

## LHP 301

### ELECTRICAL INSTALLATIONS - INDUSTRIAL PROCESS



The LHP-301 laboratory covers all areas, theoretical and practical, concerning the installation, operation **electrical installations for industrial installation and process.**

This includes assembling, installing, testing and maintaining electrical wiring, components and control systems commonly found in the industrial installations. Training also includes diagnose and repair malfunctioning systems, apparatus, and components when a fault is present.

Trainers provided are of two types:

**PT 2101 M - Modular type:** a structure which consists of didactic modular panels with symbols and diagrams that are installed on a vertical frame. The system includes connection terminals in accordance to standard safety regulations and real components mounted on isolated panels suitable for insertion in the work bench frame.

**PT 2101 C - Panel type:** a structure which offers the possibility of installation and wiring of real components on a bench top frame. The workbench frame is designed to offer easy access for installation and wiring and safety features. It offers a real hands on experience and training.

Both of these didactic systems grant to the students a direct and immediate approach to the topic, offering the opportunity to study various subjects performing different experiments.

Trainers come with a complete Experimental guide and instructions for installation.

#### BENCH TRAINER MODULAR PT 2101 M

Industrial Installations Module Trainer

#### BENCH TRAINER FOR COMPONENT WIRING

##### PT 2101 C2 & PT 2101 C4

Industrial Installation Bench Trainer

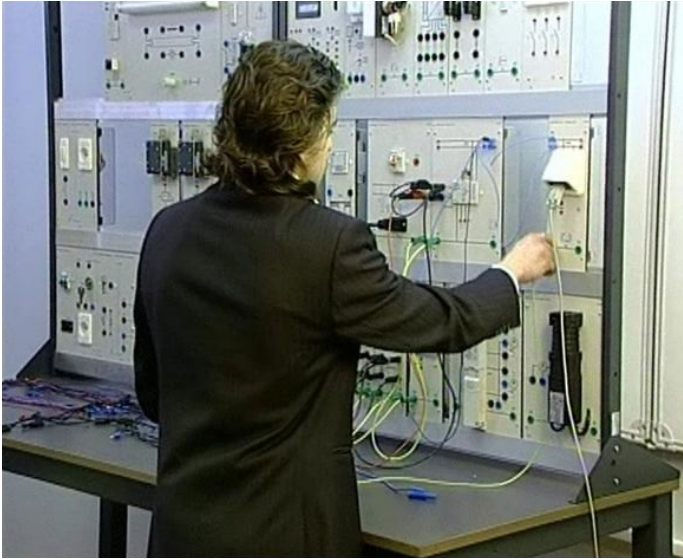
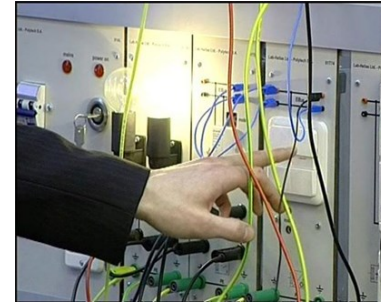
##### PT 2101 C

Industrial Installation Bench Trainer Kits



## PT 2101 M - Modular

This type of trainer is a structure which consists of didactic modular panels with symbols and diagrams that are installed on a vertical frame. The system includes connection terminals in accordance to standard safety regulations and real components mounted on isolated panels suitable for insertion in the work bench frame.



### Frame work, Bench and Modules

The bench is of robust construction, with the top in wood and the frame in metal. The bench can accommodate on its top two double metal racks, one on each side, so as four students can work at the same time on the bench. The support bench is 2 meters long, 1 meter wide and 0.9 meters high. The metal racks have three levels for the positioning, assembly and disassembly of the individual components in order to perform the exercises. The size of bench/rack allows the students to work easily.

The individual experimental modules with the components are placed on the rack. The positioning, the assembly and disassembly of the experimental modules are easy and in accordance to the current European safety rules.

The whole assembly (bench, sockets, frame, modules, etc.) withstands the laboratory use. The components are commercial materials and are mounted on insulating bases displaying the symbols and the schematics of each individual module. The modules available are listed on the right of the page.

The lab is provided with complete electronic documentation including all experimental work.

### PT 2101 M - Modules

Framework, bench & cabling
Three-Phase Power Supply
DC Power Supply
Emergency Pushbutton
Three Pushbuttons
Three Pilot Lamps
Contactor
Thermal Relay
Time Relay
Isolator
Position Sensor module
Star Delta Starter
Direct Starter With Inversion
Inductive Proximity Sensor
Capacitive Proximity Sensor
Photoelectrical Barrage Sensor
Photoelectrical Reflecting Sensor module
Level Magnetic Sensor
Flooding Probe
Star / Delta Starter With Inversion
Pole Switching For DAHLANDER Motors
Pole Switching Unit With Inversion
Pulse Counter
Programmer
Single-Phase Transformer
Level Control
Asynchronous Squirrel Cage Motor
Three-Pole Switch
Three-Phase Induction Motor
DAHLANDER Motor

## PT 2101 C2 Trainer

### Industrial Installation Bench Trainer 2 workgroups

The Industrial Installation laboratory provides for a single or more **PT-2101 C2 trainers** which are special metal top bench frames. **Each PT-2101 C2 trainer can accommodate 2 student groups for training on each side.**

On each bench frame, metal hinged panels are installed to be used for the installation of the components of the lab in circuits as per the didactic content.

Each bench tabletop frame is provided with an independent power supply module, fuse and safety features for overload and key switch for power start-up from the teacher, test leads and all accessories needed to realize the exercises and the proposed circuits. Provides all the features for the safe use of the equipment by the students within the work process.

### PT 2101 C2 trainer Configuration

Each trainer consists of:

#### Work Bench tabletop Frame PT 2100B

It is a vertical metal frame bench top with panels where students can easily and safely install the electrical components and create circuits. The trainer comes complete with installation manuals, accessories for installation of components and cables.

The bench frame is provided with a power supply module and accommodates for 2 working student spaces.

#### Power supply for PT 2100B

- 2 three-phase + N + T, 16A outputs on 36A safety terminals according to IEC 61010-1; protection through differential, magneto-thermal, 4-pole, 16A automatic switch, pilot lamp and key switch for teacher control.
- 4 outputs on 10/16A single-phase mains socket, protection through differential, magneto-thermal, 16A automatic switch and pilot lamp.

#### Junction boxes, Grid and Wooden panels

- 2 connection junction boxes **PT - 1100SD** for the safe connection of the 3-phase power supply voltage to the safety terminals and the circuits wired on the metal perforated panels.

It provides 5 safety terminals, L1, L2, L3, N and P, and 5 safety leads to connect power to the wiring of the students.

- 2 grind panels **PT 1100D** for component installation. For each side of the frame a metal grind panel is provided for circuit wiring. The



- panels are hinged and can be opened, so students can have access to their back side. The 2 panels are separated by a wooden surface, 10 cm thick, installed in the frame, behind each of the perforated panels.
- The panel is made of metal, rustproof treated and perforated with 6 mm holes for mounting on devices for circuitry. Panel size: 75 x 65 x 2 cm.
  - Each grid panel is a perforated metal panel with 2 mm thickness with holes of 6 mm, 30mm center to center distance, installed with hinges on the metal frame allowing access to the students on its back for fixing devices with screws and bolts. The panels are provided with hinges on the one side and with 3-screw mechanism (s) on the open side, to secure the panel on the frame when is closed.

It requires a **3-phase power facility in the laboratory.**

It operates with **PT-2101 C** set of components. It requires 2 sets per trainer.

#### Trainer Overall Dimensions

Dimensions: 105 x 80 cm

## PT 2101 C4 Trainer

Industrial Installation Bench Trainer 4 workgroups

The Industrial Installation laboratory provides also for a single or more PT-2101 C4 trainer configuration which are special metal top bench frames. **Each PT-2101 C4 trainer can accommodate 4 student groups for training** on each side where the PT2101 is for 2 groups and offers less facilities.

On each bench frame, metal hinged panels are installed to be used for the installation of the components of the lab in circuits as per the didactic content and all required accessories.

Each bench tabletop frame is provided with an independent power supply module, fuse and safety features for overload and key switch for power start-up from the teacher, test leads and all accessories needed to realize the exercises and the proposed circuits. Provides all the features for the safe use of the equipment by the students within the work process.



### PT 2101 C4 trainer Configuration

Each trainer consists of:

#### Work Bench tabletop Frame PT 2100C

It is a vertical metal frame bench top with panels where students can easily and safely install the electrical components and create circuits.

The bench frame is provided with a power supply module and accommodates for 4 working student spaces.

#### Power supply for PT 2100C

- 4 three-phase + N + T, 16A outputs on 36A safety terminals according to IEC 61010-1; protection through differential, magneto-thermal, 4-pole, 16A automatic switch, pilot lamp and key switch for teacher control.
- 8 outputs on 10/16A single-phase mains. sockets, protection through differential, magneto-thermal, 16A automatic switch and pilot lamp.
- 2 outputs isolated from the mains, 0-12-24Vac, 2A on isolated terminals, protection through magneto-thermal, automatic switch.
- 2 optical and acoustic circuit testers on isolated terminals, protection through fuses.



#### Junction boxes, Grid and Wooden panels

- 4 connection junction boxes **PT 1100SD** for the safe connection of the mains voltage between the safety terminals of the power supply board of the work bench and the circuit that the student has wired on the panel. Each box is provided with 5 lead cables.



- 4 grid panels **PT 1100D** for component installation. Each panel is hinged on the frame panel, accurately perforated, rustproof paint treated and provided with adequate holes for mounting on work frames. It has thickness 1.6mm, hole diameter 6mm, center distances 12mm. Suitable for assembling the components in an easy and fast way. Dimensions: 75 x 65 x 2 cm.

The trainer comes complete with installation manuals, accessories for installation of components and cables.

It requires a **3-phase power facility in the laboratory**.

It operates with **PT-2101 C** set of components. It requires 4 sets per trainer.

#### Trainer Overall Dimensions

Dimensions: 210 x 80 cm

**PT 2101 C** Component set  
Industrial Installation Bench trainer Kits

**Component set:** Each trainer comes with a set of components and teaching manuals which include experiments with theoretical references and practical exercises, schemes of main circuits used in the industrial electric installations. Each experiment is described by initiating the aim, the required components needed for the wiring, the theory reference, the electric circuit schematics and the component wiring scheme.

Components can be wired and installed on the **PT 2101 C2** and / or **PT 2101 C4** trainer bench.

The kit is composed of:

- \* 1 transformer main, 2 x 12V
- \* 1 Transformer mains 2 x 24V AC
- \* 1 emergency pushbutton with NO+NC contact
- \* 3 lamp holders (red, yellow and green) with 24V lamp
- \* 3 pushbuttons (red, yellow and green) with NO+NC contact
- \* 2 multifunction on-off delay time relays
- \* 4 contactors with 2 NO+NC contacts
- \* 1 thermal relay, complete with support
- \* 1 fuse holder, complete with fuses
- \* 1 frame for lamp and switch square holders
- \* 3 pieces of DIN section
- \* 1 set of screws to fix the components

**Required Auxiliaries**

To perform **certain tests**, it is necessary to have in the laboratory, as described below:

- ◆ a squirrel cage 3-phase Asynchronous Motor in the laboratory (see *experiments with \**)
- ◆ a 3-phase Induction Motor (see *experiments with \*\**)
- ◆ a 3-phase Squirrel cage Motor (see *experiments with \*\*\**)

**PT ASM01A**

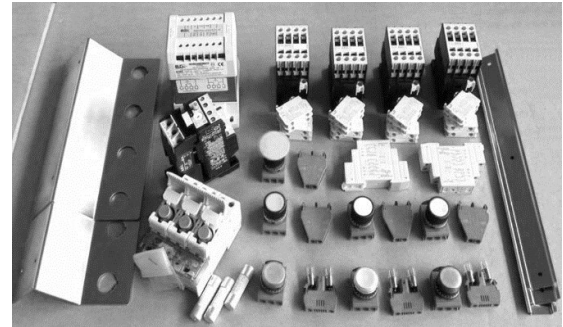
**Asynchronous Squirrel Cage Induction Motor**

Squirrel cage 3-phase asynchronous induction motor, with 3-phase stator winding and squirrel cage buried in the rotor. Rated power:180W. Terminal top box for safe interconnections is included.

**PT IRM2A**

**Three-Phase Induction Motor**

Induction motor with slip ring rotor, complete with



built-in manual braking device and 3-step starting rheostat. Rated power: 367W. Terminal top box for safe interconnections is included.

**PT ASM01D**

**DAHLANDER Motor**

Three-phase squirrel cage pole changing induction motor. Rated power: 367W. Terminal top box for safe interconnections is included.

**Didactic Aims**

With this set of components and the recommended auxiliaries, it is possible to perform experiments on the following topics:

- |    |   |     |
|----|---|-----|
| 1  | Single Pole control                               |     |
| 2  | Contactor   |     |
| 3  | Logic Operators                                   |     |
| 4  | Contactor self-supply                             |     |
| 5  | Interlock between contactors                      |     |
| 6  | Sequentially controlled contactors                |     |
| 7  | Exclusive - OR operator                           |     |
| 8  | Excitation delayed timer                          |     |
| 9  | De-excitation delayed timer                       |     |
| 10 | Static timer                                      |     |
| 11 | Thermal relay                                     | *   |
| 12 | Manual start/delta starting                       | *   |
| 13 | Manual reverser                                   | *   |
| 14 | Timed sequence control                            | *   |
| 15 | Pulse generator                                   | *   |
| 16 | Automatic star/delta starter                      | *   |
| 17 | Automatic star/delta starter with reverser        | *   |
| 18 | Counter - current braking                         | *   |
| 19 | Manual starter with rotor resistances             | **  |
| 20 | Automatic starter with rotor resistances          | **  |
| 21 | Speed variator for Dahlander motor                | *** |
| 22 | Speed reverser for Dahlander motor                | *** |
| 23 | Automatic reverser for 3-phase Asynchronous motor | *   |
| 24 | Motor starting with switch                        | *   |
| 25 | Star/delta starting with switch                   | *   |
| 26 | Reverser with switch                              | *   |
| 27 | Star/delta starting, two direction switch         | *   |

The set is provided with User Installation manual and experiment manual in **electronic form only**.