)
- It also operates as DC motor
- Form of construction: IM B3
- Protection: IP 22
- This unit also includes thermal protector
- Dimensions: 440 x 160 x 250 mm
- Weight: 15 kg

(*) other RPM values are available on demand

DIRECT-CURRENT MOTOR WITH SERIES EXCITATION Mod. M-2B/EV

- Power: 200 W
- Armature voltage: 42 Vc
- R.p.m.: 3000 (*)
- It also operates as DC motor
- Form of construction: IM B3
- Protection: IP 22
- This unit also includes thermal protector
- Dimensions: 440 x 160 x 250 mm
- Weight: 15 kg

(*) other RPM values are available on demand

THREE-PHASE SYNCHRONOUS GENERATOR WITH ASYNCHRONOUS STARTING Mod. M-3B/EV

- Power: 200 VA
- Voltage: 24/42 V 50 Hz (*)
- R.p.m.: 3000 (*) (2 poles)
- Excitation voltage: 42 Vdc
- It also runs as induction start synchronous motor
- Delta-star connection
- Form of construction: IM B3
- Protection: IP 22
- This unit also includes thermal protector
- Dimensions: 440 x 160 x 250 mm
- Weight: 17 kg

(*) other values of supply voltage and frequency and of r.p.m. are available on demand

THREE-PHASE ASYNCHRONOUS CAGE MOTOR Mod. M-4B/EV

- Power: 200 W
- Voltage: 24/42 V 50 Hz (*)
- R.p.m.: 2900 (*) (2 poles)
- Delta-star connection
- Form of construction: IM B3
- Protection: IP 44
- This unit also includes thermal protector
- Dimensions: 440 x 160 x 250 mm
- Weight: 11 kg

(*) other values of supply voltage and frequency and of r.p.m. are available on demand

THREE-PHASE ASYNCHRONOUS WOUND-ROTOR MOTOR Mod. M-5B/EV

- Power: 200 W
- Voltage: 24/42 V 50 Hz (*)
- R.p.m.: 2900 (*) (2 poles)
- Rotor voltage 42 V
- Delta-star connection
- Form of construction: IM B3
- Protection: IP 22
- This unit also includes thermal protector
- Dimensions: 440 x 160 x 250 mm
- Weight: 17 kg

(*) other values of supply voltage and frequency and of r.p.m. are available on demand

ASYNCHRONOUS SINGLE-PHASE MOTOR WITH STARTING CAPACITOR Mod. M-8B/EV

- Power: 200 W
- Voltage: 42 V 50 Hz (*)
- R.p.m.: 2900 (*) (2 poles)
- Form of construction: IM B3
- Protection: IP 44
- This unit also includes thermal protector
- Dimensions: 440 x 160 x 250 mm
- Weight: 11 kg

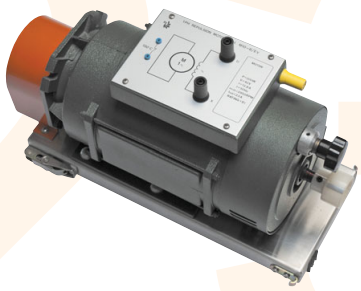
(*) other values of supply voltage and frequency and of r.p.m. are available on demand

THREE-PHASE ASYNCHRONOUS TWO-POLE (DAHLANDER) CAGE MOTOR Mod. M-6B/EV

- Power: 280/150 W
- Voltage: 42 V 50 Hz (*)
- R.p.m.: 2900/1450 (*) (2/4 poles)
- Form of construction: IM B3
- Protection: IP 44
- This unit also includes thermal protector
- Dimensions: 440 x 160 x 250 mm
- Weight: 12 kg

(*) other values of supply voltage and frequency and of r.p.m. are available on demand

REPULSION START INDUCTION SINGLE-PHASE MOTOR Mod. M-10B/EV



- Power: 200 W
- Voltage: 42 V 50 Hz (*)
- R.p.m.: 0-3000 (*)
- Form of construction: IM B3
- Protection: IP 22
- This unit also includes thermal protector
- Dimensions: 440 x 160 x 250 mm
- Weight: 16 kg

(*) other values of supply voltage and frequency and of r.p.m. are available on demand

ELECTRODYNAMOMETER – DC DYNAMOMETER Mod. M-12B/EV

Besides being a typical DC motor/generator, this machine also includes some devices making it particularly suitable to carry out the function of electrodynamometer for measuring the torque output by the motors coupled to it.

- Power: 250 W
- Armature voltage: 42 Vdc
- Excitation voltage: 42 Vdc
- R.p.m.: 3000 (*)
- Braking torque: 1 - 0 - 1 Nm
- It also operates as DC motor
- Mechanical device of torque measurement
- Form of construction: IM B3
- Protection: IP 22
- This unit also includes thermal protector
- It is also prearranged to be connected with digital torque meter mod. UM-G1/EV
- Dimensions: 440 x 160 x 250 mm
- Weight: 21 kg

(*) other RPM values are available on demand

THREE-PHASE TRANSFORMER Mod. M-14B/EV

- Power: 200 VA
- Voltage of primary winding: 24/42/36V 50-60 Hz
- Delta/star/zigzag connection
- Voltage of secondary winding: 24/42/36V (*)
- Delta/star/zigzag connection
- Protection: IP 22
- This unit also includes thermal protector
- Dimensions: 360 x 160 x 250 mm
- Weight: 8 kg

UNIVERSAL AC/DC MOTOR Mod. M-11B/EV

- Power: 100 W
- Voltage: 42 Vac 50 Hz (*) / 42 Vdc
- R.p.m.: 3000 (*)
- Form of construction: IM B3
- Protection: IP 22
- This unit also includes thermal protector
- Dimensions: 440 x 160 x 250 mm
- Weight: 15 kg

(*) other values of supply voltage and frequency and of r.p.m. are available on demand

SINGLE-PHASE TRANSFORMER Mod. M-13B/EV

- Power: 200 VA
- Voltage of primary winding: 42 V 50-60 Hz
- Voltage of secondary winding 1: 0-6,3-21-42 V
- Voltage of secondary winding 2: 0-12-24 V
- Protection: IP 22
- This unit also includes thermal protector
- Dimensions: 360 x 160 x 250 mm
- Weight: 10 kg

TACHOGENERATOR Mod. M-16/EV

This tachogenerator is used to measure the speed of rotation of "M" and "M-B" electric machines. The output signal can be converted into r.p.m. by tachometer voltmeter mod. AZ-73. It can also be connected with digital unit mod. UM-G1/EV to plot the characteristic curves with an X-Y recorder (not included in the equipment).

- Output voltage: 0,06 V per revolution
- R.p.m.: 5000 max.
- Output voltage 1: 300 Vdc at 5000 r.p.m.
- Output voltage 2: 10 Vdc at 5000 r.p.m.
- Protection: IP 44
- This unit also includes thermal protector
- Dimensions: 160 x 160 x 250 mm
- Weight: 5 kg

TABLETOP POWER SUPPLY UNIT OF EXTRA-LOW VOLTAGE

Mod. AV-B/EV

INTRODUCTION

This power supply unit and its accessories represent the ideal solution for the implementation of programs of measurements applied to "Security" electric machines.

This power supply unit outputs the necessary fixed and variable Safety Extra-Low Voltages (SELV).

TECHNICAL SPECIFICATIONS:

Mechanical characteristics:
Box made of sheet steel and sections, painted with epoxy varnish; silk-screen-printed fore panel of aluminium alloy with flush-mounted handles for transport.

Electric characteristics:

- **Main control device of electro-magnetic type,** with key switch; magneto-thermal differential circuit breaker of high sensitivity and emergency pushbutton.
- **Service line** with two EEC-type universal single-phase (230 V) and three-phase (3x 400 / N / PE) sockets
- **Fixed three-phase line 3 x 42 Vac – 10 A,** protected by magneto-thermal circuit breaker, safety terminals
- **Fixed line of 42 Vdc – 10 A,** with protected and rectified voltage, safety terminals
- **Variable three-phase line of 0-48 Vac / 0-48 Vdc 10 A**, with magneto-thermal/fuse protection, AC and DC separate output with safety terminals
- **Regulated variable line of 0-48 Vdc – 2 A,** with electronic protection against short-circuits and overload, digital instrument for measuring output voltage and current

Dimensions: 525 x 500 x 600 mm
Net weight: 70 kg

TRAINING PROGRAM:

The training program is that of measurements on "Security" electric machines.

POWER SUPPLY:

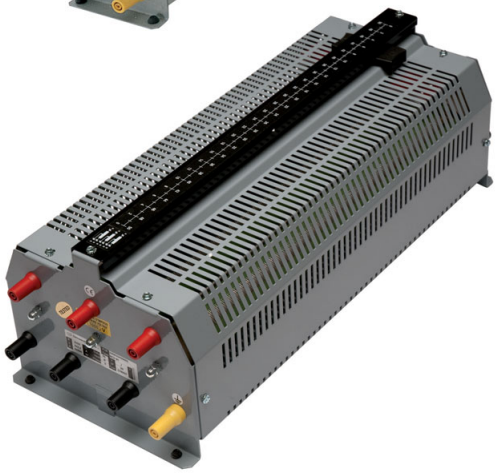
3 x 400 V / N / PE 50-60 Hz
(3 X 220-230 V, or other values on demand)
Max. absorption.: 2 kVA

TABLETOP SLIDE VARIABLE RHEOSTATS

Mod. RT-1B/EV
Mod. RT-3B/EV

INTRODUCTION

These laboratory rheostats are wound on tubular cylinders of porcelain. Resistive Constantan alloy is anchored onto the collar-shaped ends, slider with copper-silver contacts connected with safety terminals (Ø 4 mm). Protection against indirect contacts by pierced sheet steel with protection degree IP 20. Rheostats of RT-1/EV line have only one resistor, whereas rheostat of RT-3/EV line includes three resistors.



SHUNT FIELD RHEOSTAT GENERATOR Mod. RT-1B/EV

- Linear rheostat
- Power: 500 W
- Current: 1 A
- Resistance value: 500 Ohm
- Terminals: 3
- Dimensions: 350 x 100 x 150 mm
- Weight: 3 kg
- Suitable for machines mod. M-1B/EV, M-2B/EV, M-3B/EV, M-12B/EV

SHUNT FIELD RHEOSTAT SERIES FIELD RHEOSTAT MOTOR DC STARTING RHEOSTAT ROTOR STARTING STATOR STARTING Mod. RT-3B/EV

- Linear rheostat
- Power: 3 x 500 W
- Current: 7 A
- Resistance value: 3 x 10 Ω
- Terminals: 9
- Dimensions: 550 x 300 x 150 mm
- Weight: 3,5 kg
- Suitable for machines mod. M-1B/EV, M-2B/EV, M-4B/EV, M-5B/EV, M-12B/EV

THEORETICAL-EXPERIMENTAL HANDBOOKS

Technical handbook

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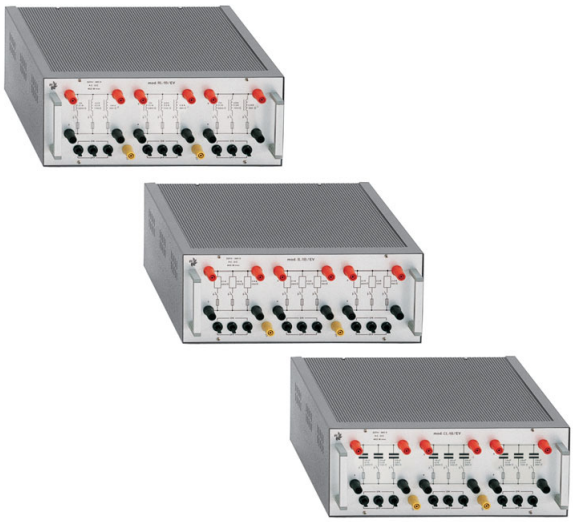
VARIABLE LOADS
Mod. RL-1B/EV
Mod. IL-1B/EV
Mod. CL-1B/EV

INTRODUCTION

These loads are assembled in a painted tabletop metallic box with silk-screen-printed fore panel of aluminium alloy and graphic representation of components.



VARIABLE RESISTIVE LOAD Mod. RL-1B/EV

- 3 separate resistive sectors
- 21 values of DC or single-phase active power
- 7 values of three-phase active power
- Safety terminals and protection by fuses
- Power supply CA: 24/42 V
- Power supply CC: 42 V
- Maximum apparent power: 250 W
- Dimensions: 400 x 395 x 170 mm
- Weight: 11 kg

VARIABLE CAPACITIVE LOAD Mod. CL-1B/EV

- 3 separate capacitive sectors
- 21 values of single-phase reactive power
- 7 values of three-phase reactive power
- Safety terminals and protection by fuses
- Power supply: 24/42 V 50 Hz (*)
- Maximum apparent power: 250 VA
- Dimensions: 400 x 395 x 170 mm
- Weight: 8 kg

VARIABLE INDUCTIVE LOAD Mod. IL-1B/EV

- 3 separate inductive sectors
- 21 values of single-phase reactive power
- 7 values of three-phase reactive power
- Safety terminals and protection by fuses
- Power supply: 24/42 V 50 Hz (*)
- Maximum apparent power: 250 VA
- Dimensions: 400 x 395 x 170 mm
- Weight: 40 kg

(*) other values of supply frequency are available on demand

ACCESSORIES SUPPLIED WITH EACH LOAD:
Set of 9 cables with safety plugs (Ø 4 mm).

THEORETICAL-EXPERIMENTAL HANDBOOKS

Technical handbook

MEASUREMENT UNIT OF TORQUE, SPEED, MECHANICAL POWER

Mod. UM-G1/EV

INTRODUCTION

This unit supplied in a tabletop box includes a revolution counter, a torque meter and a digital mechanical power meter; it can perfectly be inserted in the modular systems for measurements on electric machines of "SECURITY", "COMPACT" and "POWER" lines.
Besides displaying the digital values of the various quantities, this unit is also provided with the corresponding analog outputs, separated electrically: these outputs enable to drive an X-Y recorder for plotting characteristic curves or interfacing to acquisition systems.
This type of units can easily be connected with the measuring circuit thanks to a silk-screen-printed schematic diagram, to educational terminals for safety plugs with diameter of 4 mm, to DIN connectors for the load cell and the reflection speed transducer.

TECHNICAL SPECIFICATIONS:

- Microcontroller with USB interface for a possible use with personal computer
- 4 buttons (Up – Down – Return – Back) for the control of instruments
- Graphic Liquid-Crystal Display of 128 x 64: it simultaneously indicates the speed (in rpm), the torque (in Nm), the force (in kg) and the mechanical power (in W)
- Measurement of speed 1, input from tachogenerator ± 10 Vdc / 5000 rpm 12-bit A/D converter for D.T. 2 mV/rev (not included in the equipment; units suggested: mod. M-16/EV or mod. P-16/EV)
- Measurement of speed 2, input from reflection transducer (included in the equipment); range of 0 to 5000 rpm
- Measurement of force/torque, input from load cell of 20 kg (included in the equipment), 12-bit A/D converter; the arm length can be set up to 1 m according to the application. The load cell is prearranged for applications with Tachogenerator mod. M-12/EV or mod. P-12/EV and with Eddy current brake mod. M-15/EV or P-15/EV (not included in the equipment)
- The display of this unit also indicates the value of the mechanical power of the motor under test
- 3 analog outputs of 0 to ±10Vdc, proportional to the measured quantities of speed, torque and mechanical power, for X-Y recorder
- Painted tabletop metallic box with silk-screen-printed fore panel of aluminium alloy

Dimensions: 400 x 405 x 160 mm
Net weight: 8 kg

SUPPLIED ACCESSORIES:

- Reflection transducer for detecting the speed of electric rotating machines
- Load cell of 20 kg
- Single-phase power cord with German/French plug

OPTIONAL ACCESSORIES:

- USB cable
- Software for using the unit with a personal computer. This software is designed to display all the measured parameters and to gather the corresponding data in a table, with a format compatible with the most common spreadsheets

POWER SUPPLY:

230 V / PE 50-60 Hz 50 VA (other voltages on demand)

COURSEWARE

Technical handbook

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23-C

ELECTRICAL AUTOMATION LABORATORY

 ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

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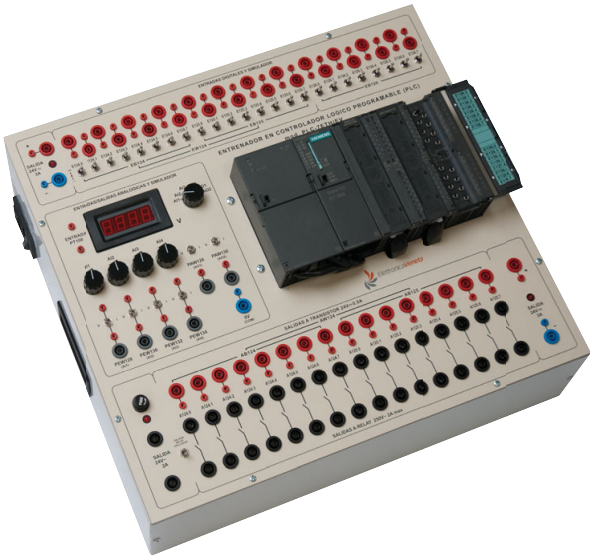
23-C

PLC

PLC TRAINING PANEL
Mod. PLC-V7/EV



Inside a laboratory for automation technologies, the trainer mod. PLC-V7/EV is the necessary tool for the high level training of technicians operating in modern process industry. Totally carried out with industrial components, the trainer PLC-V7/EV enables the development of a solid experimentation and a high content of knowledge on PLC programming and the solution of more complex problems related to automation.

The training program includes a wide range of applications in:

- **Industrial installations**
- **Robotics**
- **Automation with conveyor**
- **Process controls with PID techniques**

The PLC installed in the trainer mod. PLC-V7/EV is one of the most powerful and used in industry. It provides many digital inputs and outputs accessible by means of terminals of two diameters (ø 4 mm and ø 2 mm) present on the front panel of the trainer. Twelve special digital inputs are used for fast counting, process alarms, frequency measurement and positioning. As concerns the digital outputs, these are available as relay outputs or transistor outputs for all those applications which need quicker timing. The logic state of the digital inputs and outputs is displayed via LED diodes on the PLC. Four analog inputs, one input for Pt100 temperature probe and two analog outputs are available for exercises involving process control.

With four rotating potentiometers and an inner stabilizer, you can adjust the voltages or currents level at the analog inputs. In this way, no external power supply is necessary for the generation of references.

The front panel of the trainer PLC-V7/EV shows the silk screen panel of the diagrams and the inner components of the equipment, complete with any name. This wide and clear vision of the system increases its teaching value, facilitating the layout of connections and the development of the exercises. A 3 and ½ – digits digital voltmeter displays the voltage across the analog inputs and outputs according to the position of a rotating switch. The programming software in WIN 7 Professional (32/64 Bit) enables the development of programs of exercises with PLC in the most used languages of industrial automation: **AWL, KOP, FUP, SCL, S7-GRAPH**, according to IEC 61131-3 standards.

The connection between Personal Computer and PLC is made via supplied USB interface cable and PC adapter. Moreover, the PLC can be connected to industrial networks according to Profinet e Profibus protocols At last, the development of the exercises is guided effectively by the theoretical/experimental handbooks available with the trainer.

TRAINING PROGRAM:

The trainer PLC-V7/EV enables the theoretical analysis and the experiments on the following main exercises:

- PLC architecture
- Instructions processing: the cycle concept
- Synchronous, asynchronous and priority cycles
- Performing times, cycle and reaction
- Boolean Algebra
- AWL, KOP, FUP, SCL, S7-GRAPH programming
- Combinational logic functions
- Sequential logic functions
- Addressing
- Timers & counters
- Clock generators
- Monostable and bistable circuits
- Algebra operation: addition, subtraction, multiplication
- BCD/binary conversions
- Binary/BCD conversions
- Structured programming techniques
- Basic and structured data
- Programming of functions, function blocks, data blocks
- Integrated functions of fast counting, frequency measurement, positioning
- Process interruptions management
- Industrial networks: Profinet and Profibus
- Programming and use of industrial operators panels

Typical application
- Mechatronics modules

PID regulations
- Process control (Level, flow, pressure, temperature)

PLC and PC Communication:
- Inputs/Outputs diagnosis
- Internal states diagnosis
- I/O and internal variables forcing
- PLC networks (Master/Slave)

TECHNICAL SPECIFICATIONS:

- Tabletop metal box with press-formed aluminium section structure
- Side handles, not protruding, for easy transport in the laboratory
- Front panel, in insulating material, with silk screen representation of the diagrams and inner components of the equipment
- 24 Vdc/3 A power supply for control of the digital inputs and outputs. With electronic protection against short-circuits and overloads.
- 24 Vac/3 A power supply relay outputs control with fuse protection against overloads
- 1 3 and 1/2-digit digital voltmeter for measurement of the voltage present across the inputs or the analog output 0.1Vdc resolution.
- 1 Rotating switch for voltmeter input selection
- 4 analog inputs V/I: ±10 Vdc, ±20 mA
- 1 input for Pt 100 temperature probe
- 2 analog outputs V/I: ±10 Vdc, ±20 mA
- 4 Rotating potentiometers for setting up voltage analog references in the range 0..10 Vdc
- Inner voltage reference obtained via 24 Vdc inner stabilizer
- 24 Digital standard inputs of which 12 special for technologic functions (counting, frequency measurement max 60 kHz. Digital input simulator with permanent and pulse state switches
- Simulator block for testing the program during commissioning and operation, 16 digital inputs or 16 digital outputs or 8 digital inputs and 6 digital outputs
- 16 24 Vdc digital outputs
- Safety terminals, standard ø 4 mm and ø 2 mm for connection of the inputs and outputs to external devices.

- **Digital outputs interfacing**
  - With 10 Aac/2 Adc relay
  - Transistor for fast applications

PLC characteristics
- Power Supply: 24 Vdc
- Working memory: 192 kByte
- Load memory: 512 Kbyte with MMC
- Programming interface: RS-485
- Network interface: RS-485, Profinet, Profibus
- Communication: MPI (Multi Point Interface)
- Operating mode: Master/Slave
- Digital inputs: 24 at 24 Vdc; potential separation in groups of 4; protection from polarity inversion. Bit, byte, word addressing
- Special digital inputs: 12 with technologic functions
- Input state display: green LED
- Digital outputs: 16 at 24 Vdc/0,5 A; galvanic separation from CPU in groups of 8; immunity against short-circuits.
- Bit, byte, word addressing
- Output state display: LED diodes
- Analog inputs: 4 voltage/current
- Temperature probe input: 1 for Pt100 probe
- A/D conversion resolution: 11 bit + sign
- Range of the analog input voltage: ±10 Vdc
- Range of the analog input current: ±20 mA
- Analog outputs: 2 voltage/current
- D/A conversion resolution: 11 bit + sign
- Range of the analog output voltage: ±10 Vdc
- Range of the analog output current: ±20 mA
- Operating mode selector: "STOP","RUN", "MRES" USB/ MPI
- USB/ MPI interface
- USB cable for connection to PC
- Single-phase power supply cable

Power Supply:	230 Vac – 50 Hz single-phase (Other voltage and frequency upon request)
Dimensions:	415 x 400 x 150 mm
Net Weight:	10 kg

INDISPENSABLE (NOT INCLUDED)

PLC PROGRAMMING SOFTWARE mod. SW7/EV
Software for developing PLC programs using AWL, KOP, FUP, SCL and S7-GRAPH languages and for creation of basic HMI screens. Windows 7 Professional (32 bit/64 bit) programming environment.

INCLUDED

THEORETICAL-EXPERIMENTAL HANDBOOK AND APPLICATION GUIDE

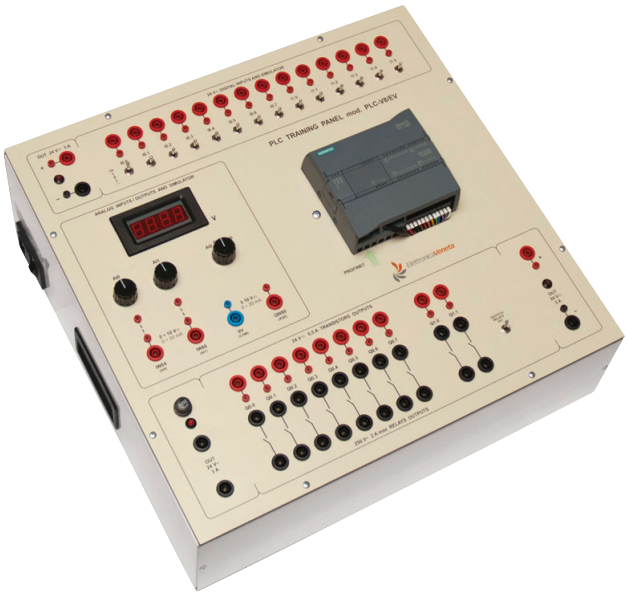
TECHNICAL HANDBOOK ON DVD WITH CONTROLLER SPECIFICATIONS, OPERATION, MAINTENANCE AND COMMUNICATION INSTRUCTIONS

OPTIONALS

- **TOUCHSCREEN OPERATOR PANEL Mod. T7-IOP/EV**

- **HMI SUPERVISION SOFTWARE Mod. SV/EV**
  Industrial HMI software with graphic pages, suggested for supervision and servicing practices when using operator panels. Windows 7 Professional (32 bit/64 bit) programming environment.

PLC TRAINING PANEL
Mod. PLC-V8/EV



Inside a laboratory for automation technologies, the trainer mod. PLC-V8/EV is the necessary tool for the high level training of technicians operating in modern process industry, for installations maintenance and program designing levels. Totally carried out with industrial components, the trainer PLC-V8/EV enables the development of a solid experimentation and a high content of knowledge on PLC programming and the solution of more complex problems related to automation, with particular reference to process control with HMI/SCADA software and to communication in industrial networks.

The PLC installed in the trainer is one of the most powerful and used in industry. It provides many digital inputs and outputs accessible by means of terminals of two diameters (ø 4 mm and ø 2 mm) present on the front panel of the trainer. The digital outputs are available as relay outputs or transistor outputs for all those applications which need quicker timing. The logic state of the digital inputs and outputs is displayed via LED diodes on the PLC. The analog signals processing allows it to be used within the industrial regulations in closed-loop PID controls. With two rotating potentiometers, you can adjust the voltages or currents level at the analog inputs.

In this way, no external power supply is necessary for the generation of references.

The front panel of the trainer PLC-V8/EV shows the silk screen panel of the diagrams and the inner components of the equipment, complete with any name. This wide and clear vision of the system increases its teaching value, facilitating the layout of connections and the development of the exercises. A 3 and ½ – digits digital voltmeter displays the voltage across the analog inputs and outputs according to the position of a rotating switch. The programming software in WIN 7 Professional (32/64 Bit) enables the development of programs of exercises with PLC in the most used languages of industrial automation **KOP, FUP**, according to IEC 61131-3 standards.

The connection between Personal Computer and PLC is made via supplied Ethernet interface. Moreover, the PLC can be connected to industrial networks according to **ProfiNet** protocols. At last, the development of the exercises is guided effectively by the theoretical/experimental handbooks available with the trainer.

TRAINING PROGRAM:

The trainer PLC-V8/EV enables the theoretical analysis and the experiments on the following main exercises:

- PLC architecture
- Instructions processing: the cycle concept
- Synchronous, asynchronous and priority cycles
- 2 rotating potentiometers for setting the analog references
- Ø 4 mm and Ø 2 mm standard safety terminals for the connection of I/O to external devices
- Communication Protocol: TCP/IP
- Industrial communication interface: ProfiNet
- Performing times, cycle and reaction
- Boolean Algebra
- **KOP** and **FUP** basic programming
- Combinational logic functions
- Sequential logic functions
- Addressing
- Timers & counters
- Clock generators
- Monostable and bistable circuits
- Algebra operation: addition, subtraction, multiplication, division
- BCD/binary and Binary/BCD conversions
- Integrated functions of fast counting, frequency measurement, positioning
- Program Blocs
- PID control with auto-tuning
- Interrupt related to internal and external events
- Programming and use of industrial operators panels
- Industrial networks: ProfiNet

Typical application
- Mechatronics modules

PID regulations
- Process control (Level, flow, pressure, temperature)

PLC and PC Communication
- Inputs/Outputs diagnosis
- Internal states diagnosis
- I/O and internal variables forcing
- PLC networks (Master/Slave)

TECHNICAL SPECIFICATIONS:

- Tabletop metal box with press-formed aluminium section structure
- Side handles, not protruding, for easy transport in the laboratory
- Front panel, in insulating material, with silk screen representation of the diagrams and inner components of the equipment
- 24 Vdc / 2 A power supply for control of the digital inputs and outputs. With electronic protection against short-circuits and overloads.
- 24 Vac / 2 A power supply relay outputs control with fuse protection against overloads
- 1 3 and 1/2-digit digital voltmeter for measurement of the voltage present across the inputs or the analog output 0.1Vdc resolution.
- 1 Rotating switch for voltmeter input selection
- 2 analog inputs V/I: 0÷10 Vdc, 0÷20mA
- 1 analog output V/I: ±10 Vdc, 0÷20mA
- 14 Digital standard inputs of which 6 special for fast counting
- Digital inputs simulator with permanent and pulse state switches
- 10 24 Vdc digital outputs of which 2 with f=100 kHz pulses
- Safety terminals, standard ø 4 mm and ø 2 mm for connection of the inputs and outputs to external devices.

Digital outputs interfacing
- With 10 Aac/2 Adc relay
- Transistor for fast applications

PLC characteristics
- Power Supply: 24 Vdc
- Hardware clock: YES
- Backup time: 240 h
- Working record: 50kbyte
- Data record: 2 Mbyte
- Speed: 0,1 µs for binary instruction
- Programming interface: TCP/IP
- Network interface: PROFINET
- Digital inputs: 14 at 24 Vdc; potential separation; protection from polarity inversion. Bit, byte, word addressing, from which 6 with fast counting functions
- Input state display: YES (green LED)
- Digital outputs: 10 at 24 Vdc/0,5A; galvanic separation from CPU; immunity against short-circuits. Bit, byte, word addressing from which 2 with f=100 kHz pulses
- Output state display: YES (LED diodes)
- Analog inputs: 2 voltage/current
- Range of the analog input voltage: 0..10 Vdc
- Range of the analog input current: 0÷20mA
- Analog outputs: 1 voltage\current
- Range of the analog output voltage: ±10 Vdc
- Range of the analog output current: 0..20 mA
- Ethernet cable for connection to PC included
- Single-phase power supply cable

Power supply:	230 Vac – 50 Hz single-phase (Other voltage and frequency upon request)
Dimensions:	415 x 400 x 150 mm
Net Weight:	10 kg

LABORATORY KIT mod. KPLC-8/EV

It is also available a laboratory kit consisting of:
- No. 6 PLC trainer panels mod. PLC-V8/EV

INCLUDED

PLC PROGRAMMING SOFTWARE
Software for developing PLC programs using KOP and FUP languages and for creation of basic HMI screens. Windows 7 Professional (32 bit/64 bit) programming environment.

THEORETICAL-EXPERIMENTAL HANDBOOK AND APPLICATION GUIDE

TECHNICAL HANDBOOK ON DVD WITH CONTROLLER SPECIFICATIONS, OPERATION, MAINTENANCE AND COMMUNICATION INSTRUCTIONS

OPTIONALS

- **TOUCHSCREEN OPERATOR PANEL Mod. T7-IOP/EV**
- **HMI SUPERVISION SOFTWARE Mod. SV/EV**
  Industrial HMI software with graphic pages, suggested for supervision and servicing practices when using operator panels. Windows 7 Professional (32 bit/64 bit) programming environment.

- **4-PORT RJ45 SWITCH - 24 Vdc Mod. CSM/EV**

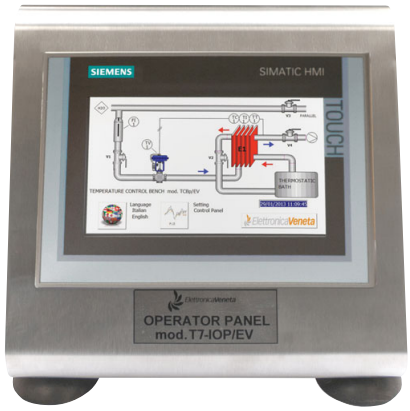
TOUCHSCREEN OPERATOR PANEL

Mod. T7-IOP/EV

INTRODUCTION

The operator panel mod. T7-IOP/EV is a suggested accessory for the PLC training panels mod. PLC-V7/EV and PLC-V8/EV.

It is the necessary tool for the study of modern HMI (Human Machine Interface) technologies used in the control panels of the industrial automated machines. It can be programmed from a PC by means of a supplied specific software and can be connected to the PLC via a supplied Ethernet communication cable.



TRAINING PROGRAM:

The industrial operator panel mod. T7-IOP/EV includes the following main exercises:

- Operator panel – PLC connection
- Creation of a program
- Display of process values
- Control and processing of exercise signals
- Set-point setting via virtual keys
- Information texts for signals

TECHNICAL SPECIFICATIONS:

- Protective case
- TFT 7" display (16 million colours)
- Touchscreen display
- 800 x 480 pixels resolution
- 12 MB user memory
- 2 x RJ 45 for PROFINET (with integrated switch)
- 1 x RS 485/422 for PROFIBUS/MPI
- 2 x USB-host, 1 x USB-device
- 2 x SD card slot
- 2 terminals (Ø = 4 mm) for power supply from PLC trainer
- 2 cables (Ø = 4 mm) with safety terminals
- Ethernet cable

Power Supply: 24 Vdc from PLC training panel
Dimensions: 214 x 158 x 63 mm
Weight: 2 kg

SUPPLIED WITH

THEORETICAL-EXPERIMENTAL HANDBOOK FOR EQUIPMENT PRESENTATION AND GUIDE TO EXERCISES

TECHNICAL HANDBOOK WITH TECHNICAL SPECIFICATIONS, USE, MAINTENANCE, SERIAL COMMUNICATION

SUPERVISION SOFTWARE - ADVANCED LEVEL MOD. SV/EV

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APPLICATIONS OF ELECTRIC AUTOMATION

Topics concerning electrical automation are also featured on the following modules:

SIMULATOR OF PROGRAMMABLE SYSTEMS

Mod. SSP-1/EV

INTRODUCTION

Simulating various systems and installations is very useful in training practice; in fact, the physical part of an installation is often complex and cumbersome, but in the meantime it is essential from a functional point of view; simulators are designed to replace this part of systems.

System Simulator mod. SSP-1/EV is equipped with 20 interchangeable masks, thus it cam reproduce different installations with sequential and analog control. Simple electric connections can interface the process reproduced on the mask to PLC inputs and outputs. Processes are represented on masks via LEDs, bargraphs, pushbuttons, limit switches, etc…

Users can write the control program in the programmable controller or they can use the programs supplied with the controller that can also be customized.

This System Simulator consists of a basic module that house the various masks corresponding to the system having to be simulated, from time to time. This simulator is also equipped with a handbook including some exercises already developed for each mask (available also on CD) for PLC training panel mod. PLC-V7/EV (not included).

TRAINING PROGRAM:

The training programme includes the following exercises:

1 - FILLING A BIN
Managing the process control for filling a bin

2 - ELEVATOR
Controlling an elevator moving on 4 floors

3 - PEDESTRIAN TRAFFIC LIGHT
Controlling a traffic light unit on main road with pedestrian crossing

4 - STARTING AN ASYNCHRONOUS WOUND-ROTOR MOTOR
Controlling the starting sequence by 1, 2 or 3 (selectable) steps. Resetting the initial conditions at stop

5 - STARTING DAHLANDER MOTOR
Controlling the HIGH / LOW motor speed

6 - REVERSAL OF ROTATION OF ASYNCHRONOUS MOTOR
Controlling the direction of rotation of the motor

7 - STAR-DELTA START OF ASYNCHRONOUS MOTOR
Controlling the D/Y starting sequence at adjustable times; resetting the initial conditions at stop

8 - SEQUENTIAL NEON SIGN
Controlling different programs of sequential lighting of 1 to 8 lamps, with separate variation of lighting times; operation: AUTO/MAN and UP/DOWN

9 - DRINK MACHINE
Simulating the different operation sequences of a drink machine

10 - REACTOR
Managing the reaction with control of refrigerant (hot and cold) and of mixer

11 - MIXER
Controlling the mixing process of different substances

12 - STARTING AN ASYNCHRONOUS MOTOR
Starting sequence of an asynchronous motor

13 - CAR PARK
Controlling a car park with indications of "FULL" and of "FREE BAYS"

14 - COMPRESSED AIR NETWORK
Controlling compressors and tank for production and distribution of compressed air

15 - CONVEYOR BELTS 1
Transport of sandy material controlled by three conveyor belts

16 - CONVEYOR BELTS 2
Controlling conveyor belts for the transport of various products

17 - FILLING SYSTEM 1
Automatic filling process of tablets

18 - FILLING SYSTEM 2
Filling process of three tanks

19 - MACHINING LINE
Implementation of different sequences by the use of all the phase or of some of them

20 - MONITORING THE OPERATION OF FOUR PUMPS
Controlling the operation of four pumps for testing pressure inside a distribution network

TECHNICAL SPECIFICATIONS:

This System Simulator consists of a panel that can be used as tabletop unit or mounted on vertical frame.
It includes 12 inputs and 12 digital outputs connected via safety leads with plugs of Ø 4 mm. Two potentiometers enable to set two analog variables (0 – 10 V) used, for instance, to indicate the filling rate of a bin, the up and down movements of an elevator, etc…
6 instantaneous contacts held by switches and 6 LEDs of state indication are available on the fore panel.
A bargraph display will show the level of a tank or the position of an elevator; 6 electric limit switches enable to monitor the minimum/maximum positions, as well as the intermediate positions.

Dimensions: 390 x 297 x 100 mm
Net weight: 5 kg

SUPPLIED ACCESSORIES:

Set of 24 leads with safety plugs (Ø 4 mm)

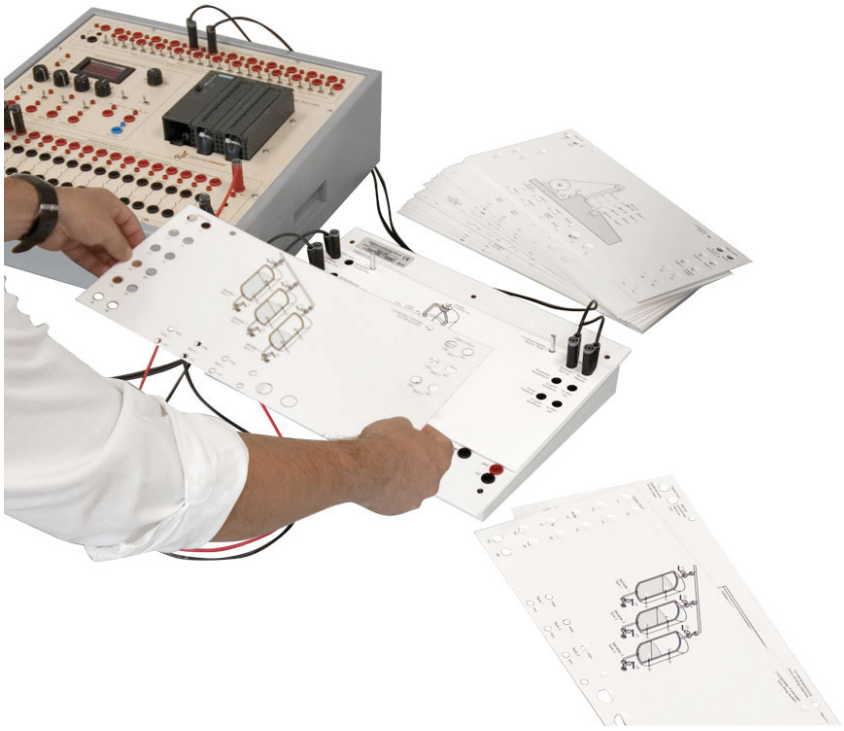
SYSTEM REQUIREMENTS - PLC:

- 12 positive-logic digital inputs
- 12 digital outputs, 24 Vdc
- 2 analog inputs, 0-10 Vdc
- 2 analog output, 0-10 Vdc

RECOMMENDED PLC:

For a better educational experience use PLC Training panel mod. PLC-V7/EV (not included).

AS AN ALTERNATIVE:
PLC Training panel mod. PLC-V8/EV (not included). Remark: Mask 14 - *Compressed air network* cannot run with this PLC.



Example of configuration with a PLC training panel (not included)

POWER SUPPLY:

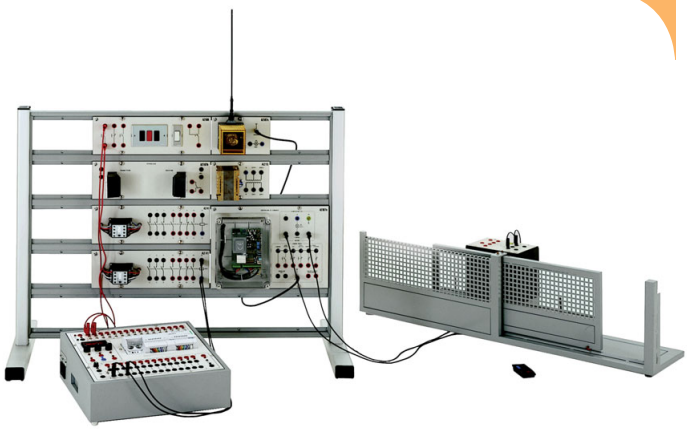
24 Vdc (that can be output by the PLC)

THEORETICAL-EXPERIMENTAL HANDBOOKS

Handbook of installation and of theoretical-experimental use, with exercises. It includes the application for PLC on magnetic storage medium.

AUTOMATION OF SLIDING GATES

Mod. MR/EV



Example of configuration with a PLC training panel (not included)

INTRODUCTION

This system has been designed so that students can assemble, analyze and test a wide range of electric circuits used in programmable logic. **Using a PLC training panel (PLC-V7/EV or PLC-V8/EV, not included in the system)** with interchangeable modules, students can assemble more and more complex circuits by connecting the PLC and the devices having to be automated, via flexible cables supplied with the equipment.
Modules are made of insulating material and they represent the support of the necessary devices for implementing the experimentation program; they are also provided with the graphic representation showing the standardized electric symbol of the component; connections are made easier by standardized educational terminals (Ø 4 mm) with high protection degree against accidental contacts.

The set of modules for home installations has been designed specifically to assemble, analyze and test installations using electric devices whose functionality is managed by electronics or by micro-electronics. In this context, the automation functions can be "customized" by PLC: custom-made programs can be written as alternative of the standard ones offered by industries.
Modules can also be inserted in vertical frame mod. TSI/EV to implement the training programme and the workstation can be powered by power supply unit mod. AZ-1PH/EV (both these units are supplied separately on demand).
This set of modules using actual commercial components enables to implement the process completely as the (sliding) gate and the safety devices having to be automated are actually present.

TECHNICAL SPECIFICATIONS:

The set of modules for implementing the automation of a gate mod. MR/EV includes:

- 1 Module AZ-15
  - 1 transformer – 115/230 / 12-24 V 50-60 Hz 72 VA
- 2 Modules AZ-41
  - 1 electromagnetic contactor for industrial uses, with coil of 24 Vac
- 1 Modules AZ-187a
  - 1 electronic control unit for gate automation with radio control card
- 1 Module AZ-187b
  - 1 pair of photoelectric barrier sensors
- 1 Module AZ-187c
  - 1 blinking light indicator for gate automation including radio control antenna
- 1 Module AZ-187d
  - 1 driving unit with single-phase motor and limit switches
- 1 Module AZ-188
  - 1 two-way switch for home use including 2 pushbuttons with 1 NO contact
  - 1 pushbutton with 1 NC contact

TRAINING PROGRAM:

- System for the automatic control of a gate by PLC (radio control unit), barrier sensors and driving unit with limit switches

SUPPLIED ACCESSORIES:

Set of 50 leads with safety plugs (Ø 4 mm)

POWER SUPPLY:

230 V / PE 50-60 Hz

THEORETICAL-EXPERIMENTAL HANDBOOKS

Application handbook with exercises.

2-STOREY CAR PARK SIMULATOR

Mod. PLC-A1/EV

GENERAL CHARACTERISTICS:

This equipment simulates a control system for entry, exit and storage of motor vehicles in a two-storey garage with maximum storing capacity of 100 motor vehicles.
The various elements of the electric circuit controlled by a PLC Training panel **(mod. PLC-V7/EV - not included)** are mounted on a panel of aluminium where the plan of the building and the relevant signalling pf entry, exit and storage have been silk-screen-printed.
All the warning lights are connected separately with a terminal board with standardized terminals of educational type with hole of Ø 4 mm so that users can choose the type of connection between the various elements and the PLC according to the control program. This equipment also includes a system of digital display that enables the user (park attendant) to check the traffic in and out, as well as the quantity of parked motor vehicles, in the 1st floor, in the 2nd floor and in total, from his/her own lodge.

ELECTRICAL CHARACTERISTICS:

- 5 warning lights of different colours
- 4 pushbuttons
- 1 three-position selector
- 2 seven-segment displays with decoding
- 20 terminals of different colours with diameter of 4 mm

MECHANICAL CHARACTERISTICS:

Tabletop metallic box of horizontal arrangement, made of sheet steel chemically treated and painted with several coats of epoxy varnish. Panel of aluminium with silk-screen-printed schematic diagram.

Dimensions: 415 x 400 x 150 mm
Net weight: 5 kg

POWER SUPPLY:

output by PLC (24 Vdc – max. absorption 0,5A)

 ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

INTELLIGENT TRAFFIC LIGHT SIMULATOR

Mod. PLC-A2/EV

GENERAL CHARACTERISTICS:

This equipment simulates a traffic light system for a junction of 2 roads, one of which offers the possibility of separate turning rightwards.
The various elements of the electric circuit controlled by a PLC Training panel **(mod. PLC-V7/EV - not included)** are mounted on a panel of aluminium where the crossroads and the relevant traffic lights have been silk-screen-printed.
All the warning lights are connected separately with a terminal board with standardized terminals of educational type with hole of Ø 4 mm so that users can choose the type of connection between the various elements and the PLC according to the control program.
This equipment also includes some control elements for managing some control functions of cycle times directly from the simulator or for enabling the system operation manually.

ELECTRICAL CHARACTERISTICS:

- 14 warning lights of different colours
- 4 single-pole lever switches
- 20 terminals of different colours with diameter of 4 mm

MECHANICAL CHARACTERISTICS:

Tabletop metallic box of horizontal arrangement, made of sheet steel chemically treated and painted with several coats of epoxy varnish. Panel of aluminium with silk-screen-printed schematic diagram.

Dimensions: 415 x 400 x 150 mm
Net weight: 4,5 kg

POWER SUPPLY:

output by PLC (24 Vdc – max. absorption 0,5A)

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CAR WASHING SIMULATOR

Mod. PLC-A3/EV

It simulates a tunnel type car washing system. The different electrical/electromechanical devices to be controlled via PLC are fixed in an aluminium frontal silk screen that reproduces the complete car washing machine. The control devices and the pilot lamps showing the relative state of the devices that are distributed in the system lay-out are connected to Ø=4 mm safety terminals. By so doing, the user is absolutely free to select those devices to be used in his specific PLC program.

TRAINING PROGRAM:

- System analysis
- Definition of the inputs/outputs of the system
- Creating a process diagram
- Indication of the sequential stages of the operation
- Implementation of the logical scheme
- Analysis of the problem
- Implementation of a PLC program

TECHNICAL SPECIFICATIONS:

Electrical Characteristics

In the panel are included the following control, signalling and command devices:

- 1 Pushbutton for START WASHING.
- 1 Pushbutton for STOP/EMERGENCY
- 1 Pilot lamp for MACHINE ON
- 1 Pilot lamp: water valve open
- 1 Pilot lamp: detergent valve open
- 1 Pilot lamp: indicate motor ON of the left brush.
- 1 Pilot lamp: indicate motor ON of the right brush.
- 1 Pilot lamp: indicate motor ON of the top brush.
- 1 bar graph: indicate the movement of the left brush
- 1 bar graph: indicate the movement of the right brush
- 1 bar graph: indicate the movement of the top brush
- 1 bar graph: indicate the movement of the car
- 2 Limit switches: movement of the car in the tunnel
- 6 Limit switches for the movement of the brushes
- 33 Safety terminals Ø=4 mm for PLC connections.

Mechanical Characteristics

Totally included in a table-top metal container, made with steel profiles and epoxy-painted steel sheet. Aluminium frontal silk screen with the system layout.

Trainer PLC

PLC resources required for controlling the simulator:
16 Digital inputs 24Vdc
15 Digital outputs 24Vdc

Suggested:

PLC training panel mod. PLC-V7/EV

Dimensions: 460 x 440 x 120 mm
Net weight: 5 kg

POWER SUPPLY:

24 VDC – 1 A max. 100VA (from the PLC)

EXPERIMENTAL THEORETICAL TEXTS

Theoretical-experimental handbook for equipment presentation and guide to the exercises.

 ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

23-C

23-C

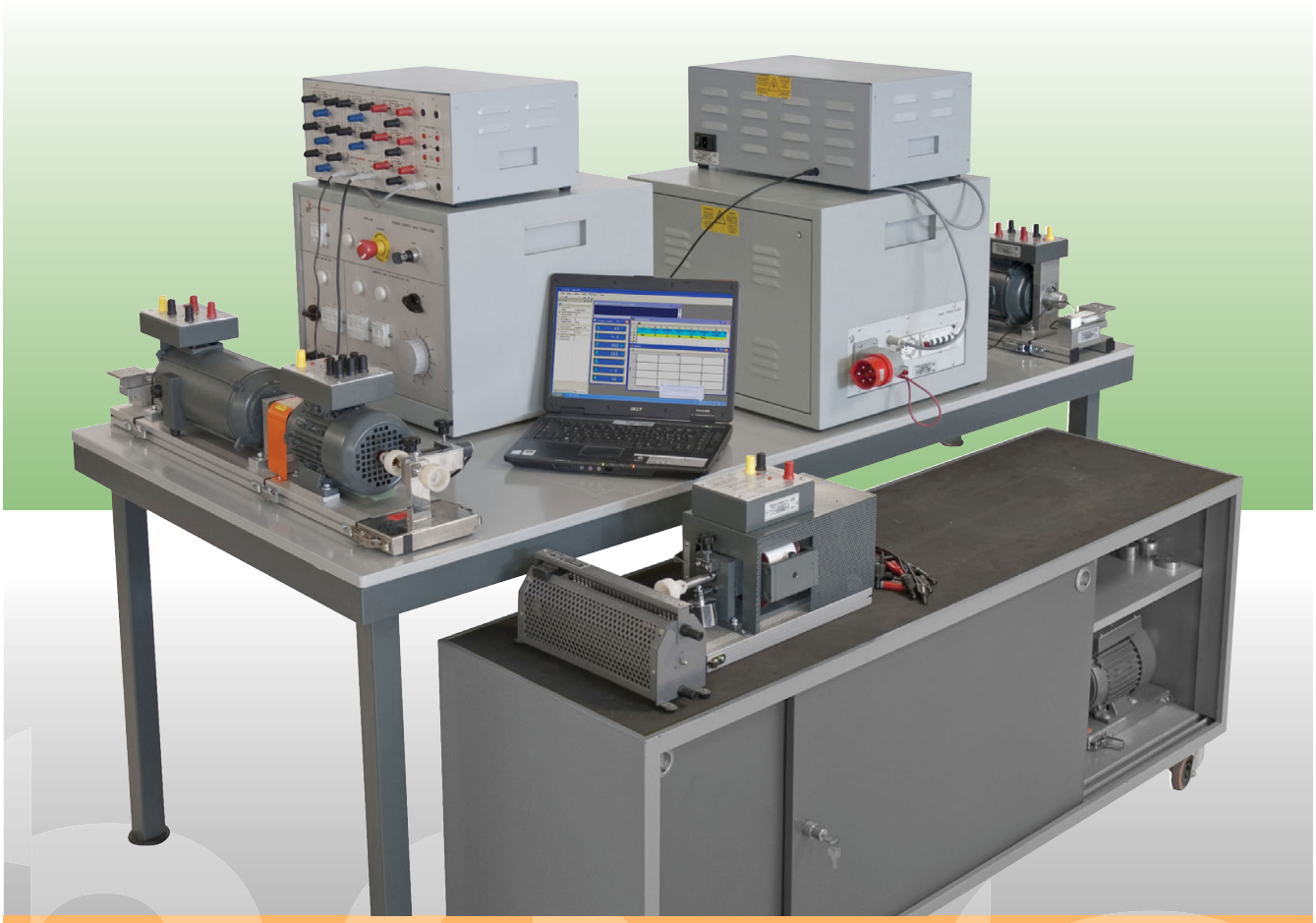
INSTRUMENTS AND ACCESSORIES

www.elettronicaveneta.com

23-C

COMPUTER-AIDED MEASUREMENT SYSTEMS

COMPUTER-AIDED MEASUREMENT SYSTEMS



INTRODUCTION

The Laboratories of Electric Machines and Installations by Elettronica Veneta S.p.a. are completed by a full set of tabletop electric instruments of class 0.5%, by some computer-aided systems for measurements and automatic tests on electric machines and by a line of accessories for a correct execution of all measurement and control activities of machines, such as variac, power supply units and RLC loads.

EDUCATIONAL SOFTWARE FOR THE ELECTRICAL MACHINES MEASUREMENTS

Mod. CAI-EM/EV

INTRODUCTION

This CAI (Computer Aided Instruction) software package, used either as an independent virtual test and measurement tool, or, in combination with the Computerized Measurement Unit mod. CEM-U/EV, simplifies the study of the theory and the experiments on static and rotational electrical machines.

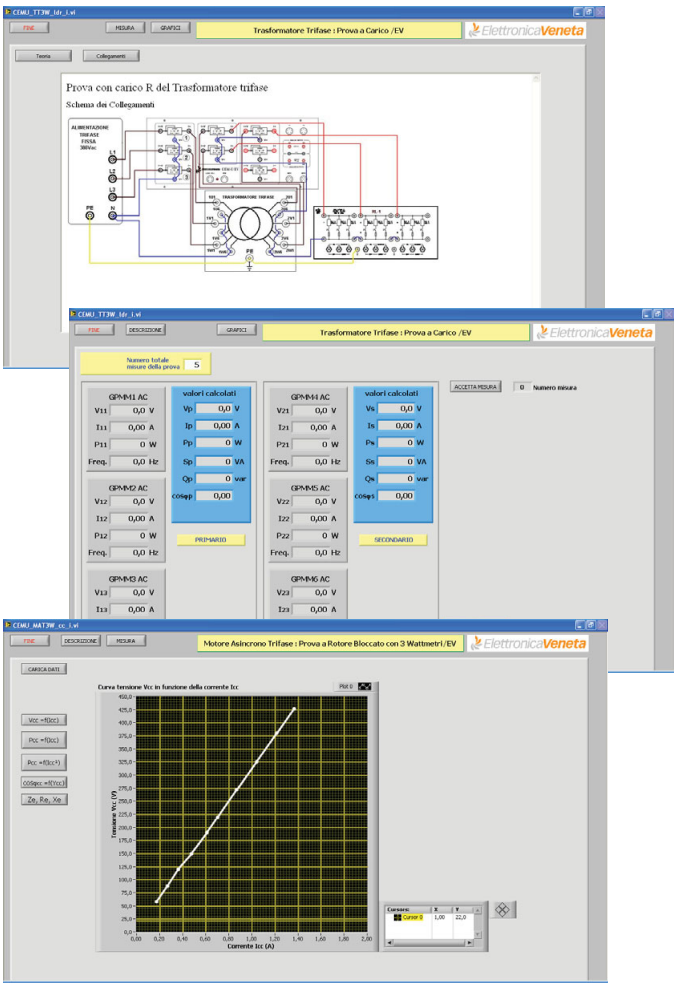
It is particularly suitable for Lecturers who can project the images through an overhead projector or distribute them to the class via a LAN network.

Developed in Labview, it allows the study of and practical exercises on the following electrical machines:

- General Electrical Measurement
- Single phase Transformers
- Three-phase Transformers
- Three-phase Asynchronous Motors: squirrel cage, slip ring motors and 2-speed machines.
- Single phase Asynchronous Motors: with starting capacitor, with running capacitor.
- Universal Motors
- Three-phase Synchronous Machines: motor and alternator
- DC Machines: motors and generators

Each software application is divided in sections that can be used at different educational levels:

- Theoretical topics related to specific measurements
- Guide to electrical connections
- Performing measurements and saving the results
- Visualizing the results in graphics



APPLICATIONS

General Electrical Measurements:

- DC resistance measurements by means of volt-ampere method
- Detection of dipole characteristics
- Instruments calibration by means of comparison method
- Transitional processes in a RC circuit (charging and discharging of capacitors)
- Power measurement in a single-phase circuit
- Power and power factor measurement in a symmetric and balanced system with Aron's insertion

Single-phase Transformers
Includes the necessary tests for obtaining the operation characteristic curves:

- Coil resistance measurement
- Transformer Ratio
- Connection polarity and connection group
- No-load test
- Short-circuit test
- External characteristic and efficiency

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Three-phase Transformers
Includes the necessary tests for obtaining the operation characteristic curves:
- Coil resistance measurement
- Transformer Ratio
- Connection polarity and connection group
- No-load test
- Short-circuit test
- External characteristic and Efficiency

Three-phase Asynchronous Motors
Includes the necessary tests for obtaining the operation characteristic curves:
- Coil resistance measurement
- Transformer Ratio measurement of the slip ring motor
- No-load test
- Load test, efficiency (with direct measurement with brake)
- Short-circuit test (blocked rotor test)
- Slip measurement

Single-phase Asynchronous Motors
Includes the necessary tests for obtaining the operation characteristic curves:
- Coil resistance measurement
- Transformer Ratio measurement of the slip ring motor
- No-load test
- Load test, efficiency (with direct measurement with brake)
- Short-circuit test (blocked rotor test)
- Slip measurement

Universal Motors
Includes the necessary tests for obtaining the operation characteristic curves:
- Coil resistance measurement
- Transformer Ratio measurement of the slip ring motor
- No-load test
- Load test, efficiency (with direct measurement with brake) AC/DC
- Short-circuit test (blocked rotor test)
- Slip measurement

DC Machines
Includes the necessary tests for obtaining the operation characteristic curves:
- Coil resistance measurement
- Mechanical and iron losses
- DC generators (different connections) magnetic, external and control characteristics
- DC motor electromechanical characteristics (different connections), brake test and efficiency

Three-phase Synchronous Machines
Includes the necessary tests for obtaining the operation characteristic curves:
- Coil resistance measurement
- Mechanical and iron losses
- Alternators magnetic, external and control characteristics
- Electromechanical characteristics of the synchronous motor, brake test and efficiency

COMPUTER-AIDED SYSTEM OF ELECTRIC MEASUREMENTS AND LABORATORY TESTS PROVIDED WITH CONTROL SOFTWARE

Mod. CEM-U/EV

INTRODUCTION

This computer-aided measurement and test system is designed to automate all the measurements and tests usually carried out in Electrical Engineering, by the use of Personal Computer. This system is characterized by the highest flexibility as it can easily be apply to any measurement circuit or electric machine. The Personal Computer can acquire all the considered quantities (currents, voltages, electric powers, mechanical powers, RPM, etc…) from a full set of transducers, besides processing these data graphically or as report for print. These systems use interfaces with icons to simplify the measurement and test procedures as much as possible.
System flexibility allows to use it in any Laboratory: in fact it can be connected with circuits and machines already owned by users. This system can be used together with the Packet of Classes for the Theoretical/Practical/Experimental Study of Electrical Engineering, as tool for the execution of all the measurements programmed in experimentation.

This system mainly consists of:
- Universal programmable measurement unit mod. CEM-U/EV
- Control software

Optional equipment:
- Programmable variable AC/DC power supply unit, available in two different models: mod. CEM-2-A/EV or mod. CEM-E-AT/EV
- Personal Computer

Furthermore the software included in unit mod. CEM-U/EV and provided with icon interface, can:
- manage the instruments displayed on PC screen (selection of instrument, range, etc…), directly
- define an environment fort the development of an automatic test, besides running the execution of this test with acquisition of concerned data
- transform the gathered data into a format compatible with a spreadsheet for numerical and graphic processing

TRAINING PROGRAM:

The possibility of measuring electric quantities in single-phase and three-phase direct and alternating current enables a lot of educational applications on general electric measurements and on motors, with control, processing and presentation of measurement reports.
This system can carry out:
- measurements of currents, voltages and powers in circuits powered in direct current
- measurements of currents, voltages and of active – reactive - apparent powers in both single-phase and three-phase direct current circuits
- measurements on asynchronous single-phase motors up to 3,5 kW
- measurements on asynchronous three-phase motors up to 10 kW
- measurements on synchronous motors - generators up to 15 kVA - 10 kW
- measurements on Direct Current motors - generators up to 5 kW
- measurements on single-phase transformers up to 3.5 kW
- measurements on three-phase transformers up to 10 kW

TECHNICAL SPECIFICATIONS:

UNIVERSAL MEASUREMENT UNIT Mod. CEM-U/EV

This is the main unit of the system and it includes the transducers converting electric signals into digital signals with 16-bit A/D converters, and the transmission lines for sending digital information to PC.
Ist compact structure is designed to assemble not only the traditional fixed workstation (bench for electric measurements), but also a movable unit that can be brought near the electric machines with fixed base that are often available in pre-existing educational laboratories.
The panel with silk-screen-printed schematic diagram, with safety terminals for plugs of Ø 4 mm, shows thw inputs of instruments.
The card inserted in measurement units carries out A/D abd D/A conversion enabling to connect the system with Personal Computer via USB communication port.
The accuracy rating of this system is equal to ± 1%.

8 MULTI-FUNCTION AC/DC INSTRUMENTS

Using AC

- U inputs: 500 Vac with input resistance of 1 MΩ for RMS voltage measurements, frequency measurement in the range of 30-70 Hz
- I input: 25 Aac, with input resistance of 4 MΩ for RMS current measurements
- Autoranging on voltage and current inputs
- They measure (calculate) Active, Reactive, Apparent Power and the power factor
- A/D conversion by 16-bit ∑-Δ converters
- Separate use as single-phase frequency meters – voltmeters ammeters – wattmeters – var meters – cosphimeters
- Possibility of combined use as two-system three-phase wattmeter – var meter (Aron measuring circuit)

Using DC

- V input: 500 Vdc with input resistance of 1 MΩ for DC voltage measurements with sign
- I input: 25 Adc, with input resistance of 4 MΩ for DC current measurements with sign
- Autoranging on I/V inputs
- They measure (calculate) DC Power
- A/D conversion by 16-bit ∑-Δ converters
- Separate use as DC voltmeters – ammeters – wattmeters

1 FORCE GAUGE

- Force gauge with load cell transducer
- Measurement range: 0 – 20 kg
- It measures (calculates) torque according to the application arm that can be selected from 0 to 1 m
- A/D conversion by 16-bit ∑-Δ converters

2 TEMPERATURE SENSORS

- 1 PT-100 sensor for air
- 1 contact PT-100 sensor
- Temperature measurement range: 0 – 150 °C
- A/D conversion by 16-bit ∑-Δ converters

1 SPEED METER

- Optical reflection transducer
- Measurement range: 0 to 5000 r.p.m.

2 AUXILIARY DC VOLTAGE INPUTS

- Range: -10 to +10 Vdc
- A/D conversion by 16-bit ∑-Δ converters

2 VARIABLE REFERENCE VOLTAGE OUTPUTS

- Range: -10 to +10 Vdc, maximum current of 10 mA
- 8-bit D/A conversion

2 OUTPUTS FOR VARIAC CONTROL

- Driver for stepper motors with rated current of 1.5 A (motors are coupled to voltage regulators of programmable power supply units)
- Two different variable AC/DC power supply units are available
- Tabletop version with one voltage regulator
- Wheeled version with two voltage regulators

Dimensions: 485 x 310 x 210 mm
Net weight: 10 kg

CONTROL SOFTWARE

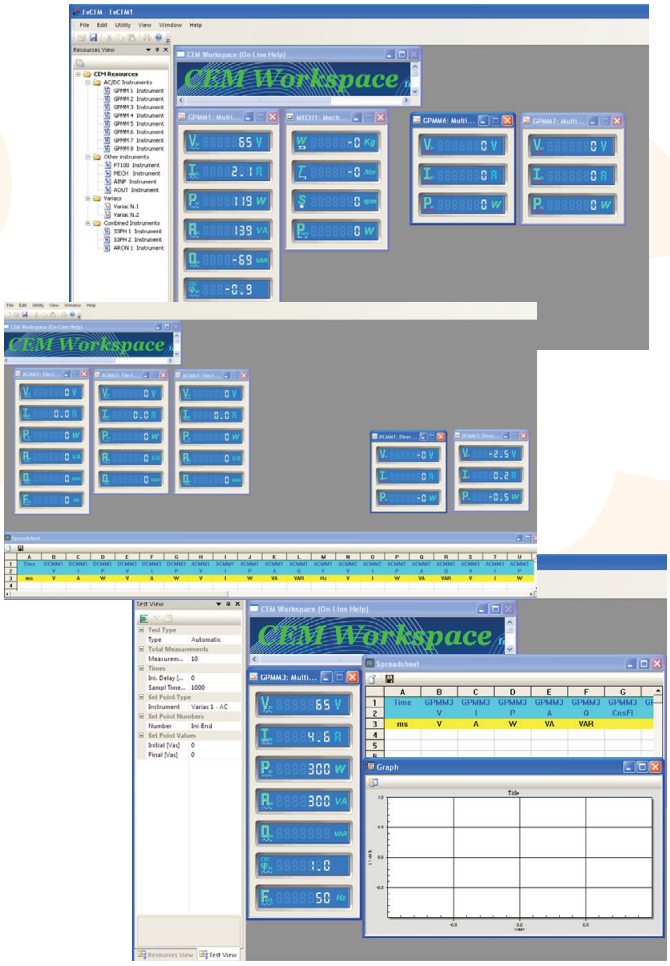
The control software supplied with this system enables to use all the resources in a simple way. It has a graphic interface with icons so that instruments, ranges and functions can be selected directly via mouse.
It uses a system of superimposed windows so that both instruments and selection masks of parameters and functions having to be implemented, can be displayed on the screen.
This software enables to work inside 2 main environments:

Measurement section in immediate way
video control of instruments with direct measurement of quantities. Thus it is possible:

- to select and position instruments on a screen window, to change ranges, to disable instruments
- to select programmable power supply units and to change their operating conditions

Programming section and execution of tests that can be carried out in manual or automatic mode

- to acquire data from any test, even automatically, and to store them
  Furthermore, it is possible:
  - to select the instruments for the test
  - to select the type of test among time tests, tests with keyboard trigger, automatic tests with setting of set point via variable power supply units
  - to carry out the test with autosave of data in a format compatible with spreadsheets



SUPPLIED ACCESSORIES:

Set of 40 cables with Ø 4 mm safety plugs

OPTIONAL ACCESSORIES:

- Programmable variable AC/DC power supply units mod. CEM-2-A/EV, or mod. CEM-E-AT/EV (refer to technical specifications at pages MS 172 and MS 173)
- Personal Computer

POWER SUPPLY:

230 V – 50/60 Hz

THEORETICAL-EXPERIMENTAL HANDBOOKS

Handbook of installation, use and service.

EXAMPLES OF ARRANGEMENT

FIXED WORKSTATION - 1

Table mod. TOP/EV
Measurement unit mod. CEM-U/EV
Tabletop Personal Computer
Power supply unit mod. CEM-E-AT/EV

FIXED WORKSTATION - 2

Table mod. TOP/EV
Measurement unit mod. CEM-U/EV
Portable Personal Computer
Power supply unit mod. CEM-E-AT/EV

MOVABLE WORKSTATION

Measurement unit mod. CEM-U/EV
Personal Computer portatile
Wheeled trolley
Power supply unit mod. CEM-2-A/EV

PROGRAMMABLE AC/DC POWER SUPPLY UNIT

Mod. CEM-2-A/EV

INTRODUCTION

This unit is designed to supply students with the possibility of automating all the tests needing a variation of supply voltage (e.g.: no-load tests and short-circuit tests on electric machines), automatically.
It consists of two motor-driven three-phase voltage regulator connected with two three-phase bridge rectifiers of 6 diodes. This configuration outputs two separate single-phase-three-phase or DC voltages that can vary according to needs, these components are controlled by computer-aided measurement systems, consequently managed by PC.

TECHNICAL SPECIFICATIONS:

- Three-phase output with neutral, fixed voltage 3 x 400 V - 10 A
- Output 1: variable continuously: 0 to 430 Vac – 8 A, or 0 to 250 Vdc – 15 A
- Output 2: variable continuously: 0 to 430 Vac – 3 A, or 0 to 250 Vdc – 5 A
- Protection against overloads and short-circuits by fast-blow fuses; main control device of electro-magnetic type, with key switch, emergency pushbutton, magneto-thermal differential circuit breaker of 30 mA, warning light for indicating energized unit and safety terminals with plugs of Ø 4 mm
- Wheeled framework (4 wheels, 2 of which with brakes) with desk-shaped top. It is wholly made of press-formed sheet steel, painted with several coats of epoxy varnish. The upper panel where names and symbols of the components are silk-screen-printed, houses the control, protection and testing devices.

This power supply unit is a peripheral equipment recommended for computer-aided system of electric measurements mod. CEM-U/EV.

Dimensions: 850 x 550 x 950 mm
Net weight: 130 kg

POWER SUPPLY:
3 x 400 V / N / PE - 50/60 Hz - 6000VA

PROGRAMMABLE AC/DC POWER SUPPLY UNIT

Mod. CEM-E-AT/EV

INTRODUCTION

This tabletop unit is designed to supply students with the possibility of carrying out all the tests needing a variation of supply voltage (e.g.: no-load tests, load and short-circuit tests on electric machines), automatically.
Voltages are varied by a motor-driven voltage regulator controlled by computer-aided measurement systems, consequently managed by PC.

TECHNICAL SPECIFICATIONS:

- Variable output (even manually): 0 to 430 Vac – 8 A / 0 to 250 Vdc – 10 A
- Fixed output 3 x 400 / three-phase + N – 10 A
- Fixed output 220 Vdc - 3A
- Fixed output 230V / single-phase – 10 A
- Protection against overloads and short-circuits by fast-blow fuses; main control device of electro-magnetic type, with key switch, emergency pushbutton, magneto-thermal differential circuit breaker of 30 mA class A, warning light for indicating energized unit and safety terminals with plugs of Ø 4 mm

This power supply unit is a peripheral equipment recommended for Computer-aided system of electric measurements mod. CEM-U/EV.

Dimensions: 525 x 500 x 430 mm
Net weight: 80 kg

POWER SUPPLY:
3 x 400 V / N / PE - 50/60 Hz

THEORETICAL-EXPERIMENTAL HANDBOOKS
Handbook of installation, use and service.

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23-C

ELECTRIC INSTRUMENTS

ANALOG INSTRUMENTS
FOR ELECTRIC MEASUREMENTS

INTRODUCTION

These precision instruments (accuracy rating of 0.5) have been designed to be used in electrical engineering laboratories. Losses and response times of movable components are minimized, thus these apparatuses are light and damped, shockproof and vibrationproof.

The cases of these instruments are of shockproof thermosetting material. Scales are plotted with a high number of divisions; a lot of instruments have various scales to avoid the adoption of non integer or inconvenient constants.

Electromagnetic (or moving iron) instruments are shielded against external magnetic fields and they have not any hysteresis; they can be used in both DC and AC always complying with the limits of accuracy rating.
Here are the available instruments:

- Ammeters
- Voltmeters
- Wattmeters
- Cosphimeters
- Frequency meters
- Galvanometers
- Ammeter transformers
- Shunters

INSTRUMENTS FOR IMPLEMENTING THE EXPERIMENTAL PROGRAMS OF ELECTRIC MEASUREMENTS AND MACHINES

(Magneto-electric) MOVING COIL AMMETER mod. LCA-1
For DC measurements; accuracy rating: ± 0.5%
Ranges: 0.6-1.2-3-6-12-30-60 mA
(range of 60 mV for shunter SH-3)

MOVING COIL AMMETER mod. LCA-2
For DC measurements; accuracy rating: ± 0.5%
Ranges: 60-120-300-600 mA - 1,2-3-6 A
(range of 60 mV for shunter SH-3)

SHUNTER mod. SH-3
Accuracy rating: ± 0.2%
Measurement range: 6-12-30-60 A
Output: 60 mV

MOVING COIL VOLTMETER mod. LCV-1
For DC measurements; accuracy rating: ± 0.5%
Ranges: 60-120-300-600 mV 1.2-3-6 V

MOVING COIL VOLTMETER mod. LCV-2
For DC measurements; accuracy rating: ± 0.5%
Ranges: 6-12-60-120-300-600 V

(Electromagnetic) MOVING IRON AMMETER mod. LAA-1
For DC and AC measurements; accuracy rating: ± 0.5%
Ranges: 60-120-300-600 mA

MOVING IRON AMMETER mod. LAA-2
For DC and AC measurements; accuracy rating: ± 0.5%
Ranges: 0.6-1.2-3-6 A

MOVING IRON VOLTMETER mod. LAV-1
For DC and AC measurements; accuracy rating: ± 0.5%
Ranges: 3-6-12-30 V

MOVING IRON VOLTMETER mod. LAV-2
For DC and AC measurements; accuracy rating: ± 0.5%
Ranges: 60-120-200-600 V

ELECTRODYNAMIC WATTMETER WITH POWER FACTOR 1 mod. LW-5/480
For DC and AC measurements; accuracy rating: ± 0.5%
Ranges: 48-120-240-480 V / 2.5-5 A

ELECTRODYNAMIC WATTMETER WITH POWER FACTOR 1 mod. LW-1/600
For DC and AC measurements; accuracy rating: ± 0.5%
Ranges: 15-30-75-150-300-600 V / 0.5-1 A

ELECTRODYNAMIC WATTMETER WITH POWER FACTOR 1 mod. LW-10/600
For DC and AC measurements; accuracy rating: ± 0.5%
Ranges: 15-30-75-150-300-600 V / 5-10 A

ELECTRODYNAMIC WATTMETER WITH POWER FACTOR 0.2 mod. LW0,2-5/600
For DC and AC measurements of low power factor
Accuracy rating: ± 1%
Ranges: 15-30-75-150-300-600 V / 2.5-5 A

ELECTRODYNAMIC WATTMETER WITH POWER FACTOR 0.2 mod. LW0,2-1/600
For DC and AC measurements of low power factor
Accuracy rating: ± 1%
Ranges: 15-30-75-150-300-600 V / 0.5-1 A

ELECTRODYNAMIC WATTMETER WITH POWER FACTOR 0.2 mod. LW0,2-10/600
For DC and AC measurements of low power factor
Accuracy rating: ± 1%
Ranges: 15-30-75-150-300-600 V / 10 A

CENTRAL ZERO GALVANOMETER mod. LCG-2
Accuracy rating: ± 1.5%
Ranges: ± 50 – 100 – 250 - 500 µA

MOVING IRON SINGLE/THREE-PHASE POWER FACTOR METER mod. COS-3/2
Accuracy rating: ± 1.5%
Voltage: single-phase 150-300-450-500 V
three-phase 150-300-450 V;
Current: 1-5 A
Scale: 0.2 (lag) – 1 – 0.8 (lead)

MOVING IRON SINGLE/THREE-PHASE POWER FACTOR METER mod. COS-3/3
Accuracy rating: ± 1.5%
Voltage: single-phase 150-300-450-500 V
three-phase 150-300-450 V
Current: 1-5 A
Scale: 0.4 – 1 – 0.4

MOVING IRON SINGLE-PHASE POWER FACTOR METER mod. COS-1/2
Accuracy rating: ± 1.5%
Voltage: 100-240-400-500 V
Current: 1-5 A
Scale: 0.2 (lag) – 1 – 0.8 (lead)

ELECTRODYNAMIC SINGLE-PHASE POWER FACTOR METER mod. COS-1/3
Accuracy rating: ± 1.5%
Voltage: 100-240-400-500 V
Current: 1-5 A
Scale: 0.4 – 1 – 0.4

REED FREQUENCY METER mod. F-1
Accuracy rating: ± 0.5%, a row of 21 reeds
Voltage: 120-240-400-500 V
Scale: 45 to 55 Hz

REED FREQUENCY METER mod. F-2
Accuracy rating: ± 0.5%, a row of 21 reeds
Voltage: 120-240-400-500 V
Scale: 55 to 65 Hz

POINTER FREQUENCY METER mod. F-4
Accuracy rating: ± 0.5%
Voltage: 100-230-400-500 V
Scale: 45 to 55 Hz and 55 to 65 Hz

PORTABLE MEASUREMENT TRANSFORMER mod. TA-3
Accuracy rating: ± 0.5%
Primary ranges: 2.5-5-10-25-50 A (terminals), 100-150-300 A (through hole); secondary range: 5 A

DIGITAL INSTRUMENTS FOR ELECTRICAL MEASUREMENTS - AC

Mod. AZ-VIP3/EV
Mod. AZ-VIP5/EV
Mod. AZ-VIP10/EV
Mod. AZ-VIP20/EV

AZ-VIP3/EV

AZ-VIP5/EV

AZ-VIP10/EV

AZ-VIP20/EV

23C-E-MS-AZVIP351020-0 www.elettronicaveneta.com

1. COMMON FEATURES				
Digital multimeter	DMG 700		DMG 800	
	AZ-VIP3/EV	AZ-VIP5/EV	AZ-VIP10/EV	AZ-VIP20/EV
• Suitable for single & 3-ph systems, balanced/unbalanced, w/wo neutral • Auxiliary power supply 110…230 VAC, 50/60 Hz • Display graphic, backlit LCD, 128 x 80 pixel graphs for harmonics, trends and waveforms • Possibility to create up to 4 personalized pages (4 parameters each) • Menu in 5 languages: Italian, English, French, Spanish & Portughese • Four multifunction keys for visualizing the parameters and programming the unit. • All I/O connections with 4-mm diameter safety connectors • Possibility to visualize INSTANTANEOUS, MAX, MIN, and AVG values of voltages and currents • Certifications: UL, GOST, IEC/EN 61001/1; 61000-6-2; 61000-6-3 • Including a module for managing 2 output relays (dry contacts, 250 VAC/5A)				
2. MEASUREMENT OF AC VOLTAGES				
TRMS Volts input: single and 3-phase; phase-to-N (freq. Range: 45….66 Hz)	400			
TRMS Volts input: single and 3-phase; phase-to-phase (freq. Range: 45….66 Hz)	690			
Voltage accuracy (%)	0,5		0,2	
Voltages measured: Line-to-Line- L-N- Total equivalent (for the 3-phases)	YES			
3. MEASUREMENT OF AC CURRENTS				
TRMS Amps input per phase L1-L2-L3	5 (w/internal CTs)	5 (w/internal CTs)	10 (w/internal CTs)	20 (w/internal CTs)
Possibility to increase the currents range with external 3 CT	NO	YES 3*CT x/5 A	NO	NO
Current accuracy (%)	0,5		0,2	
Currents measured: Line-N- Total equivalent (for the 3-phases)	YES			
4. MEASUREMENT OF FREQUENCY				
Frequency range (Hz)	45….66			
5. MEASUREMENT OF POWERS				
Measurement of Apparent Power (kVA)	3,5	3,5	7	14
Measurement of Active Power (kW)	3,5	3,5	7	14
Measurement of Reactive Power (kVAr)	3,5	3,5	7	14
6. MEASUREMENT OF POWER FACTOR				
Measurement of PF of L1-L2-L3 and Total Equivalent	YES			
7. MEASUREMENT OF OTHER PARAMETERS				
Count-hour (total and partial)	YES			
THD (%) for voltages and currents	YES			
Harmonic analysis up to 31st harmonic	NO		YES	
Power counter (active, reactive, apparent); imported & exported; total & partial	YES			
8. COMMUNICATIONS				
RS485 Communication Interface. Required RS485/RS232 converter and software SW DMK	YES		optional see paragraph 10	
9. STRUCTURAL CHARACTERISTICS AND APPLICATIONS				
• AZ-VIP3/EV Dimensions: 250 x 210 x 120 mm Panel made in insulation material, suitable for module holder frame TSI-2/EV. The module can also be used as a stand-alone module. • AZ-VIP5/EV Dimensions: 396 x 123 x 120 mm Panel made in insulation material, with 4 fast plug to fix the module in the TSI/EV support. The module can also be used as a stand-alone module. • AZ-VIP10/EV and AZ-VIP20/EV Dimensions: 220 x 170 x 140 mm Stand-alone instruments contained in an isolating table-top box.				

10. ADDITIONAL FUNCTIONS (up to 3 additional Optional Modules can be included ALL OPTIONALS TO DE DEFINED AT THE P.O. STAGE)				
Module for USB communications. *See Note 1*	NO	NO	optional	optional
Module for Ethernet port communications. *See Note 2*	NO	NO	optional	optional
Module Data Memory. Should be included also a USB, Ethernet or RS485 and converter RS485/232. *See Note 3*	NO	NO	optional	optional
Module for No. 2 Analog Inputs. *See Note 4*	NO	NO	optional	optional
Module for No. 2 Analog Outputs. *See Note 5*	NO	NO	optional	optional
DMK Remote software. *See Note 6*	on request		*See Notes below for optionals*	
DMK SW 10. *See Note 7*	NO	NO		

NOTES:

1. 2 m type A/B USB cable & connectors. The DMK Remote Control Software is required.

2. 2 m Cat 5 cable with RJ45 connectors. The DMK Remote Control Software is required.

3. The DMK Remote Control Software + the DMK SW 10 software are required.

4. 0/4-20 mA; 0-10 VDC; ± 5 VDC. The AI can be any physical parameter (RPM, force etc.) converted into a voltage or a current.

5. 0/4-20 mA; 0-10 VDC; ± 5 VDC. The AOs can be selected among the instrument measured parameters (V, I, S, P, Q, PF etc).

6. DMK REMOTE CONTROL SOFTWARE PACKAGE

This software package allows to:

- Visualize the measurements from the instruments as "virtual instruments"
- Sample the user-defined measurements and save them in different formats (MS-Access, ASCII text, MS-Excel).
- Trace graphs of the sampled measurements.
- Apply alarm limits to the sampled measurements.
- Save on disk the alarms and events sequence of the instruments network.
- Visualize and modify the instrument set parameters, with the possibility of saving them on disk, recall and print the settings.
- Visualize a graph of the voltages and currents harmonic content, using the measurements given by the instrument.
- Possibility to program up to 4 pages with parameters selected by the user.
- Change the menus and commands language of the program by choosing among Italian, English, Spanish, French and Portuguese

7. DMK SW 10 DATA LOGGER MANAGEMENT SOFTWARE PACKAGE

This software package allows to:

- Configure and manage the collected data of the memory module of the instruments.
- Set-up the measurements to be sampled and the sampling time.
- Visualize the downloaded data from the instruments in MSAccess format.
- Convert the MS-Access tables in ASCII text or MS-Excel format.
- Trace graphs of the sampled measured parameters.

DIGITAL INSTRUMENTS FOR ELECTRICAL MEASUREMENTS - DC

Mod. AZ-VIDC/EV
AZ-VIDC20/EV

Module with dual digital instruments for DC measures.

TECHNICAL SPECIFICATIONS:

Common features for both instruments:

- VDC max.: 600 V; precision: ± 0,2 %
- IDC max.: 20 A; precision: ± 0,5 %; overload 2 x 20 A (3 min)
- Power WDC max.: 10 kW
- Displays: visualize V, I, W. LCD, backlit, 3 lines, 4 digit per line. Automatic decimal point. Five levels of illumination.
- All connections 4 mm. Ø safety terminals

AZ-VIDC/EV:

- Panel made in insulation material, with 4 fast plug to fix the module in the TSI/EV support. The module can also be used as a stand-alone module.
- Dimensions: 396 x 123 x 120 mm

AZ-VIDC20/EV:

- Stand-alone instrument contained in an isolating table-top box.
- Dimensions: 220 x 170 x 140 mm

AZ-VIDC/EV

AZ-VIDC20/EV

POWER SUPPLY:

Power supply: 80 to 260 VAC/DC.
Power cord included. Protection fuse in the Power plug.

POWER SUPPLY EQUIPMENT AND ELECTRIC LOADS

POWER SUPPLY EQUIPMENT

ELECTRIC LOADS

The following units are available on pages:

SINGLE-PHASE AUTOTRANSFORMERS

Mod. VM-5A/EV
Mod. VM-8A/EV

SINGLE-PHASE AUTOTRANSFORMER Mod. VM-5A/EV

AC single-phase autotransformer in metallic box, provided with graduated scale, knob, fuse, warning light, switch, power cord with three wires (without plug) and two output terminals.
- Supply voltage: 230 V – 50-60 Hz
- Output voltage: 0-250 V – 5 A

Dimensions: 200 x 200 x 250 mm
Net weight: 6 kg

SINGLE-PHASE AUTOTRANSFORMER Mod. VM-8A/EV

AC single-phase autotransformer in metallic box, provided with graduated scale, knob, fuse, warning light, switch, power cord with three wires (without plug) and two output terminals.
- Supply voltage: 230 V – 50-60 Hz
- Output voltage: 0-250 V – 8 A

Dimensions: 250 x 250 x 250 mm
Net weight: 13 kg

THREE-PHASE VARIACS

Mod. VT-8A/EV
Mod. VT-13A/EV

THREE-PHASE VARIAC Mod. VT-8A/EV

In metallic box for educational use.
- Supply voltage: 3 x 400 Vac
- Output voltage: 0-430 Vac
- Rated current: 8 A; max. current: 125% of rated current
- Power: 5.9 kVA

Dimensions: 250 x 290 x 420 mm
Net weight: 38 kg

THREE-PHASE VARIAC mod. VT-13A/EV

In metallic box for educational use, provided with graduated scale, knob, power cord with four wires (without plug) and four output terminals.
- Supply voltage: 3 x 400 Vac, 50-60 Hz
- Output voltage: 0-450 Vac
- Rated current: 13 A; max. current: 125% of rated current
- Power: 9.6 kVA

Dimensions: 285 x 315 x 520 mm
Net weight: 50 kg

WHEELED POWER SUPPLY UNIT

Mod. VTC-5/EV
Mod. VTC-10/EV

INTRODUCTION

This equipment is very useful for a laboratory of electric measurements and machines because it ensures a single-phase, three-phase alternating-current and direct-current power supply (variable with continuity) in any point of the laboratory.

VTC-5/EV

VTC-10/EV

TECHNICAL SPECIFICATIONS:

Wheeled framework with desk-shaped top. It is wholly made of press-formed sheet steel, painted with several coats of epoxy varnish. The upper panel where names and symbols of the components are silk-screen-printed, houses the control, protection and testing devices.

Mod. VTC-5/EV - ELECTRIC CHARACTERISTICS

- Outputs: (with input supply voltage of 400 V):
  0:430 V – three-phase - 5 A – safety terminals
  0:250 V – single-phase - 5 A – safety terminals
  0:500 V – 5 A – safety terminals
  2 universal single-phase sockets 230 Vac – 10 A
- This unit also includes:
  - high-sensitivity differential circuit breaker
  - main control device and emergency stop
  - 1 digital voltmeter and voltmetric switch for AC line
  - 1 digital voltmeter for DC line
  - Protection by breakable fuses

Mod. VTC-10/EV - ELECTRIC CHARACTERISTICS

- Outputs: (with input supply voltage of 400 V):
  0:430 V – three-phase - 10 A – safety terminals
  0:250 V – single-phase - 10 A – safety terminals
  0:500 V – 10 A – safety terminals
  3 universal single-phase sockets 230 Vac – 10 A
- This unit also includes:
  - high-sensitivity differential circuit breaker
  - main control device and emergeny stop
  - 3 digital AC ammeters and 1 digital AC voltmeter
  - 1 digital DC ammeter and 1 digital DC voltmeter
  - Protection by breakable fuses

Dimensions: 500 x 500 x 930 mm
Net weight: 80 kg

SUPPLIED ACCESSORIES:

Power cord with EEC plug

POWER SUPPLY:

3 x 400 V / N / PE 50-60 Hz
(3 x 230 or other voltage values on demand)
Absorption 6 kVA

THEORETICAL-EXPERIMENTAL HANDBOOKS

Service handbook.

23-C

BK

23-C

BENCHES AND KITS FOR PRACTICAL ACTIVITIES

(Assembling and wiring)

Aim:

- Individual and/or team practical activities carried out by students and concerning the functional wiring of domestic and industrial electric installations and the assembling and testing of electric machines

Equipment:

- Benches and Kits for electric systems workshop
- Benches and Kits for assembling an testing workshop of electric machines

SECTION INDEX

BK

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BENCHES AND KITS FOR PRACTICAL ACTIVITIES

INTRODUCTION

BENCHES AND KITS FOR ELECTRIC SYSTEMS WORKSHOP

This section of the catalog presents a line of Benches and Kits of specific materials for the practical learning of wiring, assembling and functional testing of the main domestic and industrial electrical installations.

The training programme mainly deals with the following topics:

- Lighting installations
- Signalling systems
- Industrial installations
- Electro-pneumatic systems

This line also includes specific equipment for fixing the electric components, as well as equipment of support for wiring and functional testing of the assembled installations. Moreover exhaustive practical textbooks are available to guide students in the implementation of the educational programme.

BENCHES AND KITS FOR ASSEMBLING AND TESTING WORKSHOP OF ELECTRIC MACHINES

This section of the catalog presents a line of Benches and Kits of specific materials for the practical learning of the topics concerning testing and quality control of the main electric machines.

The training programme mainly deals with the static abd rotating electric machines:

- Asynchronous single-phase motors
- Asynchronous three-phase motors
- Single-phase transformers and autotransformers
- Three-phase transformers and autotransformers

This line also includes some educational kits of specific equipment for wiring the electric windings, as well as equipment of support for assembling and functional testing of the various machines having to be constructed.

Moreover exhaustive practical and theoretical/experimental textbooks are available to guide students in the implementation of the educational programme.

23-C

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BENCHES AND KITS FOR ELECTRIC SYSTEMS WORKSHOP

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VERTICAL BENCH WITH FOUR WORKSTATIONS FOR PRACTICAL ELECTRIC INSTALLATIONS EXERCISES

Mod. 397-4/EV

INTRODUCTION

This bench has been designed to enable students to develop a complete program of practical assembling, wiring and testing exercises of lighting installations, signalling systems, industrial electric and electro-pneumatic installations.
In fact five different types of interchangeable panels, described in the following pages, are provided for a practical and realistic work based on the most common employed wiring techniques.

This bench has been designed for four students ensuring four comfortable workstations of proper size. Panels are fixed on the vertical frame by hinges for an easy assembling and removal; thus the realized circuit must not be disassembled. Consequently the same available interchangeable panels are used.

TECHNICAL SPECIFICATIONS:

This bench is made of welded sheet steel and section, chemically treated and painted with several coats of epoxy varnish; the working top of chipboard coated with bonded laminate, includes two drawers on each side (a drawer for each workstation).
Panels are fixed on the vertical frame by hinges for an easy assembling and removal; thus the realized circuit must not be disassembled.

Each front of the bench (two workstations) is provided with the following power supply:

- 1 three-phase (230 or 400 V) and single-phase (230 V – 16 A) line, protected by high-sensitivity magneto-thermal differential circuit breaker, safety terminals, emergency button with mechanical holding, minimum voltage release device
- Four-pole switch with key control that can be extracted only in zero position to enable three-phase line
- 1 single-phase line of 12-24 Vac – 4 A (safety extra-low voltage) protected against overloads and short-circuits by fuses and by magneto-thermal circuit breaker
- 1 circuit tester with light-acoustic signalling (powered with extra-low voltage)

Dimensions: 2.000 x 1.000 x 850 + 850 mm
Net weight: 98 kg

RECOMMENDED ACCESSORIES:

Interchangeable panels for implementing the experimental programme and relevant holding locker:

- WOODEN PANEL mod. 397-PLE/EV
- PANEL WITH FLUSH-MOUNTED BOXES mod. 397-PSI/EV
- PANEL OF PIERCED METAL SHEET mod. 397-PLF/EV
- FRAMED PANEL WITH METALLIC RODS mod. 397-PAM/EV
- PANEL FOR TESTING MODULES mod. 397-PMS/EV
- METALLIC LOCKER WITH DOORS mod. C-397/EV

Set of components for implementing the experimental programme:

- Kits for lighting installations and signalling systems (mod. MIS-I/EV, MIS-S/EV, MIS-C/EV)
- Kit for industrial installations mod. MI-P/EV
- Kit for electro-pneumatic systems mod. ME/EV

POWER SUPPLY:

400 V / N / PE 50-60 Hz
Max. absorption: 6 kVA

THEORETICAL-EXPERIMENTAL HANDBOOKS

Practical handbook of electric installations
Practical handbook of industrial installations
Practical handbook of electro-pneumatic systems

23C-E-BK-3974-1

VERTICAL BENCH WITH TWO WORKSTATIONS FOR PRACTICAL ELECTRIC INSTALLATIONS EXERCISES

Mod. 397-2/EV

INTRODUCTION

This bench has been designed to enable students to develop a complete program of practical assembling, wiring and testing exercises of lighting installations, signalling systems, industrial electric and electro-pneumatic installations.

In fact five different types of interchangeable panels, described in the following pages, are provided for a practical and realistic work based on the most common employed wiring techniques.

This bench has been designed for two students ensuring two comfortable workstations of proper size (one per side). Panels are fixed on the vertical frame by hinges for an easy assembling and removal; thus the realized circuit must not be disassembled. Consequently the same available interchangeable panels are used.

TECHNICAL SPECIFICATIONS:

This bench is made of welded sheet steel and section, chemically treated and painted with several coats of epoxy varnish; the working top of chipboard coated with bonded laminate, includes two drawers on each side (a drawer for each workstation). Panels are fixed on the vertical frame by hinges for an easy assembling and removal; thus the realized circuit must not be disassembled.

Each front of the bench (one workstation) is provided with the following power supply:

- protection by high-sensitivity magneto-thermal differential circuit breaker, safety terminals, emergency button with mechanical holding, minimum voltage release device
- four-pole switch with key control that can be extracted only in zero position to enable three-phase line
- 1 single-phase line of 12-24 Vac – 4 A (safety extra-low voltage) protected against overloads and short-circuits by fuses and by magneto-thermal circuit breaker
- 1 circuit tester with light-acoustic signalling (powered with extra-low voltage)

Dimensions: 1.050 x 900 x 850 + 850 mm
Net weight: 74 kg

RECOMMENDED ACCESSORIES:

Interchangeable panels for implementing the experimental programme and relevant holding locker:

- WOODEN PANEL mod. 397-PLE/EV
- PANEL WITH FLUSH-MOUNTED BOXES mod. 397-PSI/EV
- PANEL OF PIERCED METAL SHEET mod. 397-PLF/EV
- FRAMED PANEL WITH METALLIC RODS mod. 397-PAM/EV
- PANEL FOR TESTING MODULES mod. 397-PMS/EV
- METALLIC LOCKER WITH DOORS mod. C-397/EV

Set of components for implementing the experimental programme:

- Kits for lighting installations and signalling systems mod. MIS-EV
- Kit for industrial installations mod. MI/EV
- Kit for electro-pneumatic systems mod. ME/EV

POWER SUPPLY:

400 V / N / PE 50-60 Hz
Max. absorption: 6 kVA

THEORETICAL-EXPERIMENTAL HANDBOOKS

Practical handbook of electric installations
Practical handbook of industrial installations
Practical handbook of electro-pneumatic systems

23C-E-BK-3972-1

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INTERCHANGEABLE PANELS FOR BENCHES MOD. 397-4/EV AND 397-2/EV

WOODEN PANEL Mod. 397-PLE/EV

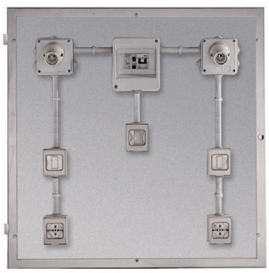
Thickness: 18 mm. Framed with 20/10 mm-thick steel angle bars, this panel is equipped with hinges for a quick insertion in the bench.
Suitable for domestic and special electric installation with surface mounting technique.

Dimensions: 790 x 790 mm
Net weight: 7 kg

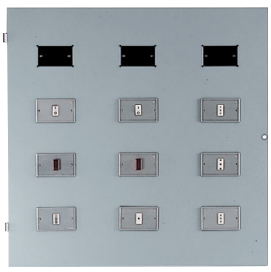
PANEL WITH FLUSH-MOUNTED BOXES Mod. 397-PSI/EV

Thickness: 15/10 mm; painted steel. It includes 12 flush-mounted rectangular boxes for components; inside dimensions: 100 x 57 x 45 mm; boxes are interconnected by plastic pipes. This panel is equipped with hinges for a quick insertion in the bench.
Mostly used for recessed domestic installations and for conduit systems.

Dimensions: 790 x 790 mm
Net weight: 8,5 kg



Example of configuration

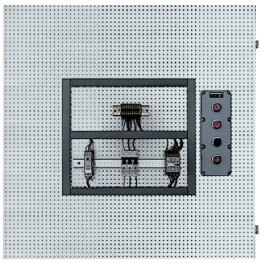


Example of configuration

PANEL OF PIERCED METAL SHEET Mod. 397-PLF/EV

Thickness: 20/10 mm; painted steel. Holes of 4 mm are drilled on the whole surface with a spacing of 12 mm. This panel is equipped with hinges for a quick insertion in the bench.
Suitable for industrial electric installations.

Dimensions: 790 x 790 mm
Net weight: 7,5 kg



Example of configuration

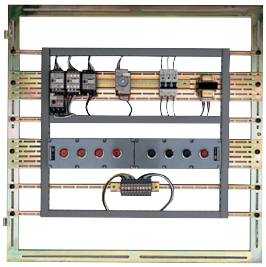
FRAMED PANEL WITH METALLIC RODS Mod. 397-PAM/EV

Frame of galvanized steel with thickness of 20/10 for bearing the metallic rods. Metallic rods are provided with eyelet holes with sized of 35 x 4.5 mm; they can slide on vertical standards and that enables to meet the specific engineering needs. This panel is equipped with hinges for a quick insertion in the bench.

In detail, the galvanized horizontal metallic rods included in the equipment are:
- 2 rods with width of 90 mm
- 4 rods with width of 15 mm

Mostly used for remote controls and industrial distribution circuits, electro-pneumatic systems.

Dimensions: 790 x 790 mm
Net weight: 5,5 kg



Example of configuration

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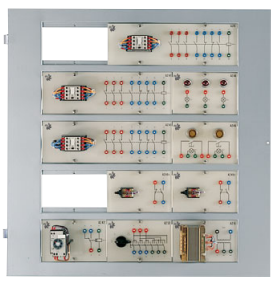
PANEL FOR TESTING MODULES Mod. 397-PMS/EV

This panel has a particular structure for fixing the testing modules of modular system for electric installations.
When used together with the benches of series 397, this panel is an alternative solution of bench mod. 398/EV and of frame mod. TSI/EV for the implementation of experimental programmes of electric installations.
This panel has a holding capacity of 20 separate modules and it is equipped with hinges for a quick insertion in the bench.

Dimensions: 790 x 790 mm
Net weight: 7,5 kg



Example of configuration

METALLIC LOCKER WITH DOORS Mod. C-397/EV

This locker is made of welded sections and sheet steel, chemically treated and painted with several coats of epoxy varnish; it is provided with two sliding doors with key lock, and with wheels.
This locker can store up to 12 panels.

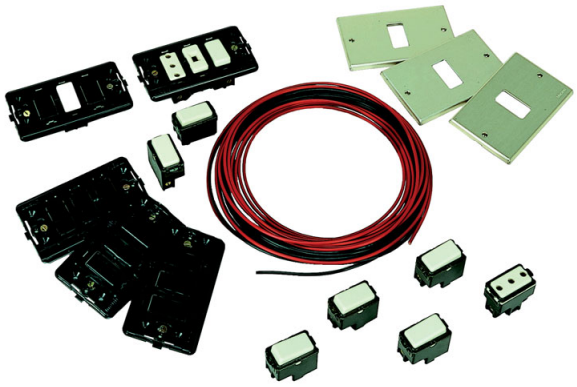
Dimensions: 2.200 x 900 x 910 mm
Net weight: 152 kg

Panel insertion

KIT FOR LIGHTING INSTALLATIONS

Mod. MIS-I/EV

Material for recessed (flush-mounted) electrical installations.



TRAINING PROGRAM:

- Lamp controlled by a switch
- Lamps controlled by a changeover switch
- Lamp controlled from two points
- Group of lamps controlled from two points + 1 socket
- Lamp controlled from 3 points
- Group of lamps controlled from 4 points + 2 sockets
- Lamp controlled from various points by relay
- Group of lamps controlled from various points by switch relay
- Control of a fluorescent lamp
- Lighting archives from 3 points
- Timed lighting of stairwell

COMPONENTS:

- 1 switch 1P 16 A – 250 Vac
- 1 changeover switch (2 switches) 1P 16 A – 250 Vac
- 2 two-way switches 1P 16 A – 250 Vac
- 2 inverters 1P 16 A – 250 Vac
- 3 NO lighting pushbuttons 1P 10 A – 250 Vac
- 2 universal two-pin and Unel sockets 10-16 A – 230 V
- 2 square lamp sockets E27
- 2 lamps E27 – 220 V – 40n W
- 1 fuse holder for cylindrical fuses 6x32
- 2 cylindrical fuses 6x32 6 A
- 1 single-phase transformer 115/230 – 12/24 V 50 VA
- 1 switch relay with contacts 10 A – 250 Vac, coil of 24 Vac
- 1 fluorescent lamp 230 V – 18 W – connection G13, including ballast, capacitos and starter
- 1 timing relay for stairwell lighting
- 6 supports of 3 controls
- 6 covering plates
- 10 false closing poles
- 3 closing lids

RECOMMENDED PANEL:

- **Mod. 397-PSI/EV**
  Panel with flush-mounted boxes

THEORETICAL-EXPERIMENTAL HANDBOOKS

Practical handbook of electric installations.

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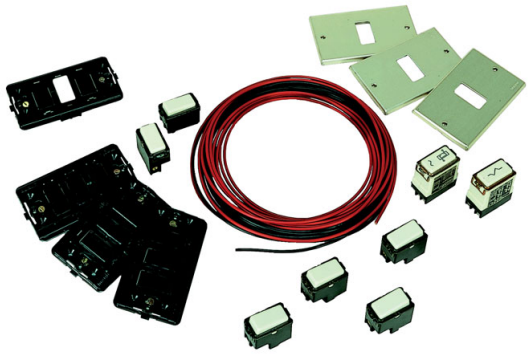
KIT FOR SIGNALLING SYSTEMS
Mod. MIS-S/EV

Material for recessed (flush-mounted) electrical installations.



TRAINING PROGRAM:

- Ringer controlled from a point
- Ringer system with call and answer
- System for controlling 3 ringers
- Ringer system for 2 flats and an outdoor unit
- Ringer system for flats and electric lock
- Optical-acoustic signalling system for offices, schools, hospitals

COMPONENTS:

- 4 NO pushbuttons 1P 10 A - 250 Vac
- 2 NO pushbuttons 1P 10 A – 250 Vac + red warning light of 24 V
- 1 fuse holder for cylindrical fuses 6x32
- 2 cylindrical fuses 6x32 6 A
- 1 single-phase transformer 115/230 – 12/24 V 50 VA
- 3 ringers of 12 Vac
- 1 buzzer od 12 Vac
- 1 four-button strip with nameplate
- 1 receptacle for four-button strip
- 1 tag of numeric calls of 24 Vac with micro-coding
- 1 electric lock of 12 Vac
- 1 metallic support for electric lock
- 6 supports of 3 controls
- 6 covering plates
- 10 false closing poles

RECOMMENDED PANEL:

- **Mod. 397-PSI/EV**
  Panel with flush-mounted boxes

THEORETICAL-EXPERIMENTAL HANDBOOKS

Practical handbook of signalling systems.

KIT FOR INTERPHONE SYSTEMS
Mod. MIS-C/EV

TRAINING PROGRAM:

- Entry phone system with electric porter, 1 outdoor unit and 1, 2, 3 indoor units
- Phonic system between two intercommunicating interphones
- Phonic system between three intercommunicating interphones and outdoor unit with relay of exclusion of outdoor speech

COMPONENTS:

- 3 interphones provided with 1 door opening pushbutton and 3 pushbuttons for intercommunication
- 1 power supply unit for interphone system
- 1 phonic unit with microphone and louspeaker
- 1 relay for excluding the outdoor unit for indoor intercommunications

RECOMMENDED PANEL:

- **Mod. 397-PLE/EV**
  Wooden panel

THEORETICAL-EXPERIMENTAL HANDBOOKS

Practical handbook of electric interphone systems.

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KIT FOR INDUSTRIAL INSTALLATIONS
Mod. MI-P/EV

TRAINING PROGRAM:

- Controlling a contactor from a point
- Impulse control of a contactor
- Separate control of two contactors
- Remote control reverser
- Remote control reverser with block on pushbuttons
- Remote control reverser with timer
- Start-delta starter
- Starting by stator resistances
- Starting by autotransformer
- Starting by rotor resistances by steps
- Remote controlled pole-change switch for two-winding motors
- Remote controlled pole-change switch for single-winding (Dahlander) motor
- Reverse current braking
- Remote control reverser, star-delta starter

COMPONENTS:

- 2 fuse holders 1/N for fuses of 10.3x38 up to 25 A – 400 Vac
- 1 set of three fuse holders for fuses of 10.3x38 up to 25 A – 400 Vac
- 6 fuses 10.3 x 38 with current of 6 A
- 1 mushroom-head emergency button with 1 NO contact + 1 NC 10 A – 250 Vac
- 3 pushbuttons of different colours with 1 NO contact + 1 NC 10 A – 250 Vac
- 4 lamp socket for warning lights with diameter of 22 mm, of different colours, including lamps Ba9s – 24 V – 3 W
- 5 three-pole contactors of 25 A – 400 Vac, 2 auxiliary NO contacts + 2 NC 10 A – 250 Vac, coil of 24 Vac
- 1 three-pole thermal relay with rated current of 4 – 6.5 A, 1 NO contact + 1 NC 10 A – 250 Vac
- 3 multi-function timers (delayed closing, delayed opening) with NO / NC exchange contact 10 A – 250 Vac, coil of 24 Vac
- 1 auxiliary relay, 2 auxiliary NO contacts + 2 NC 10 A – 250 Vac, coil of 24 Vac
- 1 single-phase transformer 115/230 – 24 V 100 VA
- 2 boxes for 4 button operators / lamp socket
- 30 screws M4 x 10-20 mm with nuts and washers
- 2 pieces of 30 cm for fixing modular components
- 1 set of 15 terminals

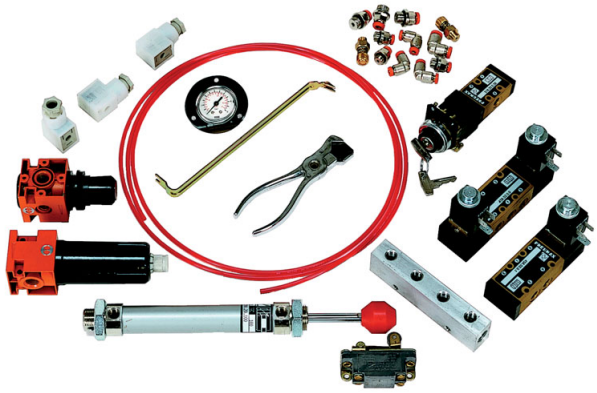
RECOMMENDED PANELS:

- **Mod. 397-PLF/EV**
  Panel of pierced metal sheet, or
- **Mod. 397-PAM/EV**
  Framed panel with metallic rods

THEORETICAL-EXPERIMENTAL HANDBOOKS

Practical handbook of industrial installations.

KIT FOR ELECTRO-PNEUMATIC SYSTEMS
Mod. ME/EV



TRAINING PROGRAM:

ELECTRO-PNEUMATIC SYSTEMS

- Controlling a cylinder by monostable solenoid valve
- Controlling a cylinder by bystable solenoid valve
- Controlling a cylinder by monostable solenoid valve and self-holding circuit
- Temporary storage with prevalent insertion
- Temporary storage with prevalent reset
- Temporary binary counter for circuits with bistable solenoid valve
- Temporary binary counter for circuits with monostable solenoid valve
- Permanent binary counter for circuits with bistable solenoid valve
- Permanent binary counter for circuits with monostable solenoid valve
- Control of a sliding door
- semi-automatic control of a double-acting cylinder by monostable solenoid valve
- semi-automatic control of a double-acting cylinder by bistable solenoid valve
- electric control of a cylinder by monostable solenoid valve (anti-repetitiveness)
- electric control of a cylinder by bistable solenoid valve (anti-repetitiveness)
- electric control of a cylinder by monostable solenoid valve and impulse relay (anti-repetitiveness)
- electric control of a cylinder by bistable solenoid valve and impulse relay (anti-repetitiveness)
- automatic control by monostable solenoid valve and stop pushbutton with return to a0 at the end of the cycle
- automatic control by bistable solenoid valve and stop pushbutton with return to a0 at the end of the cycle
- automatic control by bistable solenoid valve and stop pushbutton with immediate return to a0
- automatic control by bistable solenoid valve and stop and emergency pushbutton with different returns
- automatic control by bistable solenoid valve and stop and emergency pushbutton with immediate return to a0
- controlling a cylinder by bistable solenoid valve and delayed-excitation timer
- electric diagrams for using delayed-excitation timer, with monostable solenoid valve and instantaneous contact
- semi-automatic control of a cylinder, with bistable distributor, delayed excitation
- semi-automatic control of a cylinder, with bistable distributor, delayed excitation and exchange contact
- semi-automatic movement with limit switch, timer and monostable distributor
- semi-automatic movement with limit switch, timer and bistable distributor
- safety two-hand control

LOGICAL FUNCTIONS IMPLEMENTED WITH FUNCTIONAL ELECTRIC DIAGRAMS

- identity function (YES)
- inverse function (NOT)
- sum function (inclusive OR)
- exclusive OR
- product function (AND)
- inhibition function
- examples of logical equations

INDUSTRIAL APPLICATIONS

- pick-and-place cycle with bistable solenoid valves
- pick-and-place cycle with monostable solenoid valves
- pick-and-place cycle with monostable solenoid valves and safety and emergency circuits
- pick-and-place cycle with bistable solenoid valves and safety and emergency circuits
- "L" cycle with bistable solenoid valves
- "L" cycle with bistable solenoid valves, automatic and semiautomatic control circuits, and anti-repetitiveness condition
- "L" cycle with monostable solenoid valves, automatic and semiautomatic control circuits, and anti-repetitiveness condition

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COMPONENTS:

- 1 nylon spiral pipe Rilsan® (10 m), provided with connections M 12 MINI of ¼"
- 20 m of coloured nylon pipe Rilsan®, 4 x 2.5
- 2 m of neutral nylon pipe Rilsan®, 6 x 4
- 1 filter/reducer/pressure gauge assembly
- 1 bistable directional valve of ¼", controlled by side lever
- 1 distribution frame of 4 connections, ¼"
- Two 5/2 solenoid valves, solenoid-solenoid, 24 Vac 50-60 Hz
- Two 5/2 solenoid valves, solenoid-spring, 24 Vac 50-60 Hz
- 6 light connectors for solenoid valves
- 2 double-acting cylinders provided with 2 magnetic sensors, pins, nuts and cam on rod
- 1 silencer of 1/8"
- 1 malew quick connection of ¼"
- 4 unions R1-6 – ¼"
- 12 unions R6-4 - 1/8"
- 12 L-shaped unions, R4 4
- 4 plastic plugs (Ø 4)
- 8 drain regulators of 1/8"
- 9 unions R1-4 of 1/8"
- 1 union R2-4 of 1/8"
- 1 male plug of ¼"
- 1 union R1-6 of 1/8"

RECOMMENDED PANEL:

- **Mod. 397-PLF/EV**
  Panel of pierced metal sheet

RECOMMENDED ACCESSORIES:

Silent compressor, provided with wheels and tank, overpressure valve and pressure reducer with connection fitting M.12 MINI ¼".
Technical specifications of compressor:

- capacity: 20 l
- flow rate: 55 l/min
- pressure: 7 bars
- motor power: 0.5 kW
- revolutions per minute: 1400
- noise level: < 57 dB
- power supply: 230 V, single-phase – 50-60 Hz
- automatic thermal protection
- Dimensions: 650 x 350 x 750 mm
- Net weight: 30 kg

THEORETICAL-EXPERIMENTAL HANDBOOKS
Practical handbook of electro-pneumatic systems.

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23-C

EV

BENCHES AND KITS FOR ASSEMBLING AND TESTING WORKSHOP OF ELECTRIC MACHINES

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BENCH FOR TESTING MOTORS AND TRANSFORMERS
Mod. BMT/EV

INTRODUCTION

This bench is absolutely necessary for the testing and quality control of the machines assembled by students.
The components of these bench are perfectly equal to those used in industry to test motors and transformers.

This bench is designed to carry out:

- measurements of the power absorbed by the machine (transformers and motors) through instruments already connected with a three-phase line and with a DC line variable with continuity
- measurement of output power and of torque by eddy current drag brake, for a braking power of 2.5 HP, and by digital revolution counter for measuring RPM
- no-load and short-circuit tests on motors and transformers by variable single-phase, DC and three-phase lines
- measurement of applied voltage on samples of material or on parts already assembled by students, by dielectric strength test of 0 to 3000 V with automatic opening at 5 mA and possibility of destructive and non destructive test
- measurement of temperature by digital electronic tester mounted on the bench, and by probe inserted in various points of the objects under test
- measurements of resistance by regulated power supply that replaces the standard storage batteries
- welding of coils of motors and transformers without removal of the insulating layer of the wire nor the use of tin, by the arc-welding machine included in the bench

TECHNICAL SPECIFICATIONS:

This bench is made of press-formed sheet steel on a framework of steel sections, epoxy painted. The working top is of chipboard coated with bonded laminate.
Two drawers with flush-mounted handles and key locks are fixed under the working top. All the electric components and accessories are included in the desk where they are also represented graphically on the silk-screen-printed fore panel of aluminium alloy.

ELECTRIC CHARACTERISTICS:

The bench is provided with the following lines:

- general services, with main control device of electro-magnetic type, protected by high-sensitivity magneto-thermal differential circuit breaker, with key switch, stop/emergency pushbutton, warning light
- service line with three single-phase sockets and a three-phase socket; protection against overload and short-circuit by magneto-thermal circuit breaker
- variable single-phase line of 0-270 Vac – 8 A, switchable to DC 0-220 Vdc – 8 A, with control device of electro-magnetic type, coarse and accurate voltage regulation, digital measurement instrument of main electric parameters (voltages, currents, active, reactive and apparent power, power factor, frequency) of AC line, digital voltmeter and ammeter for DC line, magnetothermal protection against overloads and short-circuits, safety terminals
- variable three-phase line of 0-450 Vac – 8 A, switchable to DC 0-500 Vdc – 8 A, with control device of electro-magnetic type, digital measurement instrument of main three-phase electric parameters in 3 systems (voltages, currents, active, reactive and apparent power, power factor, frequency) of AC line, digital voltmeter and ammeter for DC line, magneto-thermal protection against overloads and short-circuits, safety terminals
- digital multimeter for measurements of direct voltage and current, alternating voltage and current, resistance and temperature, provided with measurement probe and prods
- line of dielectric strength test
  - as regards the applied voltage test of motors, transformers, components and generally of any electromechanical construction assembled by students, it is possible to carry out destructive and non destructive tests
  - high voltage signalled by blinking lamp
  - optical-acoustic signalling of discharge
  - start key switch and pushbutton
  - emergency button for immediate suppression of high voltage
  - insulation of prods at 20 kV
  - control and testing circuits assembled with solid state components

Line of electronic revolution counter

It consists of a digital frequency meter coupled to an optical reflection sensor. This system enables to measure the rotation speed of the motors under test on the brake, directly in r.p.m., within the limits of 0-999 r.p.m. The sensor is equipped with adjustable support for an easy positioning.

Line of the regulated power supply unit of 12 Vdc 15 A

- electronic protection of output against short-circuit and overload with automatic reset
- foldback current limitation
- serial regulation
- stability for variations of line voltage of ± 10% and of the load from 0 to maximum: 0.05%
- residual ripple: 10 mVpp

Line of welding machine

Arc-welding machine with prods for welding the ends of coils of motors and transformers assembled by students, without removal of the insulating layer of wire nor the use of tin.

Dimensions: 2.000 x 1.000 x 860 + 450 mm of desk
Net weight: 250 kg

POWER SUPPLY:

3 x 400 V (3 x 230 V) 50-60 Hz
Max. consumption: 5 kVA

THEORETICAL-EXPERIMENTAL HANDBOOKS

Handbook for testing of electromechanical constructions.

BENCH FOR TESTS OF ELECTRIC CIRCUITS WITH FIXED AND VARIABLE SUPPLY VOLTAGES

Mod. BPR-1/EV

TECHNICAL SPECIFICATIONS:

Table and power supply desk are made of press-formed sections and sheet steel, chemically treated and painted with several coats of epoxy varnish.
The working top is of chipboard coated with bonded laminate.
The desk available on the longer side of the bench can be opened on the back for inspection and service.

The described electric components are included in the desk.
The control, protection and testing devices are mounted on the silk-screen-printed fore plate of aluminium alloy.
All the protection devices accessible to students are of magneto-thermal type; no fuse that could be removed by students is available on the fore panel.

Dimensions: 2.000 x 1.000 x 860 + 350 mm of desk
Net weight: 132 kg

ELECTRIC CHARACTERISTICS:

Main control device of electro-magnetic type including:

- 1 four-pole contactor with rated current In = 32 A
- 1 single-phase transformer of 230 V / 24 V with power of 100 VA
- 2 fuse holder with fuses of 2 A for protection of control circuit (included in the desk)
- 1 start key button that can be extracted only in zero position
- 1 mushroom-head emergency button with mechanical holding; released when turned
- 1 magneto-thermal differential circuit breaker of A type, In = 32 A; Idn = 30 mA
- 1 lamp socket with warning light of energized line
- 1 three-phase autotransformer with primary winding of 230 V, secondary winding of 400 V / N, power of 12 kVA.

Fixed three-phase line of 400 V – 16 A (230 V – single-phase)

- 1 four-pole magneto-thermal circuit breaker, In = 16 A
- 1 digital measurement instrument of main electric parameters (voltages, currents, active, reactive and apparent power of every phase and three-phase) of single-phase/three-phase line, accuracy rating of ± 0.5%; provided with 3 TAs of 50/5 A (accuracy rating of ± 0.5%) for current measurements up to 25 A
- 2 EEC sockets of 16 A 3/N/earth for output of fixed three-phase line of 400 V – 16 A
- 1 EEC socket of 16 A 2/earth for output of fixed single-phase line of 230 V – 16 A
- 4 universal (2-pin and Unel) sockets 2/earth for output of single-phase line of 230 V – 16 A
- 1 lamp socket with warning light of energized line

Variable single-phase / three-phase line – 3 x 0-340 Vac – 5 A, switchable to variable DC line of 0-500 Vdc – 5 A

- 1 four-pole rotary switch for enabling and selecting AC / DC outputs
- 1 three-phase voltage regulator; input: 3 x 400 V; output: 3 x 430 Vac /Neutral – 5 A
- 1 four-pole magneto-thermal circuit breaker, In = 6 A, curve B, for protecting output of voltage regulator
- 1 digital measurement instrument of main electric parameters (voltages, currents, active, reactive and apparent power of every phase and three-phase) of single-phase/three-phase variable line, accuracy rating of ± 0.5%; (refet to the characteristics specified above); provided with 3 TAs of 50/5 A (accuracy rating of ± 0.5%) for current measurements up to 10 A
- 5 terminals of 25 A for output of variable line 3 x 0-430 Vac – 5 A
- 1 EEC socket of 16 A 3/N/Earth for output of fixed single-phase line of 230 V – 16 A
- 4 universal (2-pin and Unel) sockets 2/earth for output of three-phase line of 3x0-430 V – 5 A
- 1 double three-phase Graetz bridge (25 A – 1000 V) with residual ripple of 4.2%
- 1 two-pole magneto-thermal circuit breaker, In = 6 A, curve B, for protecting output of line 0-500 Vdc
- 1 digital voltmeter series 96 x 48, range of 500 Vdc (3 red displays of 14 mm); accuracy rating of ±1%, including current shunter of 10 A / 100 mV
- 2 terminals of 25 A for output of line 0-500 Vdc – 5 A

Refulated power supply unit of 0-24 Vdc – 3 A

- 1 control two-pole lever switch of 6 A
- 1 fuse holder with fuse of 2 A for protection of primary circuit of power supply unit (included in the desk)
- 1 multi-revolution protection for adjusting voltage from 0 to 24 Vdc
- 1 one-revolution potentiometer for adjusting current from 0 to 3 A
- 1 board-type digital (3 digits) voltmeter of 9.99 Vdc, accuracy rating of 1%, for measuring output voltage
- 1 board-type digital (3 digits) ammeter of 9.99 Adc, accuracy rating of 1%, for measuring output current

Electronic protection against overload and short-circuit, residual ripple: 5 mV peak-to-peak.

POWER SUPPLY:
3 x 400 V (3 x 230 V) 50-60 Hz
(3 x 220 V / N / PE other voltages on demand)
Max. consumption: 10 kVA

BENCH FOR ELECTROMECHANICS

Mod. 1300/EV

INTRODUCTION

This bench has been designed to carry out all the activities of a modern ELECTROMECHANIC WORKSHOP and it is the ideal support for assembling electric machines.

Examples of applications:

- Disassembling, construction of windings and reassembly of static and rotating electric machines
- Testing circuits, with continuity test by circuit tester included in the equipment
- Short testing of operation of motors and transformers
- Wiring exercises on chassis

TECHNICAL SPECIFICATIONS:

This bench is made of epoxy painted sections and sheet steel. The working top is of chipboard coated with bonded laminate. Two drawers with flush-mounted handles and key locks can be fixed under the working top. Desk is accessible from the top for inspections and service. Electric components and accessories are included in the desk where they are also represented graphically on the silk-screen-printed fore panel of aluminium alloy.

Electric characteristics

- **General services,** with main control device of electro-magnetic type, main key switch, protected by high-sensitivity magneto-thermal differential circuit breaker, stop/emergency pushbutton with mechanical holding, warning light, 2 single-phase sockets of 230 V protected by magneto-thermal circuit breaker of 10 A.
- **Three-phase line of 400 V – 10 A,** with magneto-thermal protection, four-pole key switch for line exclusion, warning light and safety terminals.
- **Low voltage line of 12-24 V,** with circuit tester, protected by magneto-thermal circuit breaker and by breakable fuses, optical alarm device, safety terminals.
- **Analog multimeter, with sensitivity of 20 kΩ / V,** for measurements of direct voltage and current, alternating voltage and current and resistance.

Dimensions: 2.000 x 1.000 x 860 + 200 mm of desk
Net weight: 90 kg

RECOMMENDED ACCESSORIES:

SUPPORT FOR STATOR mod. SH-1/EV

This device simplifies the assembly of stator windings of rotating machines.

It consists of a supporting base bearing a steel ring that can turn on two axes. This ring is provided with three adjustable arms for a quick locking/release of stator inside.
This arrangement makes the insertion of winding coils in stator slots easier

This stator holder can house stators of motors with power up to 2-3 kW.

POWER SUPPLY:

3 x 400 V (3 x 230 V) 50-60 Hz
Max. consumption: 4 kVA

AUTOMATIC WINDING MACHINE FOR TRANSFORMERS

Mod. B-15/EV

INTRODUCTION

This equipment has been designed to reel the electric windings of static machines automatically. The bearing framework is of aluminium and the rotating parts are mounted on ball bearings.

- Universal single-phase motor of 180 W
- Double-guide lead screw carriage
- Multi-speed gearbox
- Five-digit revolution counter of fast reset
- Adjustable spacers of thread guide stroke
- Pitch variator sensitive to centesimal fractions
- Automatic or manual direction reverser

TECHNICAL SPECIFICATIONS:

- Universal single-phase motor with pedal for adjusting speed, power of 180 W
- For wires with diameters of 0.06 to 1.4 mm
- Coils with maximum diameter of 180 mm
- Minimum-maximum length of coils: 5 to 190 mm
- 2 winding speeds: 1400/3000 r.p.m.
- Mechanical reversal: automatic or manual
- Clockwise machine rotation.

This winding machine is equipped with:

- 1 reel stick for medium and big wires
- 1 reel stick for thin wires
- 1 reel stick column
- 1 service handbook

Dimensions: 900 x 920 x 1.630 mm
Net weight: 110 kg

POWER SUPPLY:
230 V single-phase - 50-60 Hz
(other voltage values available on demand)

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AUTOMATIC COIL WINDER FOR MOTOR WINDINGS

Mod. GM500/DIGIT/EV

INTRODUCTION

This equipment has been designed to reel the coils of electric windings of rotating machines automatically. The bearing framework is of aluminium; a three-phase motor with built-in clutch enables a gradual starting of winding shaft; three-speed transmission with driving belts and belt stretcher.

TECHNICAL SPECIFICATIONS:

- Asynchronous three-phase motor with clutch and electric brake
- Winding speed: 0 to 900 r.p.m.
- Electronic speed variation
- Immediate locking brake at the end of the programmed operation
- Five-digit revolution counter with lever of fast reset and for setting the preset number

This coil winder is equipped with:

- 1 faceplate with diameter of 300 mm
- 2 pairs of 6-groove reels (Ø 40 – 80 mm)
- 1 pair of square journals
- 1 digital inverter
- 1 digital revolution counter of double pre-selection
- 1 machine support-table with drawer of sheet steel
- 1 protection of transparent material with electric locking contact covering the faceplate
- 1 service handbook

Dimensions: 800 x 800 x 1.600 mm
Net weight: 134 kg

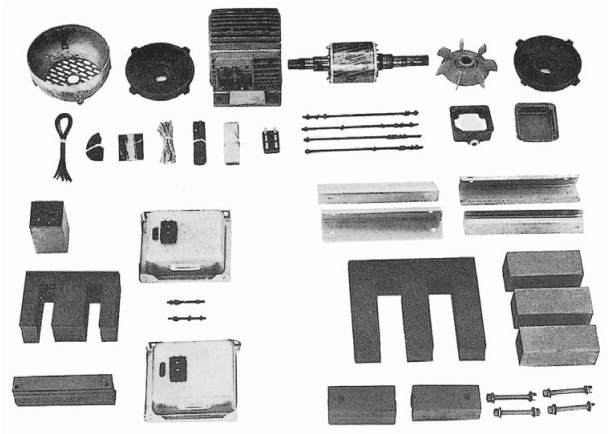
POWER SUPPLY:
230 V/PE 50-60 Hz

KITS FOR ASSEMBLING MOTORS AND TRANSFORMERS

Mod. KMT/EV

INTRODUCTION

Each kit includes magnetic circuits, mechanic and insulating parts, as well as various accessories for assembling the desired machine (copper is excluded).
Students can reel the winding considering the type of performance the machine has to ensure; then they can assemble the various components and at last they can test the assembled machine.



TRAINING PROGRAM:

This programme proposes to assemble the following machines:

- Single-phase transformer of low power
- Single-phase autotransformer of low power
- Single-phase transformer of medium power
- Single-phase autotransformer of medium power
- Three -phase transformer of medium power
- Three-phase autotransformer of medium power
- Asynchronous three-phase cage motor of 4 poles
- Asynchronous three-phase cage motor of 2 poles
- Asynchronous three-phase cage motor of 2/4 poles
- Asynchronous single-phase cage motor of 4 poles

This line of kits includes:

- 1 KIT for assembling single-phase transformers of 220 VA and autotransformers of 470 VA
- 1 KIT for assembling single-phase transformers of 1,5 kVA and autotransformers of 3 kVA
- 1 KIT for assembling three-phase transformers of 2 kVA and autotransformers of 3 kVA
- 1 KIT for assembling 24-slot motors:
  - asynchronous three-phase cage motor, 4 poles, 0.7 kW
  - asynchronous three-phase cage motor, 2 poles, 1.1 kW
  - asynchronous three-phase cage motor, 2/4 poles, 0.8/0.5 kW
  - asynchronous single-phase cage motor, 4 poles, 0.5 kW

RECOMMENDED ACCESSORIES:

SET OF SEPARATE TOOLS INCLUDING:

- 3 screwdrivers of different size
- straight scissors
- cutting nippers
- 1 wire scraper
- 1 winding iron
- 1 slot filling iron
- universal pliers
- needle-nose pliers
- 1 set of Allen wrenches
- 1 set of fork spanners
- 1 hammer of 250 g
- 1 plastic mallet
- 2 wooden tools for inserting loops into slots
- 2 wooden tools for insulating heads
- cutting nippers for extracting sheet irons
- 1 cable terminal wrench
- 1 set of straightedges for cores
- 1 gauge (1/20)
- 1 electric welder of 40 W
- 1 box of welding paste of 500 g

THEORETICAL-EXPERIMENTAL HANDBOOKS

Handbook for assembling transformers
Handbook for assembling autotransformers
Handbook for assembling AC rotating machines.

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ELECTROMAGNETIC BRAKE ON WHEELED TROLLEY

Mod. FE/EV

For braking tests on motors up to 1800 W / 2800 r.p.m.

TECHNICAL SPECIFICATIONS:

This brake is equipped with swinging yoke mounted on ball bearings, with a heavy disc of solid copper.
Motor-brake coupling is carried out by an adjustable self-centering joint for shafts with diameter up to 45 mm. It is also provided with spirit level for balancing, sensitivity balance weight, 50cm-long calibration arms with notches every 0.5 cm, weight and counterweight. Its base of aluminium alloy also includes a heavy bed for bearing the motor under test: this bed is adjustable in height with continuity thanks to a handwheel driving a patograph support; the position is locked by a knob screw. The motor is fixed onto the support by a system with locking bracket: thus motors can be fixed and removed very easily.
This brake is also equipped with the device for locking the rotor of the motor under test. The whole assembly is mounted on a wheeled trolley.

Electric characteristics

- maximum braking torque: 6.5-0-6.5 Nm
- series/parallel connection of coils
- operation of 30 minutes (intermittent operation)
- maximum speed: 3600 r.p.m.

Dimensions: 1.200 x 500 x 700 mm
Net weight: 100 kg

POWER SUPPLY:
0 to 220 Vdc

THEORETICAL-EXPERIMENTAL HANDBOOKS
Theoretical handbook.

POWER SUPPLY UNIT FOR ELECTROMAGNETIC BRAKE

Mod. AFP-1/EV
Mod. AFP-2/EV

INTRODUCTION

It outputs the variable supply voltage for electromagnetic brake mod. FE/EV for the variation of braking power. It outputs a variable line of 0 to 250 Vac / 0 to 220 Vdc – 8 A.

Unit AFP-2/EV is also suitable to supply power to the Eddy current brake mod. M-15/EV. It outputs a variable line of 0 to 250 Vac / 0 to 220 Vdc – 2 A.

TECHNICAL SPECIFICATIONS:

Testing/measurement devices are available on silk-screen-printed fore panel.

This unit is mounted in a metallic box and is provided with:

- 1 switch
- 1 lamp socket with lamp
- 1 single-phase voltage regulator:
  - 8 A (mod. AFP-1/EV)
  - 2 A (mod. AFP-2/EV)
- 1 voltmeter for measuring the output DC / AC voltage
- 1 AC/DC selector
- 2 fuse holders with breakable fuses
- 4 safety terminals of voltage output
- 1 Graetz bridge rectifier

Dimensions: 350 x 320 x 300 mm
Net weight - AFP-1/EV: 25 kg
Net weight - AFP-2/EV: 18 kg

POWER SUPPLY:
230 V 50-60 Hz

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MULTIMEDIA SOFTWARE AND FURNISHINGS

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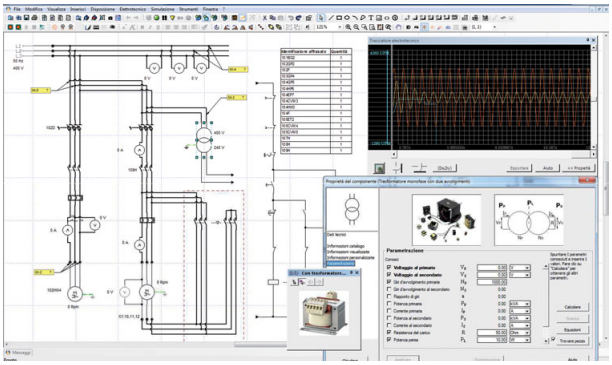
CIRCUIT DESIGN, SIMULATION AND ANIMATION SOFTWARE FOR ELECTRICAL ENGINEERING PROJECTS

Mod. SW-ELT/EV



INTRODUCTION

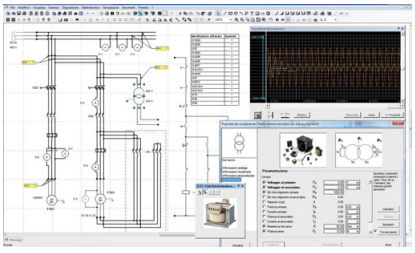
The software mod. SW-ELT/EV constitutes a very powerful educational tool to develop theoretical lessons and laboratory practical exercises. This software allows the user to design, simulate and animate circuits for the following technical fields:
- Electrical engineering
- Electrical control (standard IEC, JIC).
- Digital Electronics

It also allows:
- Creating HMI and control panels interfaces
- Interfacing with the real circuit

SYMBOLS LIBRARY:

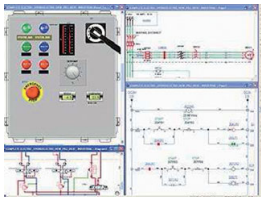
International symbols library for all the field mentioned above, according to ISO, DIN, IEC, NEMA and other standards. The user is able to create partial or specific libraries, to facilitate the design of new symbols. One important characteristic is the "component dimensioning" function, or the possibility to assign specific characteristics to the used symbols.

ELECTRICAL ENGINEERING:



The Library offers a wide range of components to create electrical D.C and/or A.C. circuits. The user can modify the simulation parameters like the resistance, inductance, torque, frequency, mutual inductance of the rotor or mutual inductance stator of the motor, the constant of inertia etc. With this library you can draw a circuit, simulate its operation and look for possible errors before passing to its realization.

HMI AND CONTROL PANEL:

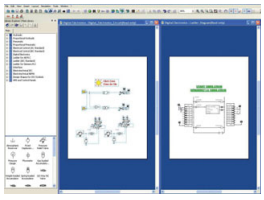


This module allows to create animations and control panels. The graphical library contains several objects such as switches, push buttons, potentiometers, etc.

ELECTRICAL CONTROL LOGICS:

This library interacts with all the components of other libraries and allows creating electrical control logic circuits. It is then possible to make electro-pneumatics project. It includes push buttons, relays, coils, etc.

DIGITAL ELECTRONICS:



This library provides a wide range of standard logic components like inverter, logic ports, flip-flops, counters, scrolling registers, comparators, push buttons, LEDs, 7-segments display, multiplexer, etc.

OPTIONAL ACCESSORIES:

- Interface board - mod. C2-IO/EV

PC SYSTEM CONFIGURATION:

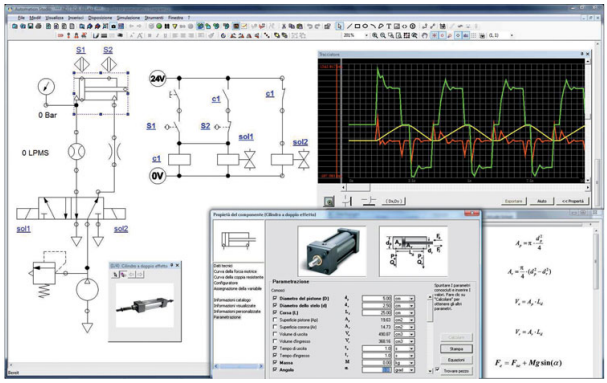
- 2 USB ports
- O.S: Windows XP (SP2), Vista or Windows 7

THEORETICAL-EXPERIMENTAL HANDBOOKS

Theoretical-experimental manual with applications guide.

CIRCUIT DESIGN, SIMULATION AND ANIMATION SOFTWARE FOR PNEUMATICS AND ELECTRO-PNEUMATICS PROJECTS

Mod. SW-AIR/EV



INTRODUCTION

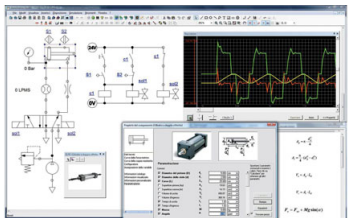
The software mod. SW-AIR/EV constitutes a very powerful educational tool to develop theoretical lessons and laboratory practical exercises. This software allows the user to design, simulate and animate circuits for the following technical fields:
- Pneumatics and Proportional Pneumatics
- Electrical control (standard IEC, JIC).
- Digital Electronics

It also allows:
- Creating Grafcet sequences
- Interfacing with the real circuit.

SYMBOLS LIBRARY:

International symbols library for all the field mentioned above, according to ISO, DIN, IEC, NEMA and other standards. The user is able to create partial or specific libraries, to facilitate the design of new symbols. One important characteristic is the "Component dimensioning" function, or the possibility to assign specific characteristics to the used symbols.

PNEUMATICS AND PROPORTIONAL PNEUMATICS:



International symbols library for the entire field mentioned above, according to ISO, DIN, IEC, NEMA and other standards. The user is able to create partial or specific libraries, to facilitate the design of new symbols. One important characteristic is the "Component dimensioning" function, or the possibility to assign specific characteristics to the used symbols.

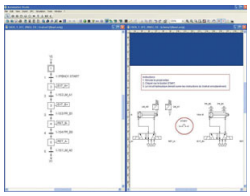
ELECTRICAL CONTROL LOGICS:

This library interacts with all the components of other libraries, and allows creating electrical control logic circuits. It is then possible to make electro-pneumatics projects. It includes push buttons, relays, coils, etc.

DIGITAL ELECTRONICS:

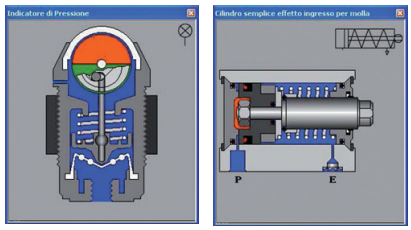
This library provides a wide range of standard logic components like inverter, logic ports, flip-flops, counters, scrolling registers, comparators, push buttons, LEDs, 7-segments display, multiplexer, etc.

GRAFCET:



This module allows implementing control structures according with IEC61131-3 standard. This universal method can be used together with other libraries to perform the control of complex pneumatics projects. The Grafcet programming technique helps to develop complex automatic sequences and to test them before transferring them to the PLC. The developed programs with this software can be exported in a compatible format with Siemens S7 PLCs and in XML format.

CUT-AWAY COMPONENTS ANIMATION:



The 3D animated cut-away components show the internal operation of the devices. The animations are synchronized with the circuit simulation.

OPTIONAL ACCESSORIES:

- Interface board - mod. C2-IO/EV

PC SYSTEM CONFIGURATION:

- 2 USB ports
- O.S: Windows XP (SP2), Vista or Windows 7

THEORETICAL-EXPERIMENTAL HANDBOOKS

Theoretical-experimental manual with applications guide.

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WORKING TABLE
Mod. TOP/EV

INTRODUCTION

Table mod. TOP/EV is the basic piece of furniture that enables to satisfy the different needs of a laboratory of electrical engineering or of electronics, thanks to its toughness and modular characteristics.

TECHNICAL SPECIFICATIONS:

It consists of:

- framework and legs of tubular steel sections
- adjustable feet
- working top of laminated wood with rounded edges
- full set of accessories
- All the metallic parts of both framework and any accessory have been oven painted and rustproof treated

Dimensions: 2.000 x 1.000 x 860 mm
Net weight: 80 kg

A wide range of accessories (drawers, socket holders, vertical frames for instruments, power consoles, instrument boards, etc…) improves table versatility adapting to the several functional and logistic needs of a laboratory.

By way of an example, here are some configurations assemblable with table TOP and the accessories.

TOP/EV WORKING TABLE ACCESSORIES

VERTICAL FRAME FOR INSTRUMENTS mod. IH/EV

- Made of oven painted steel with rustproof treatment
- Upper top with anti slip rubber mat
- 6 power sockets on base plate

Dimensions: 2.000 x 400 x 400 mm
Net weight: 23 Kg

SIMPLE / DOUBLE DRAWER

They are made of press-formed sections and sheet steel, oven painted with rustproof treatment.
They are mounted on roller slides, they are provided with handles and key lock and can be fixed under the working top on the 4 sides of the table.
They can be superimposed on each other to assemble chest of drawers of various sizes.

Dimensions - simple drawer: 420 x 120 x 440 mm
Dimensions - double drawer: 420 x 240 x 440 mm

DOUBLE SOCKET HOLDING UNIT

Unit of 2 universal sockets of 230 V – 10/16 A, with shielded pockets, that can be fixed under the working top on the 4 sides of the table.
(Sockets of the standard of the country of destination are available on demand).

UNIT FOR MAGNETO-THERMAL AND/OR DIFFERENTIAL CIRCUIT BREAKER

Unit with two-pole magneto-thermal and/or differential circuit breaker of 10 A / 30 mA and lamp socket with warning light.

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VARIOUS FURNISHINGS

STOOL

Revolving stool with seat and (optional) back of beech, adjustable in height. Chromium-plated metallic parts. Supported by 5 legs with rubber feet.

SWIVEL CHAIR

Padded seat and back. Seat height adjustment. 5-star base on wheels. Fire-resistant fabric coating.

WRITING DESK

Oven painted metal framework. Matte Melamine top, with anti-glare and scratch-resistant surface. Bevelled edges.

Optional: 3-drawer chest on wheels.

Dimensions: 1600 x 800 x 760 mm

LOCKER

Made of oven painted sheet steel, with two key locked doors, provided with 4 internal shelves.

Dimensions: 1200 x 450 x 2000 mm

SLIDING GLASS DOORS LOCKER

Made of oven painted sheet steel, with two key locked glass doors, provided with 4 internal shelves.

Dimensions: 1200 x 450 x 2000 mm

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