

## HOME & BUILDING AUTOMATION LABORATORY



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## HOME & BUILDING AUTOMATION LABORATORY STRUCTURE



NOTE: The panels highlighted in BLUE can work only if connected with a panel highlighted in RED that outputs the Bus voltage.

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## **TOPICS DEALT WITH IN THIS LABORATORY**

TOPICS	A-ILB/EV BASIC KNX BUS	A-ILD/EV DALI LINGHTING CONTROL	A-ILH/EV HEATING AND AIR CONDITIONING CONTROL	A-ILE/EV ACCESS CONTROL	A-ILC/EV CONTROL OF LOADS	A-ILV/EV SUPERVISION AND CONTROL	AZ-LOGO/EV LOGIC MODULE FOR KNX INSTALL.
Lighting installations, control of blinds, heating and scenarios – basic KNX bus	X						
Lighting installations, control of blinds, heating and scenarios – KNX bus + display and remote control	X					X	
Advanced lighting control		X					
Advanced lighting control + lighting remote control and display		X				X	
Advanced heating and air conditioning control			X				
Advanced heating and air conditioning control + heating/cooling remote control and display			X			X	
Access control and control of blinds	X			X			
Access control and control of blinds + display and remote control of accesses and blinds	X			X		X	
Control of loads	X				X		
Control of loads + display and remote control of loads	X				X	X	
Extended Bus applications; main line and 1 line	X	One o pa	f these nels				
Extended Bus applications; main line and 2 lines	X	X	X				
Extended Bus applications; main line and 2 lines + display and remote control of installations	X	X	X			X	
KNX applications with logic module	X						X

NOTE: A PC and SOFTWARE ETS are used to program and set the plant at work

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## KONNEX BUS SYSTEMS EXPERIMENTAL PANEL 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 ETS 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

#### **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.

#### RECOMMENDED ACCESSORIES:

Genuine **ETS Design Software** (EIB Tool Software) edited by consortium Konnex.

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)

#### **POWER SUPPLY:**

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

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## EXPERIMENTAL PANEL OF DALI AND KNX BUS SYSTEMS FOR ADVANCED LIGHTING CONTROL MOD. A-ILD/EV



#### INTRODUCTION

Panel for assembling lighting control installations in KNX Bus systems.

It has been designed for the testing of large and innovatory systems of lighting field, with the digital control of luminosity of fluorescent lamps via **DALI** (Digital Addressable Lighting Interface) dimmer, and control by Bus devices.

The fluorescent lamps of the panel can also be controlled and adjusted individually and by groups, and luminosity can be controlled automatically, in addition to the typical DALI control system by a KNX-DALI gateway and a luminosity sensor (included in the equipment).

Panel of insulating material with its components represented by international electric symbols. Electrical connections are carried out via leads supplied with the equipment: the power circuit development includes terminals and safety plugs with diameter of 4 mm, differently from the bus circuit assembled with terminals and safety plugs with diameter of 2 mm. Using this panel for testing does not need any tool.

### Independent operation of lighting control panel mod. A-ILD/EV.

This panel can operate independently because it includes a power supply unit and the port for the connection with a PC. It is included in a system enabling different educational combinations: it can be used together with basic panel mod. A-ILB/EV **to assemble extended configurations** (line within a main line), and with panel mod. A-ILV/EV including the touchscreen and the mini server, to create some pages for the display of state and central, local and remote modification.

This system is programmed and set at work by design software ETS, to be purchased separately (the same software is indispensable, not included, even for the basic panel mod. A-ILB/EV).

#### TESTING PROGRAM:

- Luminosity control systems of fluorescent lamps: independent control
- Luminosity control systems of fluorescent lamps: control by groups
- Luminosity control systems of fluorescent lamps: luminosity control with lux sensor
- Installations with fluorescent lamps: control of lighting scenarios
- Application of line/field coupler for assembling a line within a main line, if it is used together with basic panel mod.
   A-ILB/EV that outputs the main line in KNX Bus system.

Considering also the dimmer for traditional lamps included in basic panel mod. A-ILB/EV will enable to assemble further installations.

#### TECHNICAL CHARACTERISTICS:

- Painted metallic framework with wide front panel of insulating material
- Quick connections via terminals and safety leads with diameter of 4 mm (2 mm for bus)
- 3 electronic DALI dimmable ballasts for lamps of 18 W, with power supply of 220-240 V
- 3 lamp sockets for compact fluorescent lamps
- 3 compact fluorescent lamps of 18 W
- 1 power supply unit of 160 mA including anti interference coil; modular structure for omega slide; it is used to output and control the voltage of Bus system (29 Vdc – SELV: Safety Extra-Low Voltage); input power supply: 120...230 Vac, 50/60 Hz
- 1 line/field coupler of modular structure for omega slide, for connecting two bus lines and separating them galvanically
- 1 USB interface for the connection with a PC; modular structure for omega slide including Bus coupler
- 1 KNX-DALI gateway for connecting Konnex protocol with DALI devices
- 1 luminosity controller for indoor lighting installations including coupler for the connection with Bus line
- 1 four-channel push-button with 4 pairs of keys for various commissioning operations, and four LEDs of state indication equipped with coupler for the connection with Bus line
- 1 Polysnap power supply unit with input via plug C14 and output via socket C13, bipolar control switch with indicator lamp
- 1 single-phase power cord with Unel plug and socket C13
- 1 single-phase power cord with plug C14 and socket C13

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

# MATION

#### SUPPLIED ACCESSORIES:

- 15 cables with safety plugs (Ø 4 mm) for power connections
- 6 cables with safety plugs (Ø 2 mm) for KNX Bus connections
- 3 cables with safety plugs (Ø 2 mm) for DALI connections

#### **POWER SUPPLY:**

single-phase, 230 V - 50-60 Hz - max 100 VA

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## EXPERIMENTAL PANEL OF KNX BUS SYSTEMS FOR ADVANCED HEATING AND AIR CONDITIONING CONTROL MOD. A-ILH/EV



#### **INTRODUCTION**

Panel for assembling installations of indoor temperature control in buildings, with KNX Bus systems.

It has been designed for the testing of large and innovatory systems in the field of zone temperature control, with application of thermostats, temperature sensors, on-off actuators, proportional valves, also enabling speed variation of fans of fan-coils.

This panel enables to connect and program different types of temperature sensors and actuators in KNX standard such as:

- Temperature control unit including room thermostat and display
- Temperature control unit including room thermostat
- Temperature control unit without display
- · Activation of on-off zone valve
- Control of zone proportional valves
- Control of fan-coils with fans enabling up to 3 speeds

Panel of insulating material with its components represented by international electric symbols. Electrical connections are carried out via leads supplied with the equipment: the power circuit development includes terminals and safety plugs with diameter of 4 mm, differently from the bus circuit assembled with terminals and safety plugs with diameter of 2 mm. Using this panel for testing does not need any tool.

### Independent operation of heating control panel mod. A-ILH/EV

This panel can operate independently because it includes a power supply unit and the port for the connection with a PC. It is included in a system enabling different educational combinations: it can be used together with basic panel mod. A-ILB/EV **to assemble extended configurations** (line within a main line), and with panel mod. A-ILV/EV including the touchscreen and the mini server, to create some pages for status display and central, local and remote modification.

This system is programmed and set at work by design software ETS, to be purchased separately (the same software is indispensable, not included, even for the basic panel mod. A-ILB/EV).

#### TESTING PROGRAM:

- heating control of a zone including room thermostat and zone valve or circulation pump
- heating control of a zone including room thermostat and proportional valve for PI control
- heating/air-conditioning control of a zone including room thermostat, display and zone valves or separate circulation pumps for the two (heating and air conditioning) circuits
- 2-3 zone temperature control including room thermostats and zone valves or circulation pumps
- fan control of fan-coil unit enabling 3 speeds at maximum
- Application of line/field coupler for assembling a line within a main line, if it is used together with basic panel mod. A-ILB/EV that outputs the main line in KNX Bus system.

Considering also the thermostat included in basic panel mod. A-ILB/EV will enable to assemble further installations.

#### TECHNICAL CHARACTERISTICS:

- Painted metallic framework with wide front panel of insulating material.
- Quick connections via terminals and safety leads with diameter of 4 mm (2 mm for bus).
- 1 programmable room temperature control unit with display and 4 keys for modifying values and operating modes, and five status LEDs, including coupler for the connection with the Bus line.
- 1 programmable room temperature control unit enabling 2-point, PI and PWM control and different operating modes retrievable via Bus, and status LEDs, including coupler for the connection with the Bus line.
- 1 programmable room temperature controller enabling different operating modes retrievable via Bus, including coupler for the connection with the Bus line.
- 1 starting device for proportional valve: it integrates two binary inputs for enabling/disabling operations with status switches and includes a coupler for the connection with the Bus line.
- 1 fan-coil actuator with outputs for controlling two valves and the three-speed motor; automatic or manual controls; indications via 9 LEDs; it integrates two binary inputs for enabling/disabling operations with status switches; power supply of 230 Vac, provided with coupler for the connection with the Bus line.
- 1 switching actuator with 8 outputs up to 10 A for controlling the boiler, the valves and/or circulators; all these outputs can also be controlled manually by the buttons available on the front panel with status LED; power supply of 230 Vac, it includes coupler for the connection with the Bus line.
- 1 power supply unit of 160 mA including anti interference coil; modular structure for omega slide; it is used to output and control the voltage of Bus system (29 Vdc – SELV: Safety Extra-Low Voltage); input power supply: 120...230 Vac, 50/60 Hz.
- 1 line/field coupler of modular structure for omega slide, for connecting two bus lines and separating them galvanically

- 1 USB interface for the connection with a PC; modular structure for omega slide including Bus coupler
- 8 ideograms with indicator lamps of 230 V representing zone valves or circulators
- 1 Polysnap power supply unit with input via plug C14 and output via socket C13, bipolar control switch with indicator lamp
- 1 single-phase power cord with Unel plug and socket C13
- 1 single-phase power cord with plug C14 and socket C13

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

#### SUPPLIED ACCESSORIES:

- 20 cables with safety plugs (Ø 4 mm) for power connections
- 14 cables with safety plugs (Ø 2 mm) for KNX Bus connections

#### **POWER SUPPLY:**

Single-phase, 230 V – 50-60 Hz – 100 VA max.

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## EXPERIMENTAL PANEL OF KNX BUS SYSTEMS FOR ACCESS CONTROL MOD. A-ILE/EV



#### **INTRODUCTION**

Panel for assembling automation installations for the movement of blinds or shutters and the access control with badge readers in KNX Bus systems.

It has been designed for the testing of large and innovatory systems that can be applied in residential, commercial and service buildings (hotels) for the functions of management and control of blinds and of access control.

The motor-driven "mini" blinds available in the panel enable a realistic programming of actuators even according to the "working times", besides the necessary electrical connections. A window over the blinds will interact with a typical magnetic contact for anti intrusion detection; micro contacts are connected with an interface to send the closed/open state of the window to the Bus.

Access control is carried out by transponder card readers, typically used to control the opening of doors without any key. Valid cards are created by the specific software and by the programmer of the panel equipment. Panel of insulating material with its components represented by international electric symbols. Electrical connections are carried out via leads supplied with the equipment: the power circuit development includes terminals and safety plugs with diameter of 4 mm, differently from the bus circuit assembled with terminals and safety plugs with diameter of 2 mm, and from the auxiliary power supply needed by badge readers: in fact this uses leads with polarized jacks. Using this panel for testing does not need any tool.

#### NOTE:

Panel mod. A-ILE/EV is included in a system that enables different educational combinations, but it must always be used together with the basic panel mod. A-ILB/EV that generates KNX Bus system.

Furthermore, when used also together with panel mod. A-ILV/EV including the touch-screen and the mini server, it enables to create some pages for the display of state and local and remote control of accesses.

#### TESTING PROGRAM:

- · Local control of a motor-driven blind (or shutter)
- · Separate control of two motor-driven blinds
- · Global or group management of motor-driven blinds
- Using a badge reader to control the access to a zone (or room): programming the badge/s
- Using the card-in reader for electrical commissioning in the room
- Using two or more badge readers for the access to a zone with more entrances

Considering also the actuator for blinds included in the basic panel mod. A-ILB/EV enables to assemble further installations.

#### TECHNICAL CHARACTERISTICS:

- Painted metallic framework with wide front panel of insulating material
- Quick connections via terminals and safety leads with diameter of 4 mm (2 mm for bus)
- 2 actuators for motors of blinds including Bus coupler suitable to be inserted in control boxes. Blind actuators are equipped with a pair of keys (push-buttons) of blind control
- 2 miniature blinds with motors of 230 Vac, upward-downward movement controlled by limit switches, shutter windows interacting with a typical magnetic contact of anti-intrusion detection
- 1 four-channel Bus Coupler suitable to be inserted in control boxes: 2 channels are connected with the magnetic contacts of windows, whereas the other two channels are connected with state-indication LEDs
- 2 transponder card (or badge) readers with 4 light icons for various indications, on-off input connected with a button, 2 relay outputs with potential free contacts for general uses (e.g.: courtesy light)
- 1 transponder card-in reader with 4 light icons for various indications, on-off input connected with a button, 2 relay outputs with potential free contacts for general uses (such as switching lights on, connecting loads)
- 1 tabletop programmer of transponder cards with USB connection, provided with control software
- 10 transponder cards
- 1 Polysnap power supply unit with input via plug C14 and output via socket C13, bipolar control switch with indicator lamp
- 1 single-phase power cord with Unel plug and socket C13
- 1 single-phase power cord with plug C14 and socket C13

Dimensions: Net weight:

650 x 400 x 120 mm 17 kg

## DING MATION

#### SUPPLIED ACCESSORIES:

- 10 cables of 1 m with safety plugs (Ø 4 mm) for power connections
- 10 cables of 0.5 m with safety plugs (Ø 2 mm) for KNX Bus connections
- 4 cables of 1 m with jacks for the auxiliary power supply of readers and card-in reader

#### **POWER SUPPLY:**

single-phase, 230 V - 50-60 Hz - 100 VA max.

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## EXPERIMENTAL PANEL OF TRADITIONAL AND KNX BUS SYSTEMS FOR CONTROL OF ELECTRIC LOADS MOD. A-ILC/EV



#### INTRODUCTION

Panel enabling the control of electric loads according to their operating priority even in KNX Bus systems.

It has been designed for the testing of large and innovatory systems used to control the consumed power so that the power supply cannot be disconnected in case of excessive absorption. During the assembly of the installation, it is possible to state which power consuming devices (the least important ones) can be disconnected and which devices (the priority ones) must be kept powered. This panel also enables to study and apply different techniques for the control of loads such as:

- · Relays with one or two priority levels
- Multimeters that can disconnect the loads via a programmable relay, besides displaying the line parameters (voltage, current, power, etc..)
- Technologies for interfacing control devices with power relays for big loads
- Technologies for interfacing control devices with KNX bus actuators to manage the "smart sockets" enabling a very easy modification of priority standards: in fact no intervention is carried out on the physical wiring, it is merely sufficient to reprogram the actuators
- Remote supervision of loads (state of loads) via KNX bus.

Panel of insulating material with its components represented by international electric symbols. Electrical connections are carried out via leads supplied with the equipment: the power circuit development includes terminals and safety plugs with diameter of 4 mm, differently from the bus circuit assembled with terminals and safety plugs with diameter of 2 mm. Using this panel for testing does not need any tool.

#### NOTE:

Panel mod. A-ILC/EV is included in a system that enables different educational combinations, but it must always be used together with the basic panel mod. A-ILB/EV that generates KNX Bus system.

Furthermore, when used also together with panel mod. A-ILV/EV including the touch-screen and the mini server, it enables to create some pages for the display of state and local and remote control of loads.

#### TESTING PROGRAM:

- Control systems of loads via automatic priority relay with one or two fixed-threshold priority levels
- Control systems of loads via multimeter where not only the parameters of total absorption are displayed, but also the tripping threshold is set for the NC contact that disconnects the loads being not very important
- Interfacing the control devices with power relays for big loads
- Interfacing the control devices with KNX Bus actuators to manage the "smart sockets" with automatic and manual control
- Supervision of loads (state of loads) by remote control via
   KNX bus

#### TECHNICAL CHARACTERISTICS:

- Painted metallic framework with wide front panel of insulating material
- Quick connections via terminals and safety leads with diameter of 4 mm (2 mm for bus)
- 1 relay for controlling loads with adjustable tripping threshold ranging from 5 to 90 A; two priority levels, modular structure
- 1 digital multimeter with two 3-digit displays; it can measure voltage, current, active power, power factor. Moreover it records the active energy and time (hours and minutes) that can be reset to highlight the consumption in a certain time. It also includes a relay programmable on the measures of V, I and P, for the function of disconnecting the load as soon as the set value is exceeded, with a warning sound signal. Voltage up to 250 V, current up to 26 A; accuracy rating of 0.5% ± 2 digits
- 2 relays with a power contact, operating coil of 230 V, contact of 250 V – 25 A
- 1 four-channel binary output with current of 16 A, including current detection in each channel; it can also be enabled manually and is provided with state LED; its modular structure also includes coupler for the connection with KNX Bus line
- 1 four-channel binary input with rated voltage of 230 V, modular structure, including coupler for the connection with KNX Bus line
- 4 modular elements of the omega slide equipped with data strip are available for the connection of further modular KNX devices
- 1 four-channel push-button with 4 pairs of keys for various commissioning operations, and a LED of state indication equipped with coupler for the connection with KNX Bus line
- 4 single-phase universal sockets of 230 V, 10-16 A, for the connection of power consuming devices
- 1 Polysnap power supply unit with input via plug C14 and output via socket C13, bipolar control switch with indicator lamp
- 1 single-phase power cord with Unel plug and socket C13
- 1 single-phase power cord with plug C14 and socket C13

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

## DING MATION

#### SUPPLIED ACCESSORIES:

- 25 cables with safety plugs (Ø 4 mm) for power connections
- 6 cables with safety plugs (Ø 2 mm) for KNX Bus connections
- 3 electric loads with power of 500-1000 W (power consuming devices in the system having to be controlled)

#### **POWER SUPPLY**:

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

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## LOGIC MODULE FOR KONNEX INSTALLATION

## Mod. AZ-LOGO/EV

#### **INTRODUCTION**

This panel must be used together with the testing modules for BUS systems expanding the traditional testing with a logic module.

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.

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.

#### EXPERIMENTS PROGRAM:

• Interaction between EIB/KNX BUS systems (home automation) and automation systems with micro PLC

#### **TECHNICAL SPECIFICATIONS:**

- Painted metallic framework with fore panel of insulating material
- Quick connections via safety leads and terminals (Ø 4 mm)
- 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:	350 x 300 x 100 mm
Net weight:	6 kg



#### SUPPLIED ACCESSORIES:

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

#### POWER SUPPLY:

Single-phase 230 V 50-60 Hz 100 VA

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## DISPLAY AND CONTROL OF KNX BUS SYSTEMS EXPERIMENTAL PANEL Mod. A-ILV/EV



#### **INTRODUCTION**

Building automation functions can be summarized as follows:

- Lighting control
- Control of blinds and accesses
- · Creation and modification of typical scenarios of use
- Temperature (heating/cooling) control
- Control of loads
- Remote control and status display (normal and alarm conditions)

Besides increasing the living comfort, the various functions implement an energy-saving technology. Buildings must be equipped with automatisms that work to attain the maximum energy saving, apart from common sense (their property consists in minimizing consumptions).

The "display" and "remote control" of the plant will inform the user of the status and of the events developing during the normal and/or anomalous operation (display), enabling him/her to interact, even far away (remote control), in order to impose different countermeasures from those taken automatically by the programmed functional logic. Panel mod. A-ILV/EV has been designed for the testing of large and innovatory systems that will be used in combination with other KNX Bus panels and it includes:

- a touch-screen for creating pages of control and status display of the functions mentioned above;
- a KNX server for local Wi-Fi control via Android tablet, iPHONE, iPAD, iPOD, and remote control via networked PCs using Windows and Linux
- a router with four 100/10-Mbit Ethernet LAN ports and Wireless (Wi-Fi) connection

#### **TESTING PROGRAM:**

This panel enables to create pages for control and status display such as:

- · control and check of on-off lamps and dimmer
- control and check of blinds, curtains
- · creation and modification of typical scenarios of use
- displaying and setting temperature levels
- dtatus control of loads
- control of the installation via Wi-Fi network or remote control via LAN.

#### **TECHNICAL CHARACTERISTICS:**

- Painted metallic framework with wide front panel of insulating material
- Quick connections via terminals and safety leads with diameter of 2 mm for the KNX bus and specific leads for LAN
- 1 touch-screen for creating pages of control and status display: format 16/9 7 inches with resolution of 800 x 480 pixels, flash memory of 32 MB and SDRAM of 128 MB; it includes the BCU for the connection with the KNX bus, 3 video inputs and audio In/Out for remote analog video cameras and interphone line; the equipment of touch-screen also includes the programming software of MSI format for PCs with Windows O. S.
- 1 colour video camera with signal output in coaxial cable CCD 1/3", resolution of 380 horizontal lines, optical element of 3.7 mm; this camera can quickly be connected with the panel via a lead of 2 mm with 5-contact DIN plug
- 1 multi-platform KNX server, controllable by tablet (Android platform) and iPHONE, iPAD, iPOD devices (Apple platform); remote control by connection with LAN via PCs using Windows, Linux; this server also includes the BCU for the connection with the KNX Bus, Ehernet interface controller of 100 Mbit, USB OTG interface for software updating and Web services for the configuration of network parameters and the transfer of user profiles; internal RAM od 128 MB and flash memory of 32 MB
- 1 switch-router with four 100/10-Mbit Ethernet LAN ports and wireless (Wi-Fi) connection
- 1 Polysnap power supply unit with input via plug C14 and output via socket C13, bipolar control switch with indicator lamp
- 1 single-phase power cord with Unel plug and socket C13
- 1 single-phase power cord with plug C14 and socket C13

Dimensions:	650 x 400 x 120 mm
Net weight:	11 kg

#### ACCESSORIES SUPPLIED WITH THE EQUIPMENT:

- 1 tablet with LCD 10.1" TFT, capacitive Multitouch 1280 x 800, Dual Core CPU of 1 GHz, RAM of 1 GB, Storage of 16 GB, Wi Fi 802.11b/g/n and Bluetooth, rear and fore camera, Android Operating Syastem
- 4 cables with safety plugs (Ø 2 mm) for KNX Bus connections
- 1 USB cable of 2 m for touch-screen with USB connectors A / mini USB B
- 2 Ethernet cables RJ 45, category 5e (one of 1 m, one of 2 m)

## DING MATION

#### **OPTIONAL ACCESSORIES ON DEMAND**

(possible alternative to Tablet)

iPAD2 - Wi-Fi (802.11a/b/g/n) – Bluetooth technology – 4.0 Display – bright Multi-Touch screen backlit by LED of 9.7" with IPS technology. Resolution of 1024 x 768 pixels at 132 ppi. Rear video camera for HD video recording (720 p) up to 30 frames per second with audio; camera with digital 5x zoom, fore video camera for VGA video recording up to 30 frames per second with audio; photos of VGA quality.

#### **POWER SUPPLY:**

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

#### **THEORETICAL-EXPERIMENTAL HANDBOOKS** Application handbook with practical exercises.

### 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 and shared.

These networks can be used, for example, to differentiate between the consumption levels of different users: lighting, motive power or manufacturing machinery, laboratories, etc. 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 (energy analyzers). These instruments are advantageous because:

- they are microprocessor controlled digital instruments
- they enable the measurement of a great number of electrical parameters with a minimum of cabling
- they enable the observation of several parameters 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:

- TRMS measurement and harmonic analysis
- highly customizable
- complex Boolean functions are available within the preset limits of the measured parameters

- alarms can be configured with preset limits or by arranging them into Boolean operations
- 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 the acquired data

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 communication networks of different kind

Measurements are made using highly flexible energy analyzers for both single-phase or three-phase measures with or without neutral. Monitoring networks can be carried out using various standards such as 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 can be connected both to actual users or, as in the classic example of an experimental laboratory, to one or more variable electrical 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.

#### **EDUCATIONAL PROGRAMME & CONNECTING MODES:**



#### Connections of an instrument with a PC

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

D Connection of 3 digital instruments with a remote PC

via RS485 serial port and RS485/USB interface box.





PC - Instrument local connections



#### PC - Instruments RS485 connection

E1 LAN-Ethernet connection of 2 digital instruments with a switch / access point.

E2 Wireless LAN connection of 2 digital instruments



#### PC - Instruments LAN-Ethernet connection



#### PC - Instruments W-LAN connection

#### PANEL CONFIGURATION

- The panel mod. PRMCE-1/EV includes:
- 3 high end digital multifunctional instruments for the analysis of electrical power.
- 1 interface RS232 / USB
- 1 Wireless Router
- 1 remote control and data-logger software

#### Technical Characteristics of the 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  $(\cos\phi)$ , 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	MIDDLE	RIGHT
OUTPUT: 2 Relays	yes	yes	yes
RS485 Interface	yes	yes	yes
ETHERNET Interface	yes	yes	
USB Interface			yes
Memory + RTC	yes	yes	yes

• RS485 / USB interface to create the RS485 communication network

#### **Technical Characteristics of the Router Wireless**



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

#### The Remote control software enables:

- · Visualization of the measured values in virtual mode.
- Performing user defined measurements and saving them in several formats (MS-Access, text ASCII, MS-Excel).
- Tracing graphs of the desired parameters.
- Setting alarm limits to the desired parameters.
- Saving to disk the alarms and events sequence of the instruments network.
- Visualizing and modifying the set parameters, save, edit and print them.

- Visualizing the harmonic content graph of voltage and current, using the parameters measured by the instrument
- Programming the measurement pages, including flags associated to them, background images, labels and pushbuttons.
- Changing the menus and command language (Italian, English, French, Spanish and Portuguese are available).
- Set the desired parameters and the time elapsed for the data collection.
- Visualize the data from instruments in Excel and txt format.
- Trace graphs of the selected parameters.



#### Minimum PC requirements (NOT included)

- O.S. Windows XP or higher
- Graphic board with 1024 x 768 or higher resolution
- One USB standard port or a LAN 10/100 Mbit port
- 64 MB RAM
- Pentium class Processor or higher
- CD-ROM Drive for the installation

#### SUPPLIED ACCESSORIES

- 1 USB cable, 2 m, with A / B connectors
- 3 Cable 1 m with 9 terminals connectors, for the RS485 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 (panel)Net weight:15 kg

#### SUGGESTED ACCESSORIES

To carry out variable electrical loads to monitor:

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

#### **POWER SUPPLY:**

Single-phase 230 V 50-60 Hz, 3000 VA

#### THEORETICAL-EXPERIMENTAL HANDBOOKS

Application handbook with practical exercises.

## MULTIFUNCTION DIGITAL INSTRUMENT FOR ELECTRICAL MEASUREMENTS Mod. AZ VIP 10/EV

#### **INTRODUCTION**

Multifunction instrument for electrical measurements. The instrument has a wide flexibility for **single / 3-ph systems**, **with and w/o neutral**, for TRMS voltages up to 690 VAC and currents up to 10 A. Includes **harmonic analysis of voltages and currents** up to 31° order.

The instrument includes 2 programmable relays to activate/ deactivate alarm conditions with programmable limits related to the performed measurements.

The instrument is expandable by adding additional modules, as described later.

#### **TECHNICAL SPECIFICATIONS**

- Multifunction Instrument contained in an isolating table-top box
- Graphical Menu and Messages in 5 languages: English, Italian, Spanish, French and Portuguese
- To be used in single and 3-ph systems, balanced or unbalanced with/without neutral
- Connections from the front and sides, with electrical international symbols; power connections are carried out with 4 mm safety terminals. Alarm relays connections with dia. 2 mm connectors. Not any tool is required for the connections
- The unit measures: voltages, currents, active, reactive and apparent powers, power factor, frequency, V and I harmonic analysis up to 31° order
- Possibility to visualize instantaneous, max, min and avg values of voltages and currents
- Auxiliary power 110...250 VAC 50/60 Hz
- Graphic LCD display, 128 x 80 pixel, backlit, with 4 grey levels four parameters can be visualized per screen
- · Four keys for parameters visualizing and settings
- Possibility to create up to 4 programmable pages, each with 4 selectable measures among the instrument measures
- Two programmable relays (dry contacts, 250 VAC, 5A) for max/min alarm functions (function selected among those measured or from Boolean logic among the measured parameters)

#### **Current Measurement:**

- Up to 10A TRMS (with internal CT 10/5 A)
- Current range: up to 120 % Inom max 830 V ph-ph 45…66 Hz
- THD Total Harmonic Distortion (I1-I2-I3)
- Current Accuracy: 0.5%

#### Voltage Measurement:

- Volts Input: 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 (L1-L2-L3) & THD (L-N)

#### Frequency:

• 45...66 Hz

#### Power Measurements

• Power measurement: 6.9 kVA / kW / kVAr

#### **Other Measurements:**

• Power factor, Voltage Asymmetry, Energies meter: kWh / kVAh / kVArh and Counter Hour

Dimensions:	220 x 170 x 140 mm
Weight:	2,5 kg

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#### ADDITIONAL MODULES (optional not included)

The instrument is able to include 4 optional modules. One module is just included on-board for the two programmable relays. *Then the user can select other 3 modules for the following functions:* 

- Communications port for remote control, with specific software for data acquisition
- Data memory for data-logging,
- Analog inputs (Al<mark>) 0-20 mA, 4-20 mA, 0-10 V</mark>DC, ±5 VDC
- Analog outputs (AO) 0-20 mA, 4-20 mA, 0-10 VDC, ±5 VDC

FUNCTION	SUGGESTED	DESCRIPTION
USB Port	1 module	2 m - type A/B USB Cable. Requires Remote control software.
ETHERNET Port	1 module	2 m - ca <mark>t. 5</mark> Cable with RJ45 connectors. Requires Remote control software.
ETHERNET Port	1 module + 1 module	2 m - cat. 5 Cable with RJ45 connectors. Requires Remote control software.
	13 modules	0-20 mA, 4-20 mA, 0-10 VDC, ±5 VDC. The AI can be any physical parameter (electrical and even RPM, I/min, temperature, etc.)
ANALOG OUTPUTS	13 modules	0-20 mA, 4-20 mA, 0-10 VDC, $\pm$ 5 VDC. The AO can be selected among the instrument measured parameters (V, I, S, P, Q, PF, etc.)

Note: The additional modules must be specified when ordering, as the container box should be modified.

Examples of the multifunction instrument according to the expansions that can be arranged:

- A) Instrument direct connection to a PC through a USB port for data acquisition with remote control software.
- B) Instrument direct connection to a PC through an ETHERNET port for data acquisition with remote control software.
- C) Instrument direct connection to a PC through an ETHERNET port for data acquisition with remote control software and datalogger management (data memory).

### The Remote control software (licensed for one instrument) allows to:

- Visualize the measurements from the instrument 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.



Local connection PC - Instrument

- Configure and manage the collected data of the memory module of the instrument.
- Set-up the measurements to be sampled and the sampling time.

#### Minimum PC requirements (NOT included)

- O.S. Windows XP or higher
- Graphic board with 1024 x 768 or higher resolution
- One USB standard port or a LAN 10/100 Mbit port
- 64 MB RAM
- Pentium class Processor or higher
- CD-ROM Drive for the installation

#### **POWER SUPPLY**:

Auxiliary power 110...250 VAC - 50/60 Hz. 10 VA

THEORETICAL-EXPERIMENTAL HANDBOOKS

Application handbook with practical exercises.

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