MECHATRONIC TRAINING SOLUTION

Ver: 02

Content

I: Requirements

II: ETEK solution

III: Details of training rooms

ETEK
TOTAL AUTOMATION SOLUTIONS

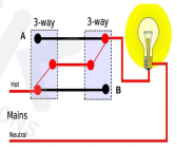
ETEK
TOTAL AUTOMATION SOLUTIONS

I. Requirements

I. Labor market requirements for the Mechatronics profession

WHAT DOES AUTOMATED FACTORY NEED FROM WORKERS?

Firmly grasp knowledge



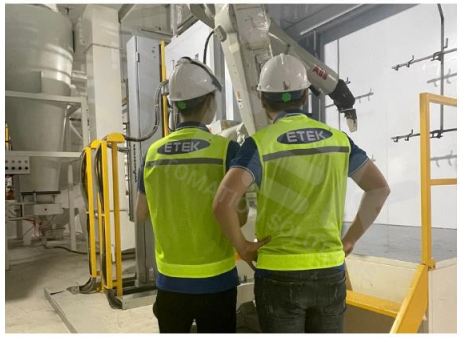
Understand system principles

System analysis and design

Mechanical installation and alignment

Programming and controlling the system

Operation and maintenance



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TOTAL AUTOMATION SOLUTIONS

II. ETEK solutions

ETEK solution

14 functional classrooms from basic to advanced

1. Electrical engineering training room	• Basic knowledge of electrical engineering and electrical tools
2. Basic electronic training room	• Knowledge of basic electronics, electronic components and applied circuits
3. Power electronics training room	• Knowledge of power electronic components and power control circuits
4. Measurement and sensor engineering training room	• Identify types of sensors, working principles and applications in industry
5. Microcontroller training room	• Programming microcontrollers, embedded programming, IoT

ETEK solution

14 functional classrooms from basic to advanced

6. Basic PLC training room	• Basic PLC programming using simulators: Logo, S7-1200, S7-1500, FX5U
7. Advanced PLC training room	• Advanced PLC programming to control systems: conveyors, elevators, mixing plants...
8. Industrial communication network training room	• PLC programming communicates through industrial communication standards: Profinet/Ethernet IP, Profibus, CC-Link, Device Net...
9. DCS distributed control technical training room	• Process control, DCS distributed control via PCS 7
10. Pneumatic training room	• Knowledge of pneumatic components and applied circuits

ETEK solution

14 functional classrooms from basic to advanced

11. Hydraulic training room	• Knowledge of hydraulic components and applied circuits
12. Industrial robot training room	• Programming Industrial robots, collaborative robots with applications
13. Flexible manufacturing system training room	• Install, program and operate mechatronic systems that simulate flexible
14. IOT and Smart Factory Training room	• Building a smart factory operation monitoring system via the Internet

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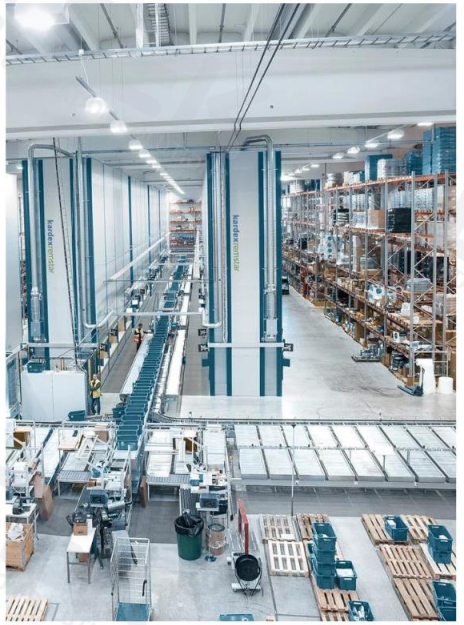
TOTAL AUTOMATION SOLUTIONS

III. Details of training rooms

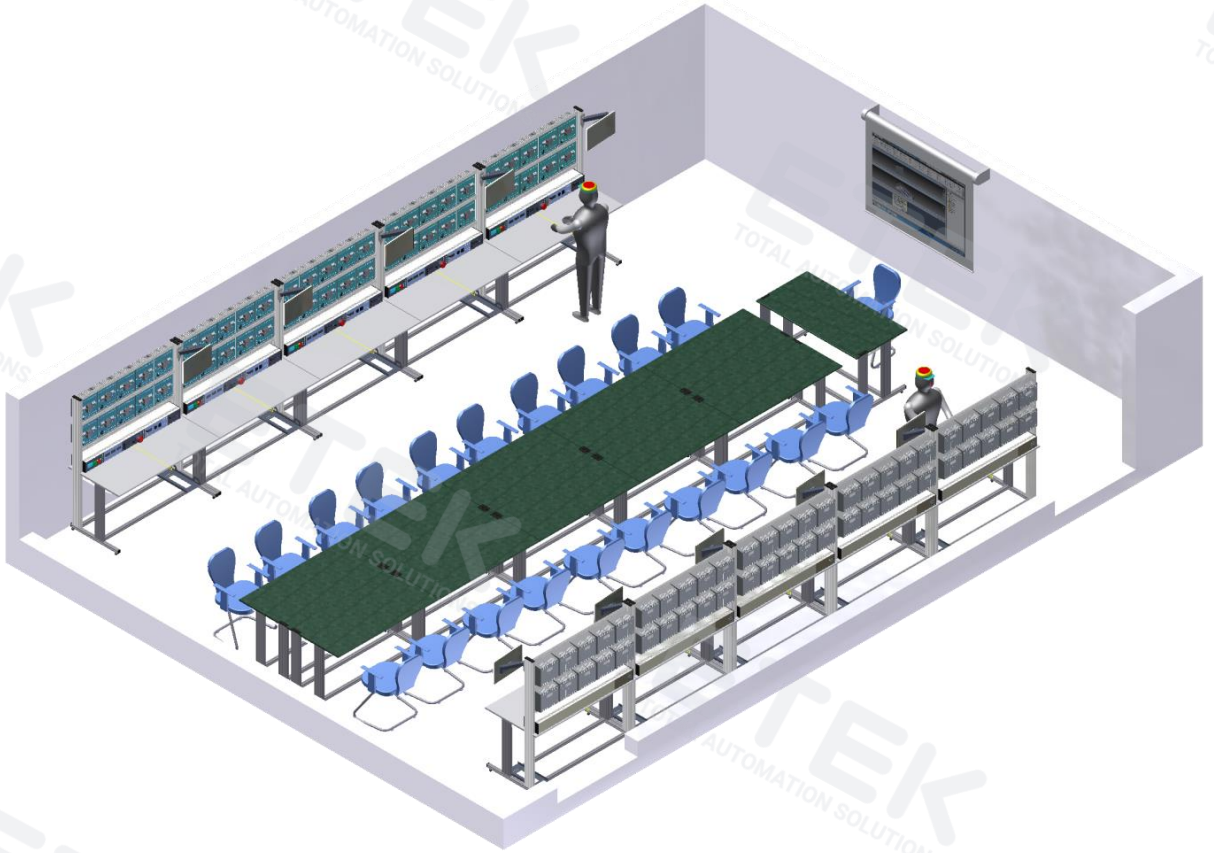


A. ELECTRICAL ENGINEERING TRAINING ROOM

ETEK
TOTAL AUTOMATION SOLUTIONS

FUNCTION

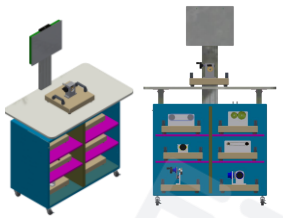
- Practice measuring voltage and direct current
- Practice pure resistive circuits, resistors in parallel, resistors in series, voltage divider circuits
- Experiments on Ohm's law, Kirchooff 1 and 2
- Current and voltage characteristics of alternating current
- Characteristics of purely resistive, purely inductive, and purely capacitive loads in AC circuits
- Calculate the capacity of 1-phase and 3-phase AC circuits
- Learn the uses, structures and operating principles of electrical tools
- Calculate and select some common electrical tools according to specific technical requirements (breakers, fuses, circuit breakers, contactors, ...) in simple cases.
- Install and operate common electrical tools
- Learn and practice the skill of finding common errors in electrical devices in electrical circuits by creating electronic errors



DC electricity training bench

AC electricity training bench

Electric instrument training bench



Mechatronic transmission model

Electrical Student WorkBench with chair

A. ELECTRICAL ENGINEERING TRAINING ROOM

1. DC electricity training bench

Training content

- Practice measuring DC voltage
- Practice measuring direct current
- Practice resistive circuits
- Practice with resistor circuits connected in parallel
- Practice with resistor circuits connected in series
- Experiment on voltage divider circuit
- Experiment on Ohm's law
- Experiment on Kirchooff's 1st and 2nd laws

A. ELECTRICAL ENGINEERING TRAINING ROOM

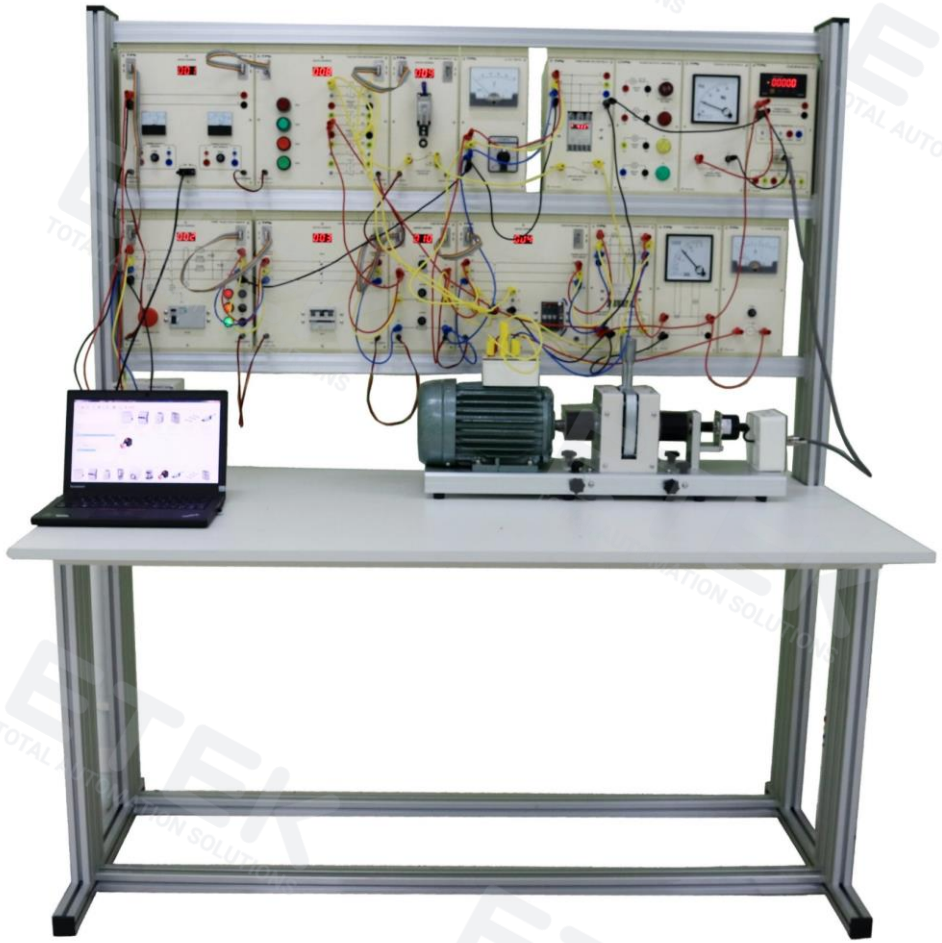
2. AC electricity training bench

Training content

- Current and voltage characteristics of alternating current
- Characteristics of purely resistive, purely inductive, and purely capacitive loads in AC circuits
- Calculate the capacity of 1-phase and 3-phase AC circuits

A. ELECTRICAL ENGINEERING TRAINING ROOM

3. Electric instrument training bench

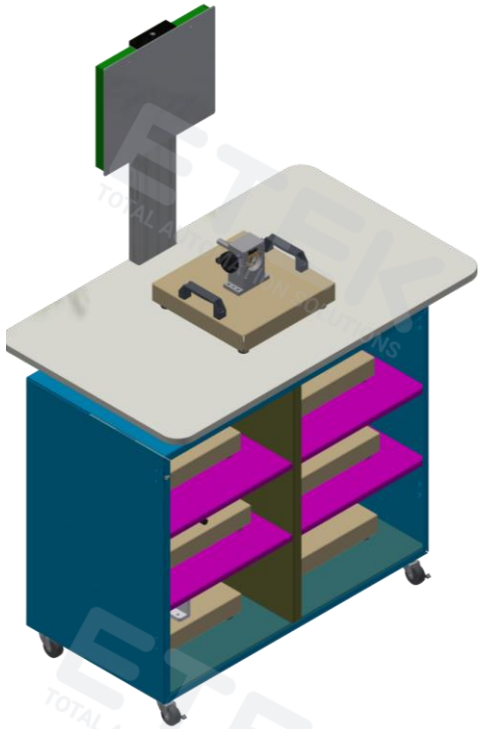


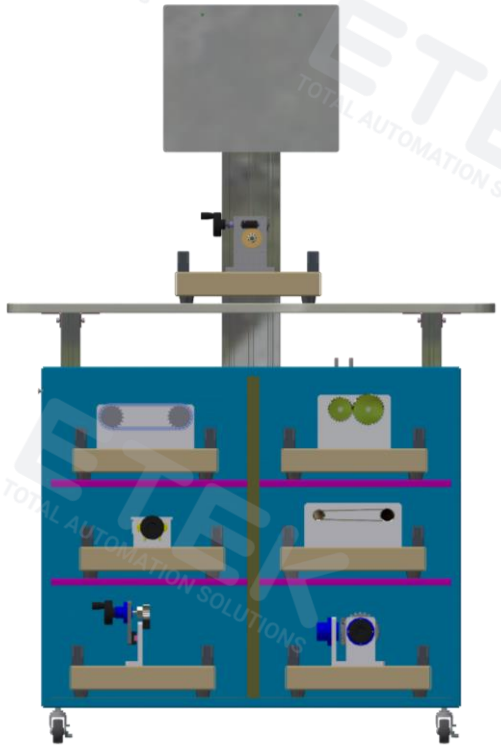
Training content:

- Learn the uses, structures and operating principles of electrical tools
- Calculate and select some common electrical tools according to specific technical requirements (breakers, fuses, circuit breakers, contactors, ...) in simple cases.
- Install and operate common electrical tools
- Installation of civil and industrial electrical circuits
- Learn and practice the skill of finding common errors of electrical devices in electrical circuits by creating electronic errors for the devices through software installed on teachers' computers.

A. ELECTRICAL ENGINEERING TRAINING ROOM

4. Mechatronic transmission model





Training content:

- Practice understanding the structure and working principles of common driving device groups in industry: straight, rotary pneumatic cylinders, reversible AC motors, speed-controlled AC motors, stepper motors, servo
- Practice understanding the structure and working principles of industrial transmissions: Lead screw-nut drive, slide rail drive, conveyor belt, vacuum cup, rack and pinion drive, screw drive , rotary table, cam drive, gevena rotary mechanism, crank mechanism, crank lever,
- Practice common sensors in industry: optical sensors, variable resistors
- Pairing sets of actuators, actuators, and sensors into complete sets of operating mechanisms in industry

B. BASIC ELECTRONICS TRAINING ROOM

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TOTAL AUTOMATION SOLUTIONS

FUNCTION

- Practice identifying different types of electronic components
- Practice DC and AC circuits
- Practice applied circuits of semiconductor devices
- Practice applications of operational amplification
- Pulse practice
- Digital practice

Main module for practicing basic electronics

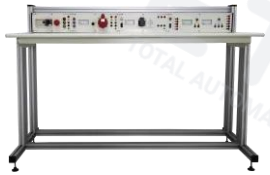
Basic experiment module for DC circuits

Theorems of DC circuits training module

AC - 1 Basic circuit training module

AC - 2 Basic circuit training module

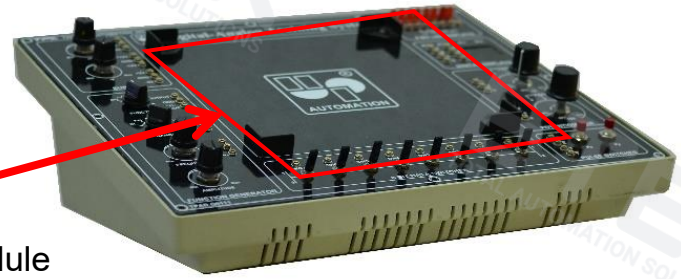
Semiconductor training module



Electronic practice table

B. BASIC ELECTRONICS TRAINING ROOM

Solution for mounting modules during practice:



Main module

Function modules

Practice set

B. BASIC ELECTRONICS TRAINING ROOM

1. Main module for practicing basic electronics

Specifications:
- Input power supply for module: 220VAC/50Hz
- Output source block:
 + Adjustable power source: 0 ~ ± 15V/500mA adjustable by rheostat
 + Fixed source: ±5V/500mA, ±12V/500mA
- Fixed AC output: 12V/1A/50Hz
- Fixed AC output: 6V/1A/50Hz
- Pulse generator block
 (A) Frequency range
 + 10 Hz ~ 100 Hz
 + 100 Hz ~ 1 kHz
 + 1 kHz ~ 10 kHz
 + 10 kHz ~ 100 kHz
 (B) Output sine wave amplitude: 0 – 8 Vpp variable
 + Output triangle wave: 0 - 6 Vpp variable
 + Square wave output: 0 – 8 Vpp variable
 + TTL level: 0 - +5 V

2. Main module for practicing basic electronics with computer connection

Specifications:

- Box size: 330 x 264 x 109 (WxDxH)
- Quality Management Standard ISO 9001:2015
- Input power supply for module: 220VAC/50Hz
- DC output power block: ±5V/500mA, ±12V/500mA
- Module design uses standard plastic box
- Standard M2 type pin
- The printing pattern guides the printing of the film on the module surface, ensuring aesthetics and the longevity of the device

B. BASIC ELECTRONICS TRAINING ROOM

3. Basic experiment module for DC circuits

Training contents:

- DC power source in series and parallel
- Dual DC source
- Determine the type of switching
- Concept of circuit reversal
- Ohm's Law: Resistance, current, circuit voltage
- Resistance, current, voltage in series resistor circuits
- Resistance, current, voltage in a parallel resistor circuit
- Resistance, current, voltage in mixed resistor circuits
- Power in series, parallel and mixed resistor circuits

4. Theorems of DC circuits training module

Training contents:

- Current in a 2-element branch circuit
- Nodal current in a 2-element branch circuit
- Voltage in a 3-element series circuit
- Add voltage in series circuit
- Circular equation
- Node equation
- Kirchhoff's voltage law for circuits with 2 sources
- Kirchhoff's current law with 2-source circuits
- Network method with 2-source circuit
- Stacking method with 2-source circuit
- Millman's theorem with 2-source circuit
- Thevenin method with one-source network
- Thevenin method with dual source network
- Thevenin bridge circuit resistor
- Thevenin bridge circuit voltage
- Convert Thevenin to Norton
- Convert Norton to Thevenin
- Tee, Wye, Pi and Delta networks
- Switch Delta and Wye Networks networks

B. BASIC ELECTRONICS TRAINING ROOM

5. AC - 1 Basic circuit training module

Training contents:

- AC waveform generator
- Measure AC amplification
- Measure AC voltage, current and impedance with an oscilloscope
- Measure and set frequency
- Inductance
- Phase angle
- Inductance in series and parallel

Basics of resistance

- Inductance and impedance
- Serial RL circuit
- Parallel RL circuit
- Electromagnetic fields
- Transformer coil
- Symptoms
- Turns ratio and voltage of the transformer
- Secondary load of transformer
- Capacitor
- Capacitors in series and parallel circuits
- Basic effects of capacitors
- Series RC circuit
- Parallel RC circuit
- RC time coefficient
- RC/RL waveform
- Basics of troubleshooting

B. BASIC ELECTRONICS TRAINING ROOM

6. AC - 2 Basic circuit training module

Training contents:
- Serial RLC circuit
- Parallel RLC circuit
- Series resonant circuit
- Q and series RLC circuit frequency range
- Resonant frequency in parallel LC circuit
- Q and frequency range
- Power division
- Power factor
- Low pass filter
- High pass filter
- Band filter
- Stop band filter
- Basics of troubleshooting

B. BASIC ELECTRONICS TRAINING ROOM

7. Semiconductor training module

Training contents:

- Identify semiconductor devices
- Semiconductor switching control
- Diode and DC characteristics
- Half-cycle rectification
- Full cycle bridge rectifier using Diode
- Filter the power source
- Voltage doubler
- Waveform using Diode
- Zener diode
- Adjust Zener Diode voltage
- Check Transistor function
- Current control circuit uses PNP Transistor
- Emitter-Base bias voltage
- Collector upstream bias
- DC circuit voltage using Transistor
- Load line uses Transistor
- Optical isolation IC
- Optical resistance
- Basics of troubleshooting

B. BASIC ELECTRONICS TRAINING ROOM

8. Transistor amplifier circuit training module

Training contents:

- Recognize, become familiar with and locate components in the circuit
- Introducing multi-stage amplification
- DC/AC operation of common Base circuit
- DC/AC operation of common Emitter circuit
- DC/AC operation of common Collector circuit
- Temperature influence on fixed polarity circuits
- Temperature influence on voltage divider bias circuit
- Transistor parameter range
- Use the Transistor parameter table
- RC coupled amplifier DC operation
- RC coupling gain and phase angle relationship
- RC coupled amplifier frequency response
- DC/AC operation of transformer coupled amplifier
- Transformer coupled amplifier frequency response
- DC/DC operation of direct coupled amplifier
- Direct coupled amplifier frequency response
- Basics of handling and troubleshooting circuit problems

9. Transistor power amplifier training module

Training contents:

- Recognize, become familiar with and locate components in the circuit
- Introduction to Transistor power amplification
- DC single output power amplifier operation
- Single AC output voltage and power amplification
- Phase-separated DC operation
- Voltage amplification and input/output signal phase relationship
- DC operation symmetrical power amplifier
- AC symmetrical voltage and power amplification
- DC operation power compensation amplifier
- AC compensation voltage and power amplification
- Amplify push-pull power
- Darlington pair current amplification characteristics
- Darlington pair input and output impedance
- Basics of handling and troubleshooting circuit problems

10. Transistor feedback circuit experiment module

Training contents:

- Recognize, become familiar with and locate components in the circuit
- Series feedback amplification operation
- Effect of feedback on AC amplification
- Effect of negative series feedback on frequency range
- Effect of series feedback on input and output impedance
- Effect of parallel feedback on AC amplification
- Effect of parallel amplification on frequency range
- Effect of parallel amplification on input and output impedance
- Multi-stage current amplification in series and parallel
- Multi-stage output amplification in series - parallel
- Multi-stage voltage amplification in series - parallel
- Multi-stage output impedance connected in series - parallel
- Differential amplifier operation
- Differential and unipolar gain characteristics
- Differential gain coefficient
- Basic concepts of handling and troubleshooting feedback amplifier circuits.

11. Power source regulation circuit training module

Training contents:

- Recognize, become familiar with and locate components in the circuit
- Introducing power supply adjustment
- Parallel adjustment operation
- Line adjustment
- Adjust load
- Serial adjustment operation
- Pressure feedback adjustment operation
- Load regulation using voltage feedback
- Reverse current limit protection circuit
- Line adjustment operation
- Adjust the line using a line regulator
- Adjust load using current regulator
- 3-pin IC adjustment and voltage adjustment activities
- Adjust 3-pin IC current and performance
- DC to DC conversion characteristics
- Regulates DC to DC conversion voltage and performance
- Basic concepts of handling and troubleshooting power source regulation circuits.

B. BASIC ELECTRONICS TRAINING ROOM

12. Thyristor and power control training module

Training contents:

- Learn the principles and practice of half-wave SCR DC Gate circuits
- Learn the principles and practice of full-wave SCR DC Gate circuits
- Learn the principles and practice of AC power control circuits using Triac

Learn the principles and practice of controlled rectifier circuits

- Learn the principles and practice of half-wave SCR AC Gate circuits
- Learn the principles and practice of full-wave SCR AC Gate circuits

B. BASIC ELECTRONICS TRAINING ROOM

13. Basic experimental module of operational amplification

Training contents:

- Basic characteristics and parameters of operational amplifiers.
- Learn the principles and practice of inverting amplifier circuits
- Learn principles and practice with non-inverting amplifier circuits
- Learn principles and practice with inverter amplifier circuits Learn the principles and practice with non-inverting additive amplifier circuits.
- Learn principles and practice with voltage repeater circuits
- Learn the principles and practice with sine wave to square wave conversion circuit
- Learn principles and practice with differential amplifier circuits
- Learn principles and practice with open loop circuits
- Learn principles and practice with gate amplifier circuits
- Learn principles and practice with exponential amplifier circuits
- Learn principles and practice with subtractive amplifier circuits

14. Experimental module of applications of operational amplification

Training contents:

- Basic characteristics and parameters of operational amplifiers.
- Learn the principles and practice with full-wave bridge diode control circuits
- Learn principles and practice with integrator circuits Learn principles and practice with differential circuits
- Learn the principles and practice with low-pass filter circuits
- Learn principles and practice with high-pass filter circuits
- Learn the principles and practice with bandpass filters
- Learn principles and practice with limited circuits
- Learn principles and practice with latching and sampling circuits
- Learn the principles and practice with window comparator circuits

15. Basic training module for FET transistors

Training contents:

- Learn the principles and operating characteristics of JFET
- Learn principles and practice with JFET amplifier circuits
- Learn principles and practice with JFET CURRENT circuit practice DC source current operation/load voltage variation with JFET
- Learn principles and practice with Colpitts oscillator circuit
- Learn the principles and practice the operation of the HARTLEY oscillator
- Learn principles and practice with thermistor circuits
- Learn the principles and practice of waveform generation and control characteristics using UJT
- Learn principles and practice with photoresistor circuits
- Learn principles and practice with fiber optic transceiver conversion circuits
- Learn the principles and practice of operating modes and dual gate MOSFET adder
- Basic troubleshooting and troubleshooting in circuits.

B. BASIC ELECTRONICS TRAINING ROOM

16. Analog electronics basic experiment module

Training contents:
- Learn the principles and practice of analog switching circuits using 4051, 4066
- Learn the principles and practice of signal amplifier circuits using LM358, BJT2N3904
- Learn the principles and practice of the PNP transistor amplifier circuit using the 2N3906 transistor
- Learn the principles and practice of logarithmic amplification using IC LM358
- Learn the principles and practice of the transformer coupled Armstrong oscillator, LC resonance

17. Digital practice module

Training contents:

- Learn circuit principles and practice with MULTIPLEXER multiplexing and DEMULTIPLEXER multiplexing circuits
- Learn the principles and practice with BCD/DECIMAL, BCD PRIORITY circuits
- Learn the principles and practice with ADC/DAC conversion circuits
- Learn the principles and practice with the 7-SEGMENT DRIVER/DISPLAY circuit
- Learn the principles and practice with the ASYNCHRONOUS RIPPLE COUNTER circuit

18. Pulse technique practice module

Training contents:

- Practice stable multivibrator circuits using transistors

Learn principles and practice with monostable oscillator circuits using OP-AMP

- Learn the principles and practice with unstable oscillator circuits using OP-AMP
- Learn principles and practice with bistable oscillator circuits using OP-AMP
- Learn principles and practice basic applications of IC555
- Learn principles and practice with IC555 - PWM circuit
- Practice creating pulses with the IC555 chip
- Learn principles and practice with Wien bridge circuits
- Learn principles and practice with IC555 linear circuits
- Learn principles and practice with trimmer circuits
- Learn principles and practice with pin circuits
- Learn principles and practice with differential circuits
- Learn principles and practice with integrator circuits
- Learn the principles and practice with frequency to voltage conversion circuits
- Learn the principles and practice with voltage to frequency conversion circuits
- Practice pulse generator circuit using UJT
- Practice pulse shortening circuit
- Practice pulse circuit using IC 74122
- Practice multivibrator circuits

B. BASIC ELECTRONICS TRAINING ROOM

19. Analog electronic circuit assembly practice kit

Training contents:

- Semiconductor, light-emitting diode in 1-way circuit
- Semiconductor diodes in AC circuits, half-cycle and full cycle rectifiers
- Use bridge diodes in DC and AC circuits
- Filter circuit, adjusting one-way pulse source
- The power circuit uses a PI filter
- Voltage multiplier circuit uses diode and capacitor
- Common E current amplifier circuit, stage amplifier, Single-End type audio amplifier
- Pull-push type audio amplifier circuit, pull-push symmetric compensation amplifier
- Zero-Phase oscillator circuit, phase shift
- Oscillator circuits ARMSTRONG, Hartley, Colpitts
- Digital circuits of AND, OR, OR– AND gates
- NAND and NOR digital circuits
- Inverting circuit, adding circuit

B. BASIC ELECTRONICS TRAINING ROOM

20. Digital electronic circuit assembly practice kit

Training contents:

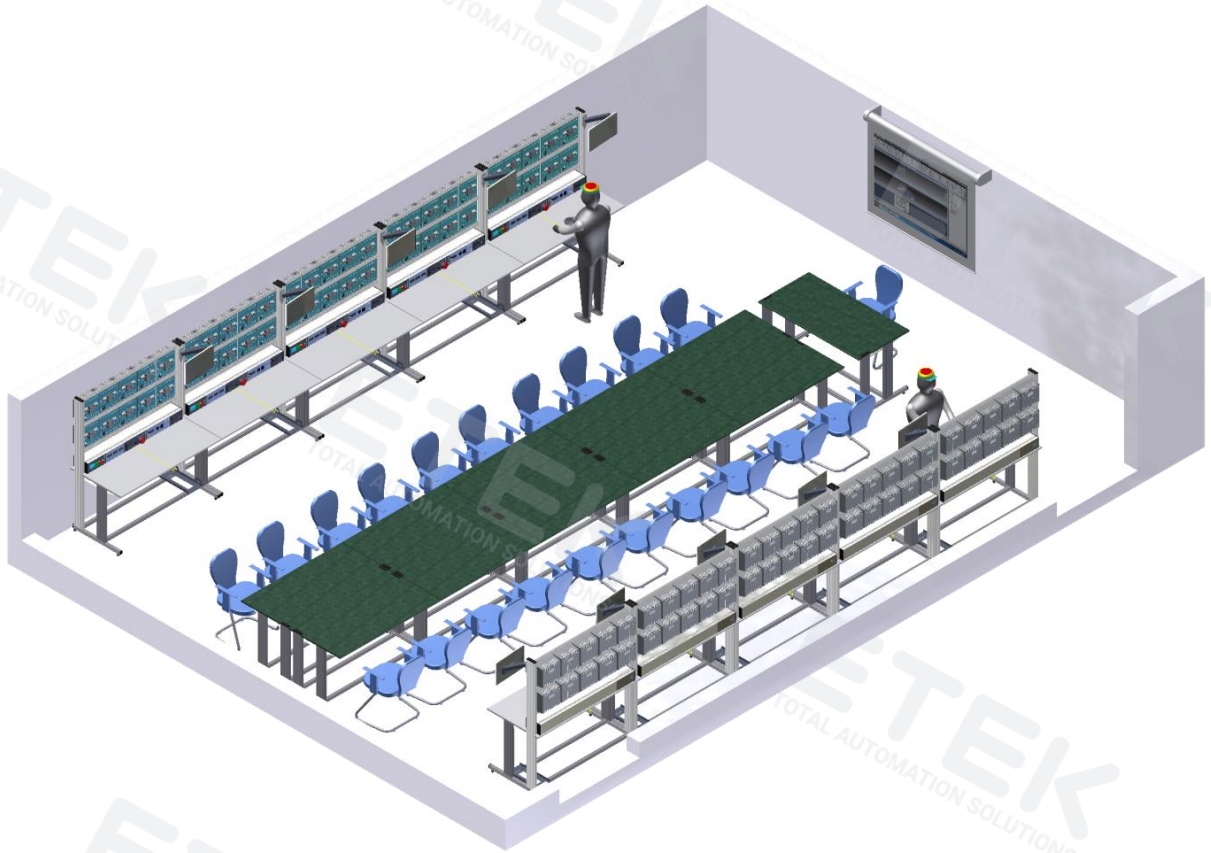
- Basic logic functions, Demoorgan theorems 1, 2, 3, 4
- Boolean algebra and simplifying logical expressions 1, 2 ,3, 4, 5, 6
- Definition and operation of TTL NAND/NOR gate 1, 2
- XOR logic function and its applications 1 - 7
- Full adder and full subtractor 1, 2, 3, 4, 5
- Binary counter and binary number system 1, 2
- Divide by -n counter and decimal counter 1 - 5
- Random access memory working memory area
- Digital-to-digital (D/A) and digital-to-digital (A/D) converters 1-2

C. POWER ELECTRONICS TRAINING ROOM

ETEK
TOTAL AUTOMATION SOLUTIONS

FUNCTION

- Laboratory test on UJT
- Experiment on SCR
- Laboratory test on DIAC and TRIAC
- Experiment on automatically adjusting light bulbs and adjusting AC motor speed using TRIAC
- Experiment on rectifier circuits using SCR
- Experiments on JFET and MOSFET
- Single-phase, half-cycle, two-half-cycle power rectification
- Single-phase bridge rectifier, 3-phase beam rectifier, 3-phase bridge rectifier
- Practice inverting current
- Practice adjusting AC voltage
- Practice adjusting DC voltage



Power electronic components training bench

Uncontrolled rectifier training bench

Controlled rectifier training bench

Inverter training bench

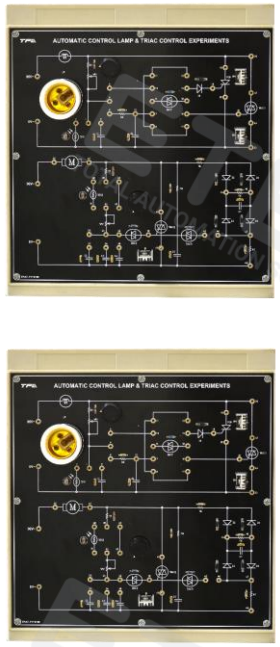
AC voltage regulation training bench

DC voltage regulation training bench

Electronic practice table with chair

C. POWER ELECTRONICS TRAINING ROOM

Solution for mounting A4 modules during practice:



Equipment

Table frame

Training set

C. POWER ELECTRONICS TRAINING ROOM

1. Power electronic components training bench

Training Contents:
- Laboratory test on UJT
- Experiment on SCR
- Laboratory test on DIAC and TRIAC
- Experiment on automatically adjusting light bulbs and adjusting AC motor speed using TRIAC
- Experiment on rectifier circuits using SCR
- Experiments on JFET and MOSFET

C. POWER ELECTRONICS TRAINING ROOM

2. Uncontrolled rectifier training bench

Training Contents:
- Half-cycle single-phase power rectification
- Power rectification in two half cycles
- Single phase bridge rectifier
- 3-phase beam rectifier
- 3-phase bridge rectifier

C. POWER ELECTRONICS TRAINING ROOM

3. Controlled rectifier training bench

Training Contents:

- Overview of power rectifier control circuit
- Single-phase half-cycle uncontrolled rectifier (Half-wave rectifier)
- Single-phase uncontrolled rectifier for the whole cycle (Full-wave rectifier)
- Rectifier with 1-phase half-cycle control (rectifier with half-cycle control)
- The rectifier has single phase control for the entire cycle
- 1-phase full-cycle symmetrical semi-controlled rectifier
- 1-phase full-cycle asymmetric semi-controlled rectifier
- 3-phase ray-shaped uncontrolled rectifier
- The rectifier does not control 3 phases throughout the cycle
- Rectifier with 3-phase beam control
- Full-cycle 3-phase semi-controlled rectifier
- The rectifier has 3-phase control for the whole cycle

C. POWER ELECTRONICS TRAINING ROOM

4. Inverter training bench

Training Contents:
- Basic characteristics of inverters and frequency conversion principles
- Practice 1-phase PWM control circuit
- Practice 3-phase PWM control circuit

C. POWER ELECTRONICS TRAINING ROOM

5. AC voltage regulation training bench

Training Contents:
- General concept of AC pressure regulation
- Single-phase AC voltage control
- Three-phase AC voltage control

C. POWER ELECTRONICS TRAINING ROOM

6. DC voltage regulation training bench

Training Contents:

- Learn the principles of controlling the speed of a DC motor using a DC-DC converter

Connect the DC motor speed control circuit using a DC-DC converter

- Measure and check voltage and current values in the circuit
- Step-down DC voltage converter (Buck)
- Booster type DC voltage converter (Boost)
- Push-pull DC voltage converter (Buck - Boost)

C. POWER ELECTRONICS TRAINING ROOM

7. AC voltage regulation training bench

Training Contents:
- Understand the principles of AC voltage regulation circuits using thyristors.
- Generation of control pulses for AC and signal waveform analysis.
- Techniques for measuring and analyzing circuits.
- Understand the impact of inductive loads on AC voltage regulation circuits.
- Signal conversion and isolation methods in high-voltage measurement.
- Use of electrical measurement tools.
- Electrical safety skills.

C. POWER ELECTRONICS TRAINING ROOM

8. Controlled inverter training bench

Training Contents:

- Understand the principles of SinPWM and 6-step inverters.
- Identify and differentiate the advantages and disadvantages of each type.
- Familiarize with control pulse waveform and motor output waveform.

C. POWER ELECTRONICS TRAINING ROOM

9. DC Voltage Regulation Training bench

Training Contents:

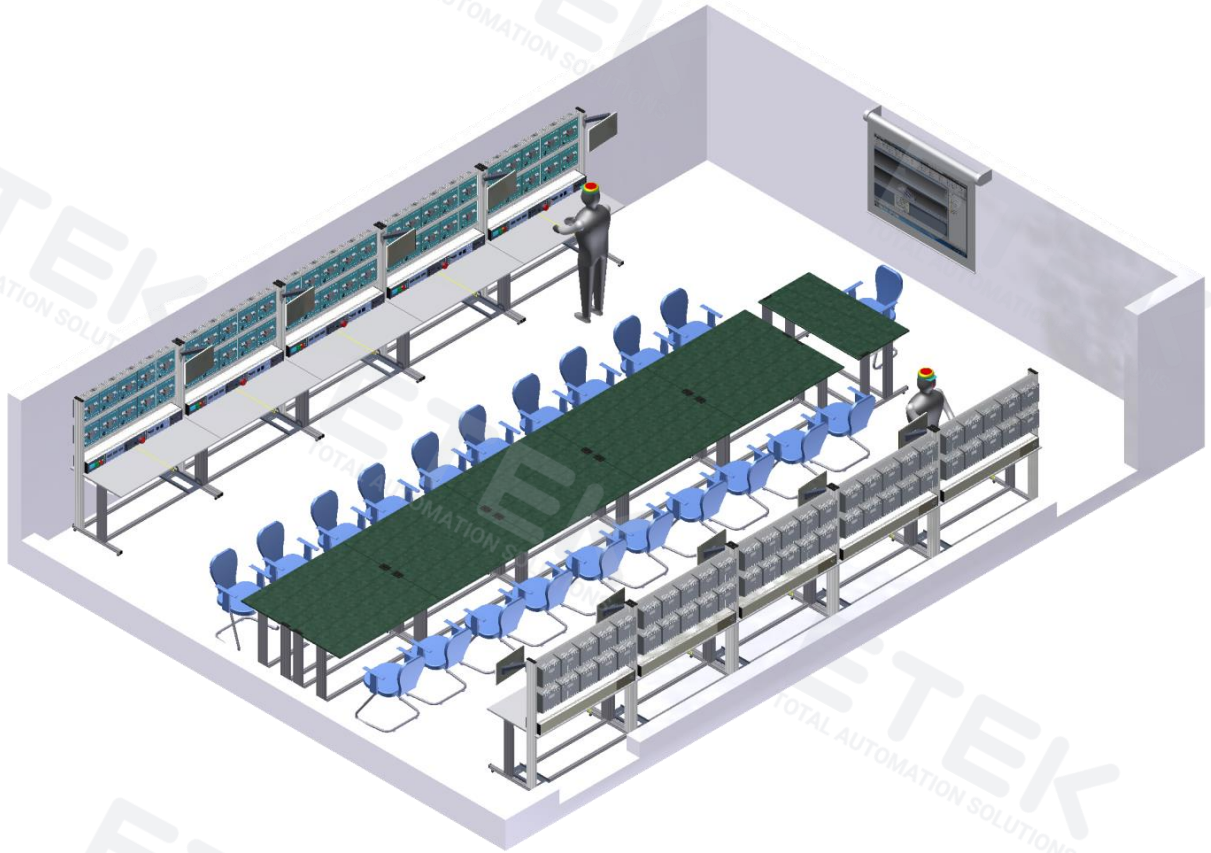
- Study the principle of DC motor speed control using a DC-DC converter
- Wire the DC motor speed control circuit using a DC-DC converter
- Measure and check voltage and current values in the circuit
- Buck-type DC-DC converter
- Boost-type DC-DC converter
- Buck-Boost-type DC-DC converter

D. MEASUREMENT AND SENSOR ENGINEERING TRAINING ROOM

ETEK
TOTAL AUTOMATION SOLUTIONS

FUNCTION

- Classification of industrial sensors
- Structural principles and measuring principles of industrial sensors
- Experiment with the working spectrum of different types of sensors
- Experiment with sensors with a variety of receivers
- Connect various types of sensors
- Adjust sensor sensitivity
- Experiment with sensor response frequency
- Understand the benefits of smart sensors in Industry 4.0
- Establish IO-Link® communication



Sensors principles training set

Distance and displacement sensor experiment training bench

Force and pressure sensor experiment training bench

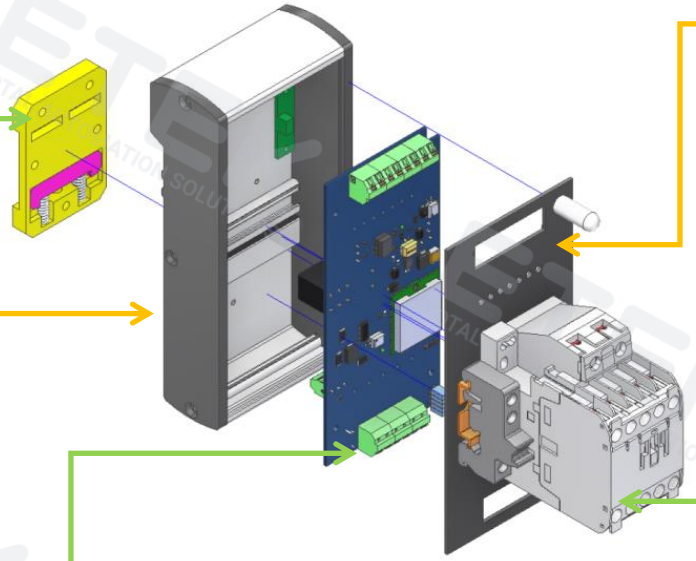
Smart sensor training bench for industry 4.0

Industrial electrical practice table with chair

Product structure

1. Quick fix mounting structure:

- Quickly mounts onto standard DIN rails
- High precision, sharp mold



2. Anode aluminum box + plastic lid:

- Hard anode, sandblasted,
- Does not leave fingerprints or stains

3. Push-in quick match:

- German equipment, industrial standards,
- Standard according to German program

4. Electronic circuit

- FR04 circuit, latest technology, fireproof
- Matte surface treatment to avoid dirt
- Quickly scan QRcode

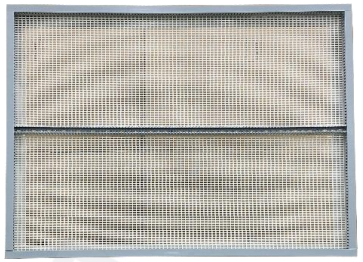
5. Main equipment:

- Easy to remove and replace.
- Mounting according to equipment standards

D. MEASUREMENT AND SENSOR ENGINEERING TRAINING ROOM

Electrical Student Work Bench Solutions

Sensor module



Assembly panel

Table frame

D. MEASUREMENT AND SENSOR ENGINEERING TRAINING ROOM

1. Sensors principles training set

Training Contents:

- Operating principles of sensors in the training set
- Collect data from sensors through the control training and signal collection module
- Draw a graph of the sensor's characteristic curves during practice and export it to an image file
- Store results after each experiment
- Export collected data to excel file

D. MEASUREMENT AND SENSOR ENGINEERING TRAINING ROOM

2. Distance and displacement sensor training bench

Training Contents:

- Learn the structure and operating principles of various types of sensors
- Practice measuring distance with ultrasonic sensors
- Practice measuring distance with sensors from analog output
- Practice measuring speed and displacement distance with encoder

D. MEASUREMENT AND SENSOR ENGINEERING TRAINING ROOM

3. Force and pressure sensor training bench

Training Contents:

- Learn the structure and operating principles of sensors
- Practice measuring mass with loadcell
- Practice measuring compression pressure

4. Smart sensor training bench for industry 4.0

Training Contents:

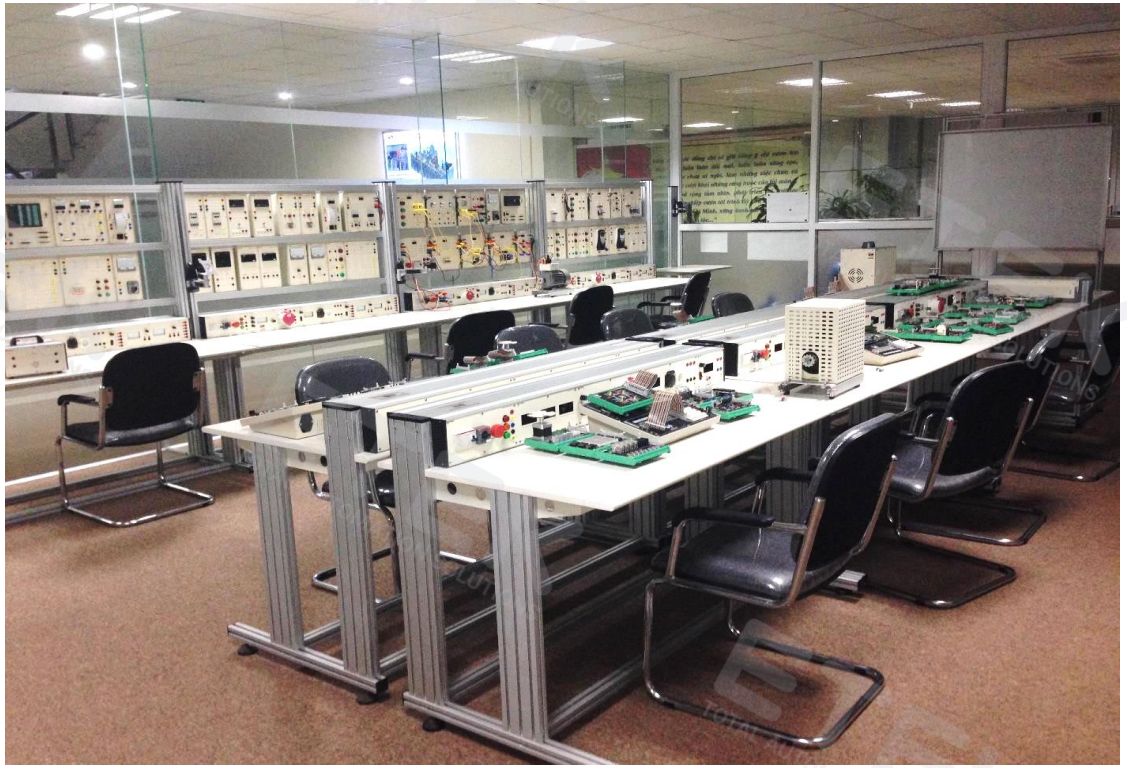
- Understand the benefits of smart sensors in Industry 4.0
- Selected, parameterized, monitored and adjusted sensors
- Establish IO-Link® communication
- Integrate sensors into different production communication layers
- Perform maintenance
- Automatic replacement of sensors and upload settings
- Troubleshooting sensor problems

E. MICROCONTROLLER TRAINING ROOM

ETEK
TOTAL AUTOMATION SOLUTIONS

FUNCTION

-Practice learning the structure of microcontrollers 8051, AVR, PIC
-Practice learning instruction sets and registers.
-Practice I/O communication programming
-Practice programming Timer and Counter controls.
-Practice programming with external interrupts
-Practice programming to read and process ADC conversions.
-Practice programming to control a single LED display.
-Practice programming the 7-segment LED display controller.
-Practice programming LED matrix display controls.
-Practice programming to read the matrix keyboard.
-Practice standard computer communication programming
-RS232 communication
- Practice programming computer communication standard RS485 communication



AVR microcontroller implementation

8051 microcontroller implementation module

PIC microcontroller implementation module

Computer communication practice module

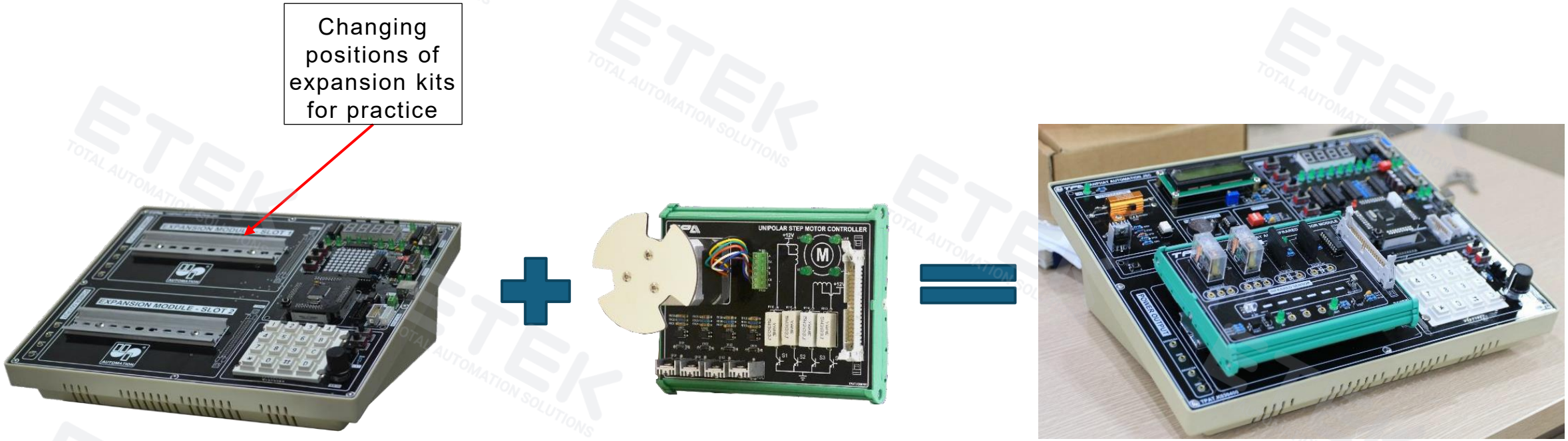
FPGA digital circuit programmer

Arduino programming practice module

Electronic practice table

E. MICROCONTROLLER TRAINING ROOM

Structure and solutions for mounting modules during practice:



Main kit

Expanded function module

Practice set

E. MICROCONTROLLER TRAINING ROOM

1. AVR microcontroller training module

Training Contents:

- Practice learning the AVR microcontroller structure
- Practice learning instruction sets and registers.
- Practice I/O communication programming
- Practice programming Timer and Counter controls. Practice programming with external interrupts
- Practice programming to read and process ADC conversions.
- Practice programming the controller to create PWM pulses.
- Practice programming to control a single LED display.
- Practice programming the 7-segment LED display controller.
- Practice programming LED matrix display controls.
- Practice programming to read the matrix keyboard.
- Practice programming computer communication standard RS232 communication
- Practice programming computer communication standard RS485 communication

E. MICROCONTROLLER TRAINING ROOM

2. 8051 microcontroller training module

Training Contents:

- Practice learning the structure of the 8051 microcontroller
- Practice learning instruction sets and registers.
- Practice I/O communication programming
- Practice programming Timer and Counter controls.

Practice programming with external interrupts

- Practice programming to control a single LED display.
- Practice programming the 7-segment LED display controller.
- Practice programming LED matrix display controls.
- Practice programming to read the matrix keyboard.
- Practice programming computer communication standard RS232 communication

E. MICROCONTROLLER TRAINING ROOM

3. PIC microcontroller training module

Training Contents:

- Practice learning PIC microcontroller structure
- Practice learning instruction sets and registers.
- Practice I/O communication programming
- Practice programming Timer and Counter controls. Practice programming with external interrupts
- Practice programming to read and process ADC conversions.
- Practice programming the controller to create PWM pulses.
- Practice programming to read and write internal ROM.
- Practice programming to control a single LED display.
- Practice programming the 7-segment LED display controller.
- Practice programming LED matrix display controls.
- Practice programming to read the matrix keyboard.
- Practice programming computer communication standard RS232 communication

4. DsPIC microcontroller training module

Training Contents:

- Practice learning the structure of the 16-bit dsPIC microcontroller
- Practice learning instruction sets and registers.
- Practice I/O communication programming
- Practice programming Timer and Counter controls. Practice programming with external interrupts
- Practice programming to read and process ADC conversions.
- Practice programming to control a single LED display.
- Practice programming the 7-segment LED display controller.
- Practice programming LED matrix display controls.
- Practice programming to read the matrix keyboard.
- Practice programming computer communication standard RS232 communication
- Practice programming computer communication standard RS485 communication

E. MICROCONTROLLER TRAINING ROOM

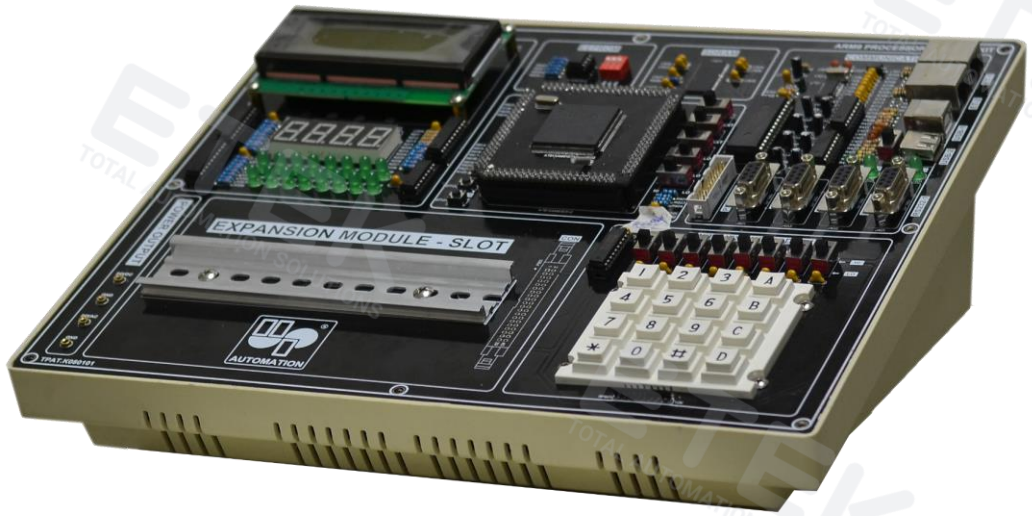
5. Multi-microcontroller training module

Training Contents:

- Practice learning the structure of microcontrollers 8051, AVR, PIC
- Practice learning instruction sets and registers.
- Practice I/O communication programming
- Practice programming Timer and Counter controls. Practice programming with external interrupts
- Practice programming to read and process ADC conversions.
- Practice programming to create PWM motor control pulses.
- Practice programming to control a single LED display.
- Practice programming the 7-segment LED display controller.
- Practice programming LED matrix display controls.
- Practice programming to read the matrix keyboard.
- Practice programming computer communication standard RS232 communication
- Practice programming computer communication standard RS485 communication

E. MICROCONTROLLER TRAINING ROOM

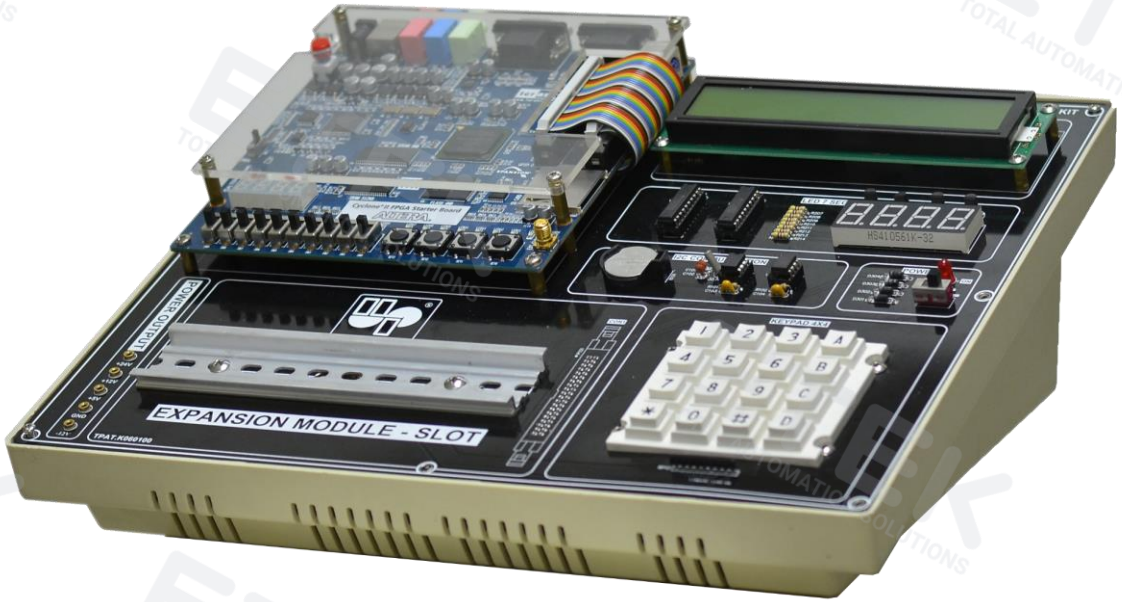
6. Computer communication training module



Training Contents:

- Practice RS232 standard computer communication
- Practice USB 2.0 standard computer communication
- Practice Ethernet standard computer communication
- Practice LPT standard computer communication
- Practice communicating with IC 82C55A
- Practice programming to control a single LED display.
- Practice programming the 7-segment LED display controller.

7. FPGA training module



Training Contents:

- Learn the structure of the FPGA digital circuit programmer
- Learn VHDL programming language and exercises:

+ Practice basic logic gate programming
+ Practice programming combinational logic circuits
+ Practice programming sequential logic circuits
+ Practice programming to control a single LED display.
+ Practice programming to control a 7-segment LED display.
+ Practice programming LCD display controls.
+ Practice programming to read single keyboard.
+ Practice programming to read the matrix keyboard.
+ Practice programming computer communication standard RS232 communication

8. ARM microcontroller training module

Training Contents:

- Practice learning the ARM 32-bit microcontroller structure
- Practice learning instruction sets and registers.
- Practice I/O communication programming
- Practice programming Timer and Counter controls.
- Practice programming with external interrupts
- Practice programming to read and process ADC conversions.
- Practice programming DAC conversion control.
- Practice programming to create PWM motor control pulses.
- Practice programming to control a single LED display.
- Practice programming the 7-segment LED display controller.
- Practice programming LED matrix display controls.
- Practice programming to read the matrix keyboard.
- Practice programming computer communication standard RS232 communication
- Practice programming computer communication standard RS485 communication

9. PSoC training module

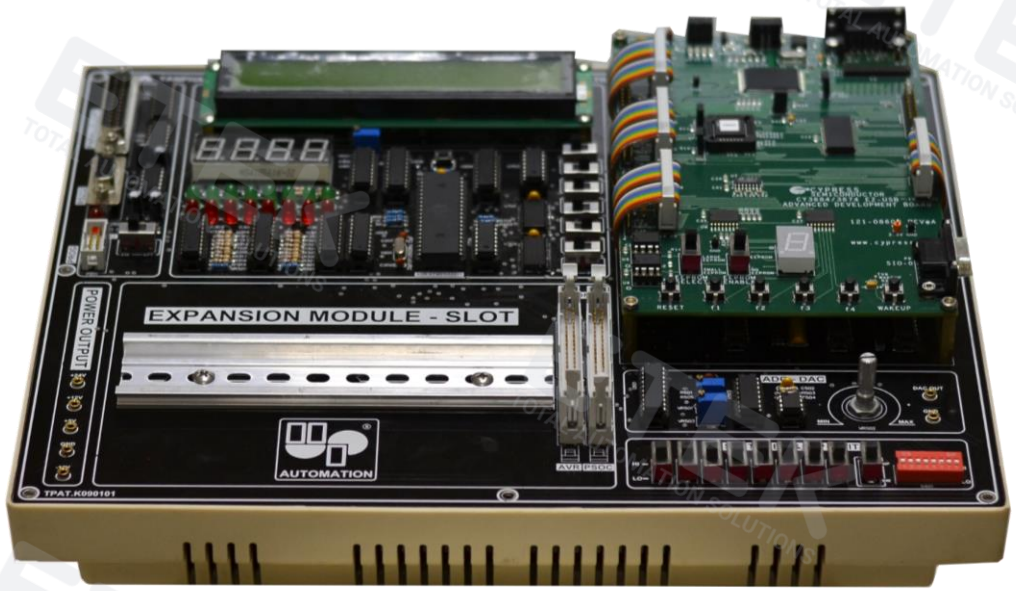
Training Contents:

- Practice understanding the PSoC family structure
- Practice learning instruction sets and registers.
- Practice I/O communication programming
- Practice programming Timer and Counter controls.

Practice programming with external interrupts

- Practice programming to read and process ADC conversions.
- Practice programming DAC conversion control.
- Practice programming the controller to create PWM pulses.
- Practice programming to control a single LED display.
- Practice programming the 7-segment LED display controller.
- Practice programming LED matrix display controls.
- Practice programming to read the matrix keyboard.
- Practice programming computer communication standard RS232 communication

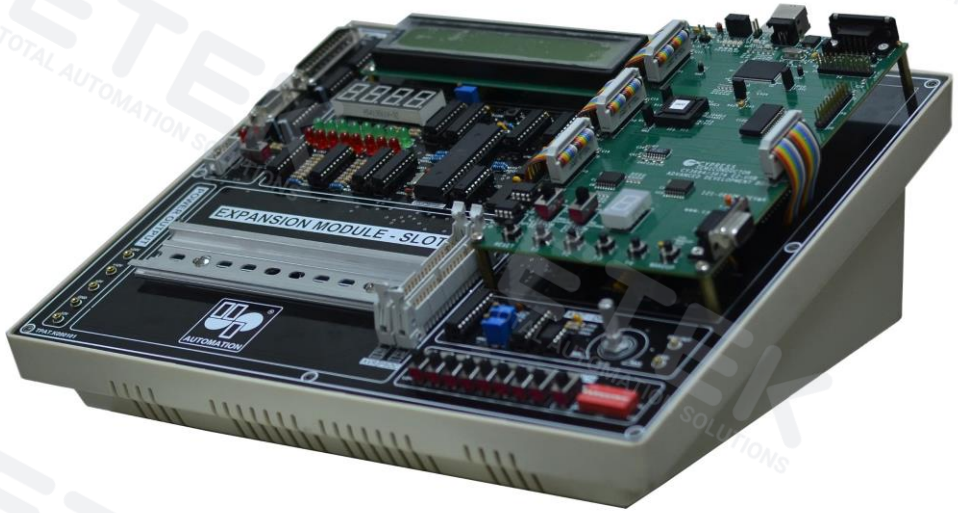
10. DSP training module



Training Contents:

- Practice learning the structure of DSP programming digital controllers
- Practice learning instruction sets and registers.
- Practice I/O communication programming
- Practice Timer control programming
- Practice programming to read and convert ADC.
- Practice programming to create PWM pulses to control the motor.
- Practice programming to control a single LED display.
- Practice programming the 7-segment LED display controller.
- Practice programming LED matrix display controls.
- Practice programming LCD display controls.
- Practice programming to read the matrix keyboard.
- Practice programming computer communication standard CAN communication

11. Arduino training module



Training Contents:

- Practice learning the Arduino structure
- Practice learning instruction sets and registers.
- Practice I/O communication programming
- Practice programming Timer and Counter controls.
- Practice programming with external interrupts
- Practice programming to read and process ADC conversions.
- Practice programming the controller to create PWM pulses.
- Practice programming to control a single LED display. Practice programming the 7-segment LED display controller.
- Practice programming LED matrix display controls.
- Practice programming to read the matrix keyboard.
- Practice programming computer communication standard RS232 communication

12. Function modules used for microcontroller practice

Training Contents:

- Practice programming temperature measurement and control with analog input.
- Practice programming temperature measurement and control with digital temperature sensors.
- Practice programming temperature measurement and control with a 12-bit SPI interface ADC.
- Practice programming to control and measure the speed of open-loop DC motors.
- Practice programming to control and measure the speed of a closed-loop DC motor using PID.
- Practice programming half-step and full-step stepper motor controls.
- Practice programming to control industrial standard actuators through relays.
- Practice programming traffic light controls.
- Practice programming to display characters and numbers on a 16x2 LCD screen
- Practice programming to display characters, numbers, and images on the graphic LCD screen

Practice programming the display control to run text on the matrix LED screen.

- Practice programming ADC/DAC conversion using 8bit IC with MCU that does not support internal ADC or DAC.
- Practice programming real-time read communication, read and write external EEPROM data.
- Practice programming RF wireless communication
- Practice programming Bluetooth wireless communication

13. Sensor training module for microcontrollers

Training Contents:

- Practice programming communication with light sensors: Photoresistor, Photodiot, Transceiver Photransistor, Reflective Phototransistor.
- Practice programming and communication with color sensors
- Practice programming communication with infrared sensors.

Practice programming communication with industrial sensors: Diffuse reflection optical sensors, capacitive proximity sensors, magnetic proximity sensors, fiber optic sensors.

- Practice programming communication with motion sensors (infrared)
- Practice programming magnetic sensor communication
- Practice programming temperature sensor communication: PT100, Can K, NTC, semiconductor.
- Practice programming distance measurement with ultrasonic sensors.
- Practice programming weight measurement with loadcell.
- Practice programming distance measurement using infrared sensors.
- Practice programming pressure sensor communication.
- Practice programming to control remote devices using infrared.

14. IOT practice set using Arduino

Training Contents:

- Provides basic knowledge about IOT, Arduino circuit board and main applications of Arduino today
- Arduino programming method
- Use the Arduino library
- Programming IO, timer, counter, communication
- Connect sensors to the cloud and program with sensor applications

15. IOT practice set uses Rasberry

Training Contents:
- Overview of IOT
- IoT smart server configuration and testing environment
- Practice smart sensor control with Raspberry Pi
- Learn the structure of various types of sensors.

16. Mobile robot model using AI and Vision

Training Contents:

Students practice exercises and experience with self-propelled robots applying AI and LiDAR technology

- Practical exercises with microcontrollers include:

+ 'Practice ARM programming to control DC motor speed.
+ Practice ARM programming to stabilize motor speed using PID algorithm.
+ Practice programming kinematic equations for multi-directional four-wheel control.
+ Practice ARM programming to balance the speeds of 4 motors.
+ Practice ARM programming to read ultrasonic and infrared distance sensors.

Practice ARM programming to control robots with sensors to avoid obstacles.

+ Practice ARM programming communicating with Jetson Xavier card

- General practice exercises:

+ Practice face detection (Face detection)
+ Practice facial recognition (Face recognition)
+ Practice object detection
+ Practice recognizing signal signs
+ Practice controlling the robot to follow the Lane
+ Practice controlling robot operations according to signal signs
+ Practice applying LiDAR sensors in map building

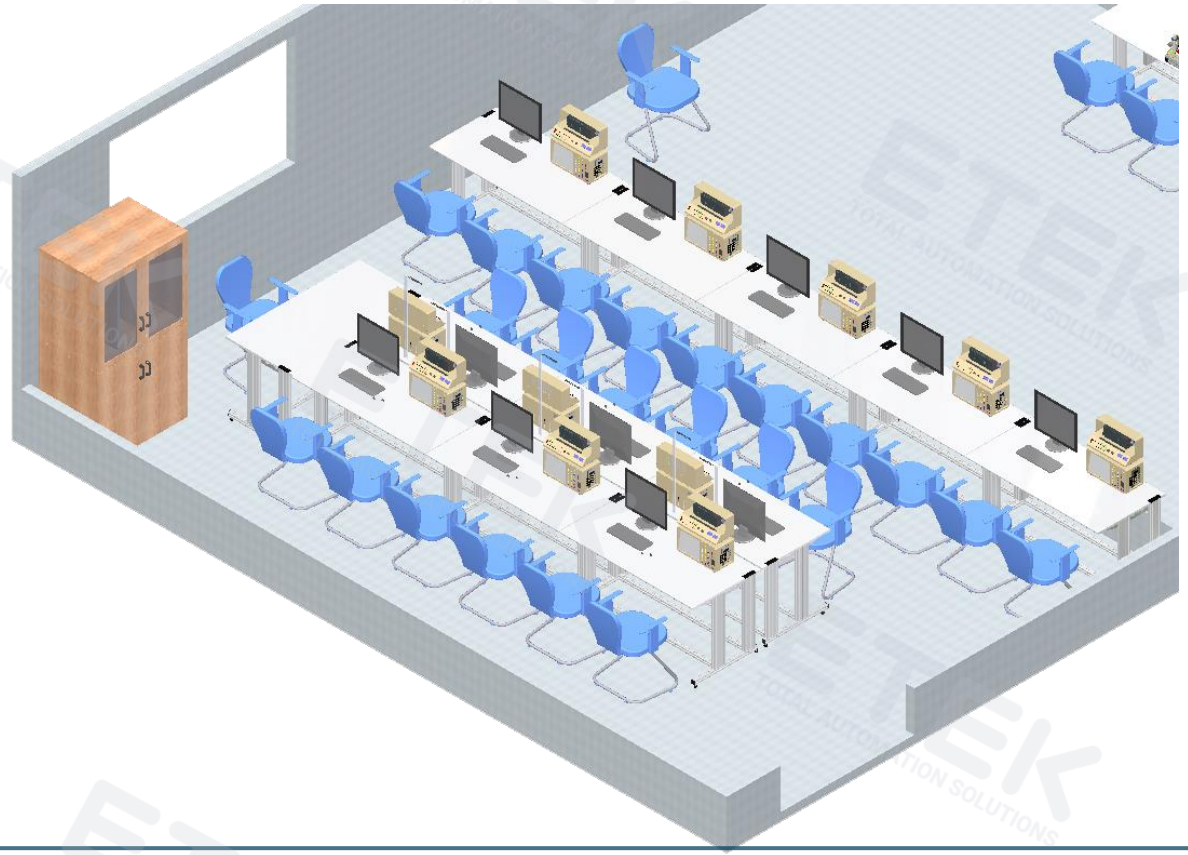
F. BASIC PLC TRAINING ROOM

ETEK
TOTAL AUTOMATION SOLUTIONS

FUNCTION

PLC programming training S7-1200, FX5U, Logo

- Learn the hardware structure
- Hardware declaration and PLC configurationprogramming basic logic commands
- Programming commands using Timer and Counter
- Programming comparison commands
- Programming basic mathematical commands
- Programming using subroutines
- Programming interrupt handler programmingreal-time programming
- Analog signal processing programming
- Analog signal processing programming



PLC Siemens
LOGO Training set

PLC S7-1200 Training set

PLC S7-1500 Training set

PLC FX5U
Training set

Table with
Chair

F. BASIC PLC TRAINING ROOM

1. PLC LOGO training set

Training Contents:

- Connect the power cord and signal cord to the PLC LOGO
- Practice programming basic logic commands Practice programming commands using Timer and Counter
- Practice programming to process analog input signals

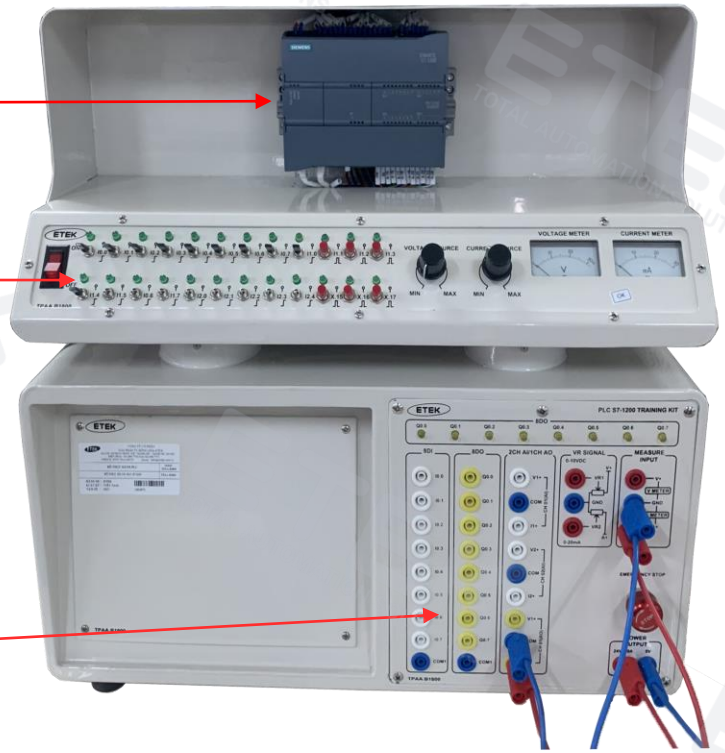
F. BASIC PLC TRAINING ROOM

2. PLC S7-1200 Training set

PLC S7-1200

Digital input simulation

Digital output



Training Contents:

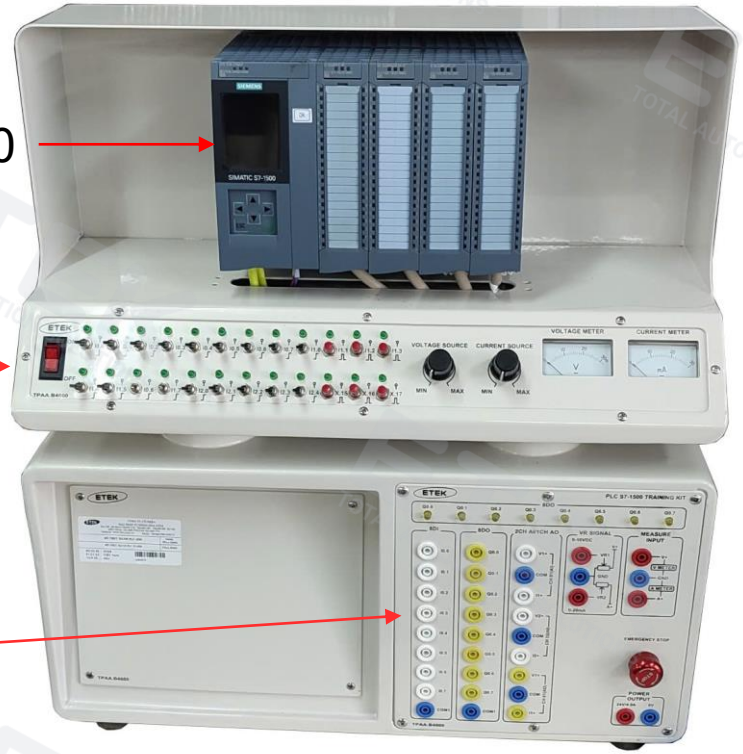
- Learn the hardware structure of PLC S7 1200
- Learn how to declare hardware and configure PLC
- Practice programming basic logic commands

Practice programming commands using Timer and Counter

- Practice programming comparison commands
- Practice programming basic mathematical commands
- Practice programming using subprograms
- Practice interrupt handling programming
- Practice real-time programming
- Practice programming to process analog input signals
- Practice programming to process analog output signals

F. BASIC PLC TRAINING ROOM

3. PLC S7-1500 Training set



Training Contents:

Pair the CPU with the power module and connect the power and signal wires to the PLC

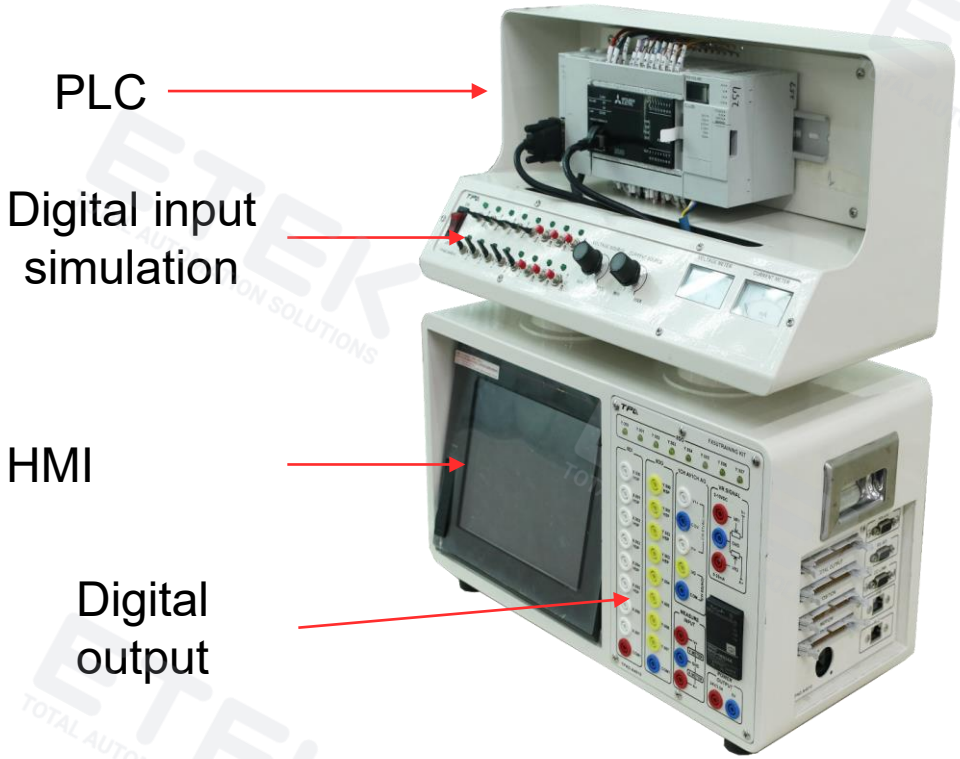
- Install and declare PLC hardware
- Practice programming basic logic commands

Practice programming commands using Timer and Counter

- Practice programming comparison commands
- Practice programming basic mathematical commands
- Practice programming using subprograms
- Practice interrupt handling programming
- Practice real-time programming
- Practice programming to process analog input signals
- Practice programming to process analog output signals
- Practice programming using subprograms FB and FC

F. BASIC PLC TRAINING ROOM

4. PLC FX5U Training set



Training Contents:

- Know the hardware structure of the FX5U PLC programmer
- Know how to connect the power supply, digital input and output, and analog input and output of PLC FX5U
- Know how to write programs for PLC FX5U with functions: logic, Timer, Counter, mathematics
- Know how to create interfaces on HMI GS2107-WTBD
- Know how to program controls. Monitoring between HMI and PLC

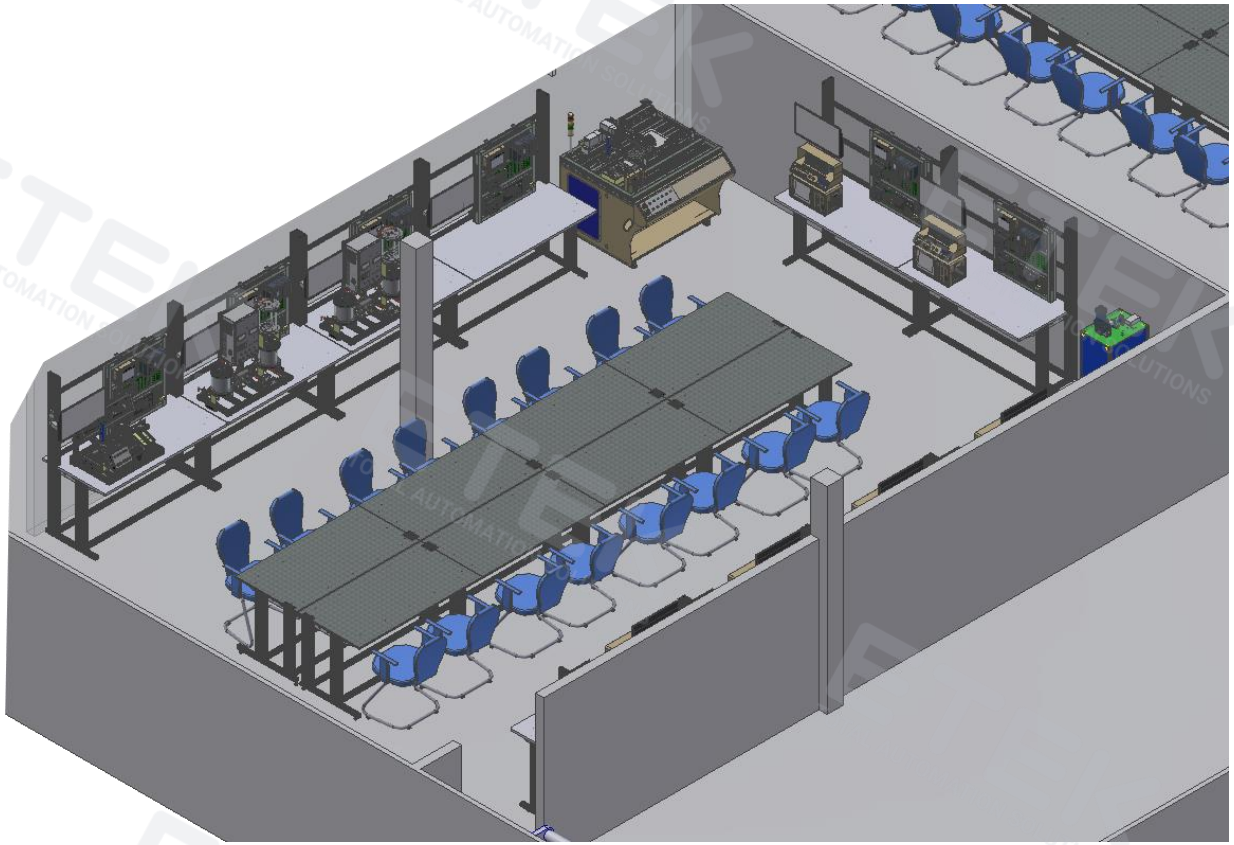
G. ADVANCED PLC TRAINING ROOM

ETEK
TOTAL AUTOMATION SOLUTIONS

FUNCTION

PLC programming training S7-1200

- Learn the hardware structure
- Hardware declaration and PLC configurationprogramming basic logic commands
- Programming commands using Timer and Counter
- Programming comparison commands
- Programming basic mathematical commands
- Programming using subroutines
- Programming interrupt handler programmingreal-time programming
- Analog signal processing programming
- Analog signal processing programming
- Programming control conveyor, 4-floor elevator, process control, motor control



PLC wiring training set

Conveyor control station

4-floor elevator

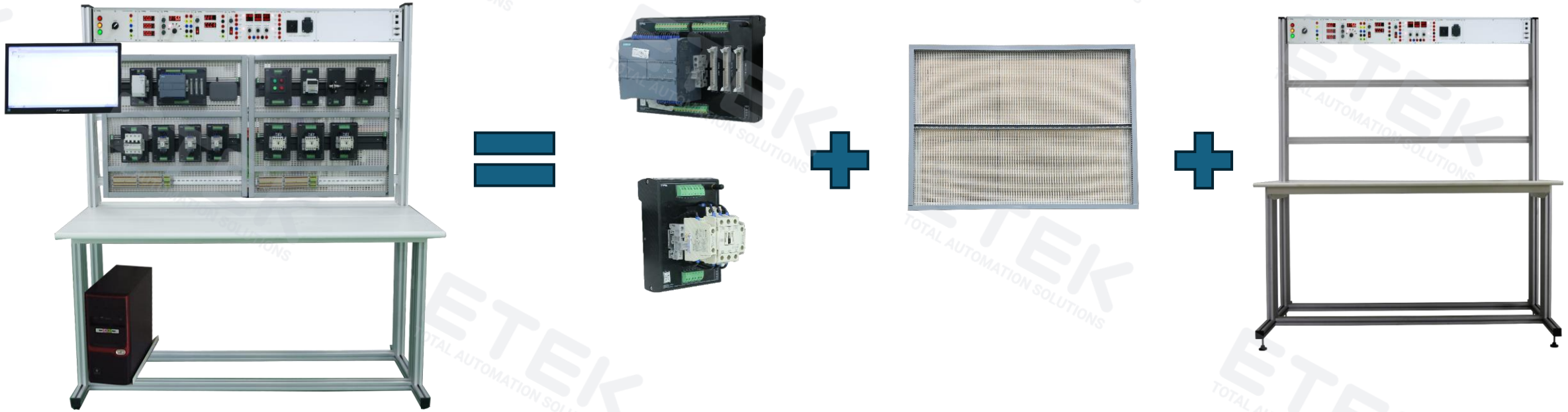
Process control station

Motor control station

Electrical Student WorkBench with chair

G. ADVANCED PLC TRAINING ROOM

1. PLC wiring training set



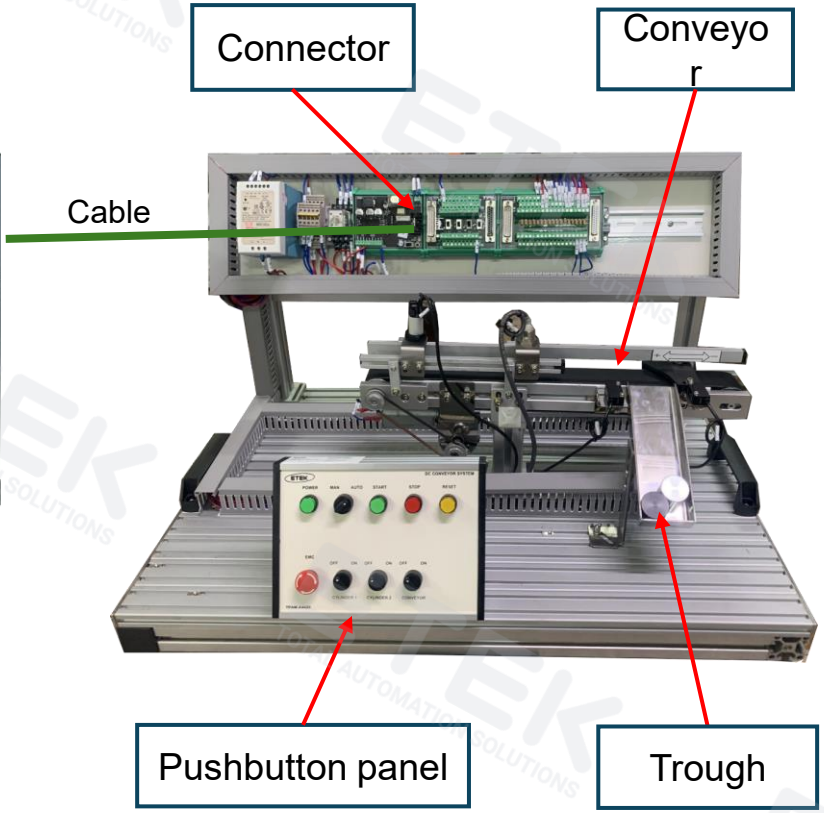
Equipment | **Assembly panel** | **Table frame**

Training Contents

- Learn the hardware structure of PLC S7 1200
- Learn how to declare hardware and configure PLC
- Practice programming basic logic commands
- Practice programming commands using Timer and Counter
- Practice programming comparison commands
- Practice programming basic mathematical commands
- Practice programming using subprograms
- Practice interrupt handling programming
- Practice real-time programming
- Practice programming to process analog input signals

G. ADVANCED PLC TRAINING ROOM

2. Model of product sorting conveyor belt actuator



Training Contents

- Install and align mechanical details
- Align industrial sensors included in the model
- Compressed air connection
- Connect the conveyor control cabinet circuit, Check I/O signal
- PLC programming to control the conveyor belt, control the system to run in cycles
- Weighing, checking weight and classifying products

G. ADVANCED PLC TRAINING ROOM

3. Model of 4-floor elevator actuator

Training Contents

- Practice learning the operating principles of the devices in the model

- Practice learning the operating principles of elevator systems in practice

Practice installing electrical equipment on the panel, connecting the elevator control cabinet

- Practice surveying the power supply for the device

- Practice surveying elevator I/Os

- Practice connecting elevator I/O to the controller

- Practice writing elevator cabin control programs

- Practice writing programs to control the opening and closing of elevator doors

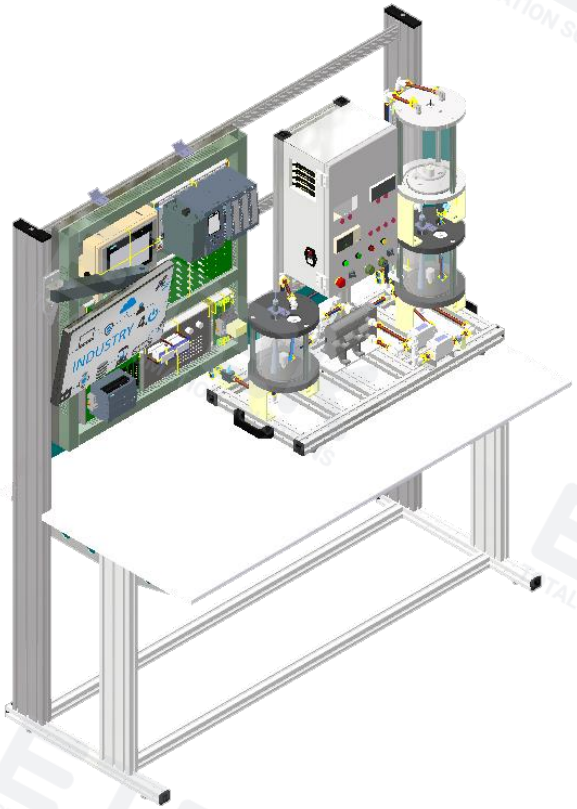
- Practice writing a program to display the elevator's floor number

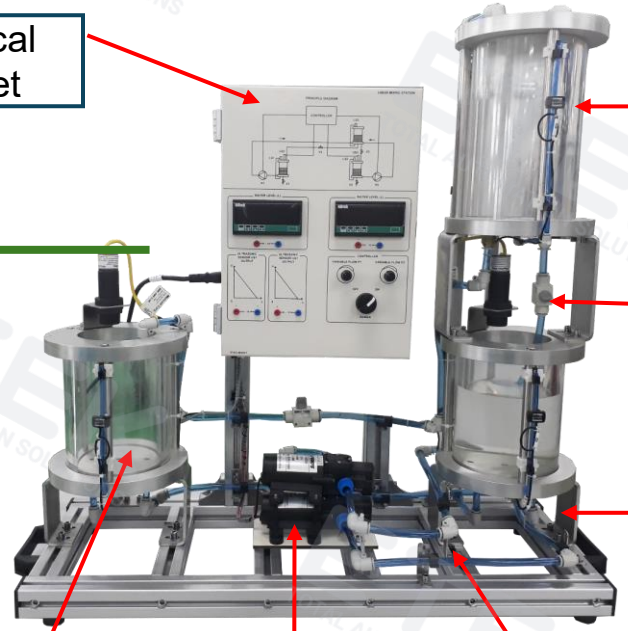
- Practice writing a program to call the elevator cabin

- Practice writing complete elevator control programs

G. ADVANCED PLC TRAINING ROOM

4. Process control actuator model (flow, level, temperature)



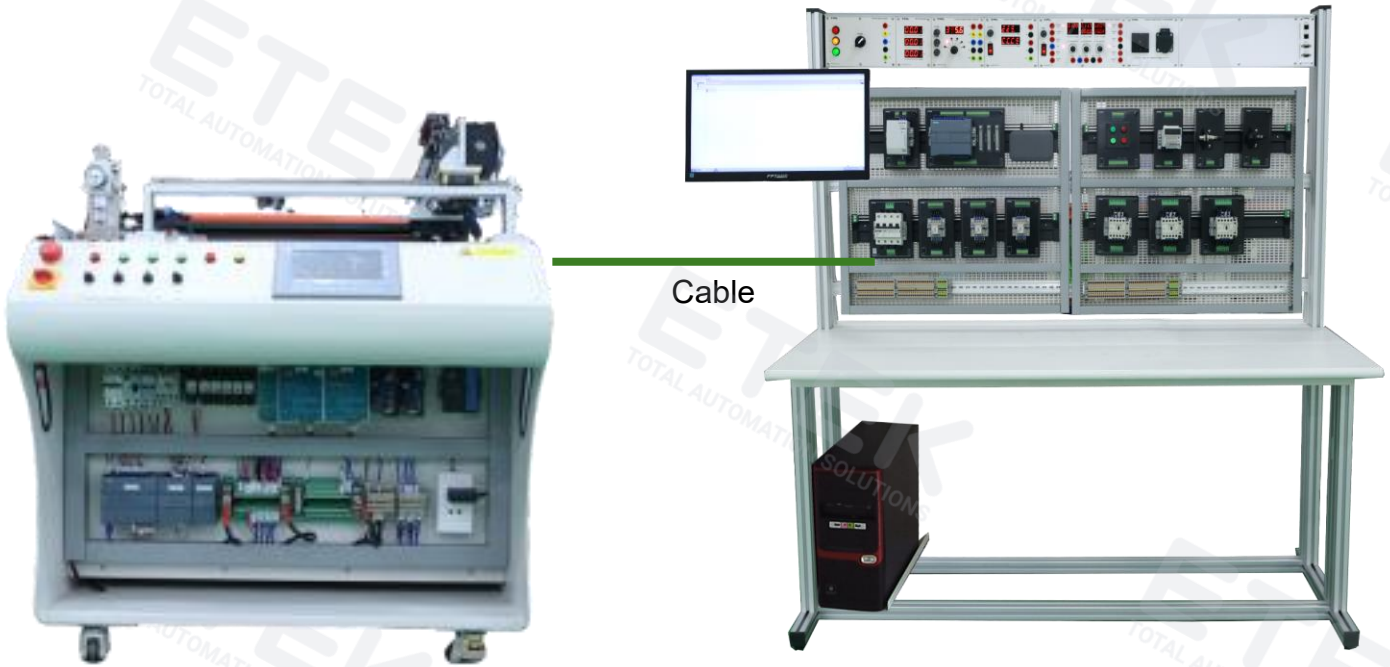


Training Contents

- Practice PLC
- Practice Level PID programming
- Practice PID Flow programming
- Practice programming and mixing product materials
- Heating control

G. ADVANCED PLC TRAINING ROOM

5. Model of 1-axis position control actuator



Training Contents

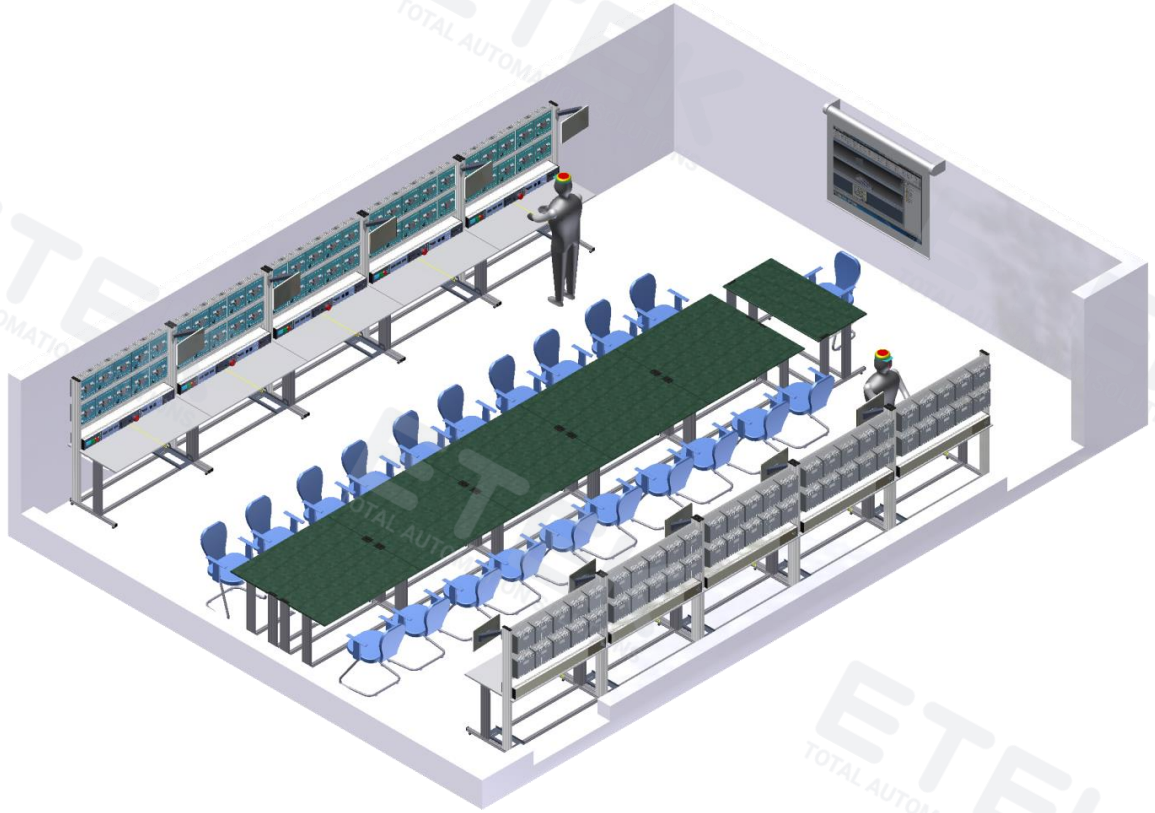
- Install and mechanically align equipment clusters in the module
- Wiring, connecting and checking the electrical control system
- Operate and test the system
- Practice PLC programming to control stepper motors
- Practice PLC programming to control DC motors
- Practice PLC programming to control AC servo motors
- Practice PLC programming to control and coordinate different types of motors in the L. INDUSTRIAL ROBOT PRACTICE ROOM

H. INDUSTRIAL COMMUNICATION NETWORK TRAINING ROOM

ETEK
TOTAL AUTOMATION SOLUTIONS

FUNCTION

- Practice Profinet/Ethernet IP communication network
- Practice Profibus communication network
- Practice ASI communication network
- Practice CC-Link communication network
- Practice CC-Link IE communication network
- Practice Device Net communication network
- Practice EtherCAT communication network
- Practice HART communication network
- Practice Modbus communication network



Profinet/Ethernet IP communication network implementation kit

Profibus communication network practice set

CC-Link communication network practice set

Device Net communication network practice set

HART communication network practice set

H. INDUSTRIAL COMMUNICATION NETWORK TRAINING ROOM

Structure of practice module

Main equipment

M4 safety jack

Plastic box

Solution for mounting A4 modules during practice:

Equipment

Table frame

Training set

H. INDUSTRIAL COMMUNICATION NETWORK TRAINING ROOM

1. Profinet/Ethernet IP communication network training bench

Training Contents:

-Know the hardware structure of the Profinet/Ethernet communication network

- Students have the ability to apply Profinet/Ethernet communication networks to different transmission line models

-Know how to program PLC S7-1500, S7-1200

- Access distributed IO control capabilities on ET200SP

-Know how to build control interfaces on HMI and monitor on SCADA

H. INDUSTRIAL COMMUNICATION NETWORK TRAINING ROOM

2. Profibus communication network training bench

Training Contents:

- Helps students understand the structure of a Profibus communication network
- Practice connecting devices in Profibus communication network
- Practice configuration on Profibus communication network
- Practice managing data exchange in the Profibus communication network
- Practice programming PLC S7-1200
- Practice distributed IO control programming with Profibus
- Practice programming the control interface for HMI screens

Practice programming SCADA monitoring interface on PC

- Practice inverter configuration manually or through software
- Practice motor control monitoring via communication

Practice DP/PA communication configuration

- Practice monitoring sensors via Profibus PA communication network

H. INDUSTRIAL COMMUNICATION NETWORK TRAINING ROOM

3. AS-i Communications Network training bench

Training Contents:

- Know the hardware structure of the AS-Interface communication network
- Students have the ability to apply AS-Interface communication networks to different transmission line models
-Know how to program PLC S7-1200
-Know the data transmission principles of the AS-Interface network

H. INDUSTRIAL COMMUNICATION NETWORK TRAINING ROOM

4. CC-Link communication network training bench

Training Contents:

- Know the hardware structure of CC-link communication network
- Students have the ability to apply CC-link communication networks to different transmission line models
- Know how to program PLC FX-3U
- Know the data transmission principle of CC-link network

H. INDUSTRIAL COMMUNICATION NETWORK TRAINING ROOM

5. CC-Link IE communication network training bench

Training Contents:

- Helps students understand the structure of a CC-link IE communication network
- Practice connecting devices in the CC-link IE communication network
- Practice configuration on CC-link IE communication network
- Practice programming CC-link IE communication program
- Practice programming PLC FX-5U, QCPU
- Practice building CC-Link IE communication network as required

H. INDUSTRIAL COMMUNICATION NETWORK TRAINING ROOM

6. Device Net communication network training bench

Training Contents:

- Helps students understand the structure of a DeviceNet communication network
- Practice connecting devices in the DeviceNet communication network
- Practice configuration on DeviceNet communication network
- Practice programming DeviceNet communication program
- Practice PLC programming

H. INDUSTRIAL COMMUNICATION NETWORK TRAINING ROOM

7. EtherCAT communication network training bench

Training Contents:

- Helps students understand the structure of an EtherCAT communication network
- Practice connecting devices in the EtherCAT communication network
- Practice configuration on EtherCAT communication network
- Practice programming DeviceNet communication program
- Practice programming PLC NX1P2
- Practice writing interfaces for HMI screens

Practice controlling 3-phase motor speed with an inverter connected directly via I/O

- Practice Ethercat communication to control 3-phase motor speed with an inverter
- Practice controlling AC servo motors connected directly via I/O
- Practice Ethercat communication to control AC servo motors

H. INDUSTRIAL COMMUNICATION NETWORK TRAINING ROOM

8. HART communication network training bench

Training Contents:

- Helps students understand the structure of a HART communication network
- Practice connecting devices in the HART communication network
- Practice configuration on HART communication network
- Practice programming PLC S7-1200

H. INDUSTRIAL COMMUNICATION NETWORK TRAINING ROOM

9. Modbus communication network training bench

Training Contents:

- Helps students understand the structure of a Modbus communication network
- Practice connecting devices in Modbus communication network
- Practice configuration on Modbus communication network
- Practice programming DeviceNet communication program
- Practice Schneider PLC programming
- Practice writing interfaces for HMI screens
- Practice controlling 3-phase motor speed with an inverter connected directly via I/O
- Practice Modbus communication to control 3-phase motor speed with an inverter

I. DCS DISTRIBUTED CONTROL TECHNICAL TRAINING ROOM

ETEK
TOTAL AUTOMATION SOLUTIONS

FUNCTION

- Initialize PCS 7 project in Simatic Mananger
- Set up hardware configuration for Automation System stations and I/O modules (can be Single or Redundant)
- Set hardware configuration for Operator System and Server stations (can be Single Station or Server Client)
- Set up terminal bus / plant bus communication networks for the system
- Assign signals between AS station, I/O module and field devices
- Get familiar with CFC/SFC programming language
- Perform programming exercises using CFC language - Perform programming exercises using SFC language: Sequential control of devices, groups of devices,...
- Design HMI interface for OS stations and connect with signals of AS stations
- Practice operating the system on the HMI interface
- Set up charts, store data and set up reports
- Optimize parameters of P, PI and PID controllers
- Develop Batch Control practice exercises

Feeding station

Mixing station

Heating station

Filling station

Table with Chair

I. DCS DISTRIBUTED CONTROL TECHNICAL TRAINING ROOM

1. Water filter station

Features:

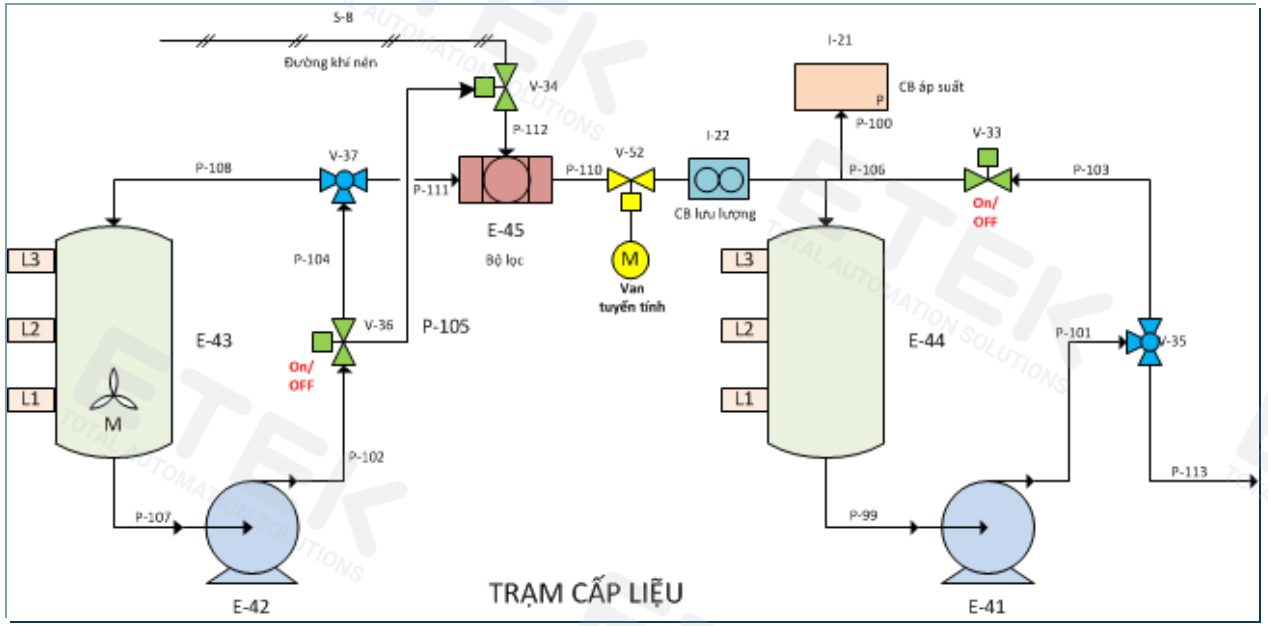
- Supply input materials to the system
- Filter the system's input materials with 3 filter cups that ensure the following criteria:
  + Dissolved solid concentration: < 300ppm
  + Removes dirt, odors, and rust

Removes impurities larger than 5 micrometers in size

2. Feeding station

- **Training content:**

+ *Survey the characteristics of the system*
+ *Device configuration and sensor settings.*
+ *On-Off controller setting: Controls pressure and flow.*
+ *Design a PID controller to control pressure*
+ *Design a PID controller to control traffic.*
+ *Route control route control*
+ *Operate and monitor the system*
+ *Check, maintain and maintain the system.*

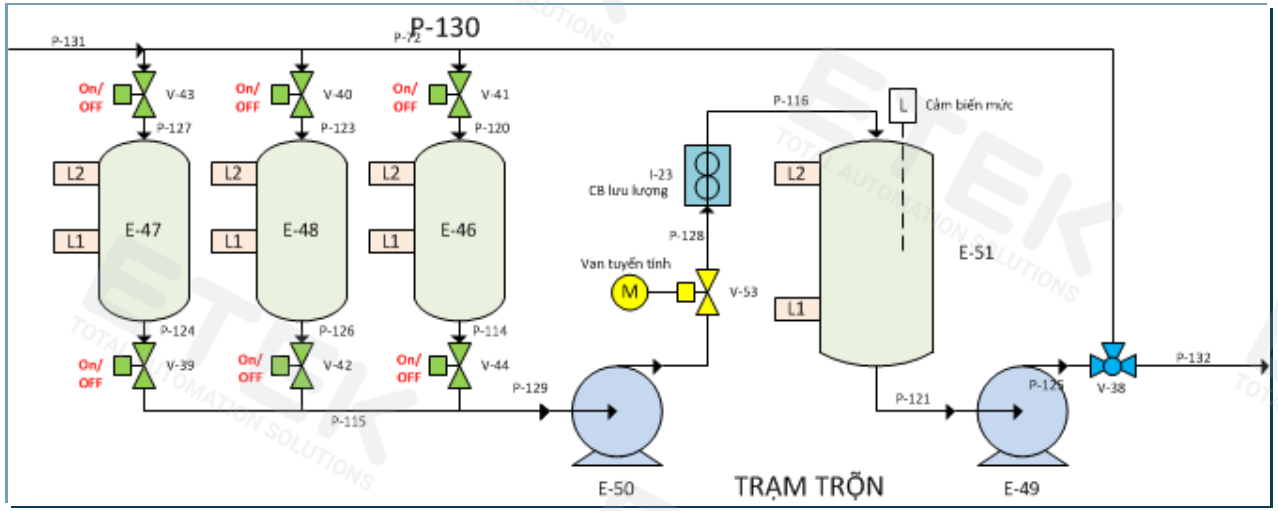


Feeding station

3. Mixing station

- **Training content:**

+ *Survey the characteristics of the system*
+ *Device configuration and sensor settings.*
+ *On-Off controller setting: Controls level and flow.*
+ *Design a PID level controller.*
+ *Design a PID controller to control traffic.*
+ *Design a PID controller to control the mixing ratio.*
+ *Multivariable control: Ratio - level*
+ *Programming batch control applications*
+ *Operate and monitor the system*
+ *Check, maintain and maintain the system.*

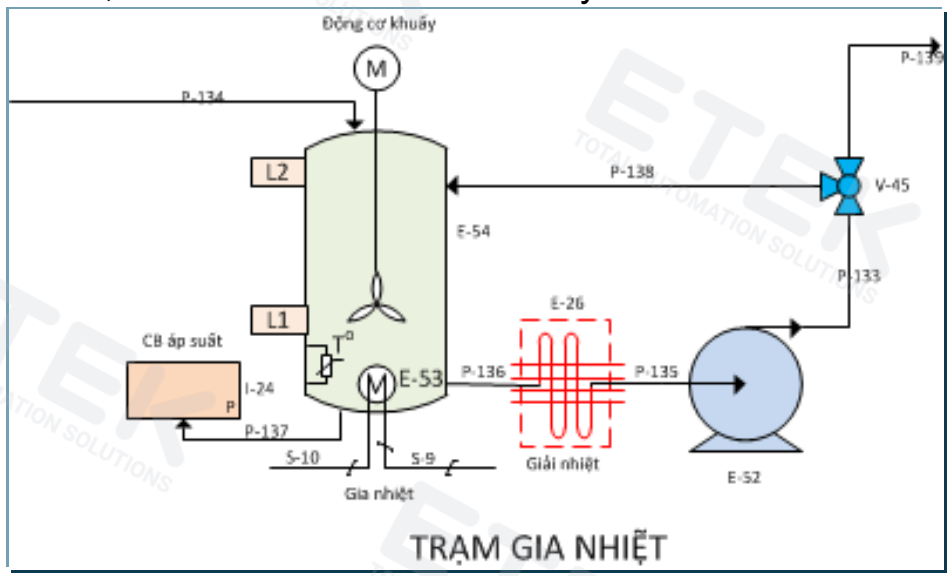


Mixing station

4. Heating station

- **Training content:**

+ Survey the characteristics of the system
+ Device configuration and sensor settings.
+ On-Off controller setting: Pressure, temperature
+ Design a PID controller to control tank pressure.
+ Design a water level PID controller through the relationship between pressure and water column height.
+ Design of PID controller for heating tank temperature.
+ Interactive control: Temperature - water level
+ Operate and monitor the system
+ Check, maintain and maintain the system.

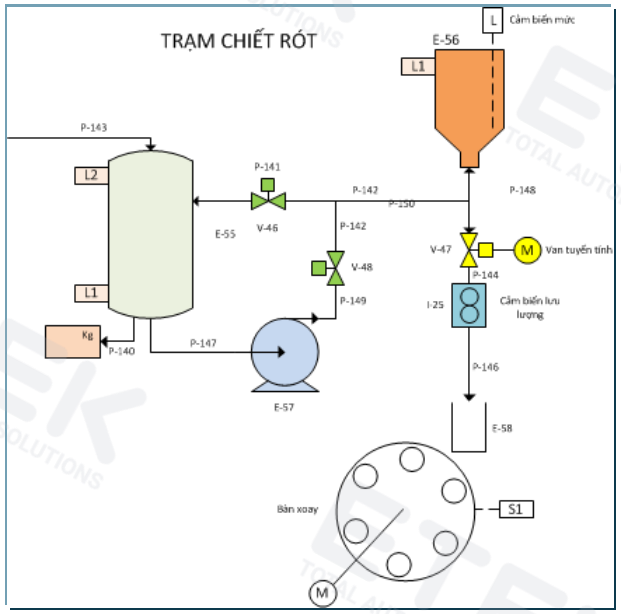


Heating station

5. Filling station

- **Training content:**

+ Survey the characteristics of the system
+ Device configuration and sensor settings.
+ On-Off controller setting: Level, volume, flow
+ Design a PID controller to control water level.
+ Design a PID controller to control mass.
+ Design a PID controller to control traffic.
+ Coordinate filling problems using level and flow sensors.
+ Coordinate filling problems using mass sensors.
+ Operate and monitor the system
+ Check, maintain and maintain the system.



6. Central control cabinet

I. Main elements in the station:

- Cabinet frame made of powder-coated folded corrugated iron
- 01 AS 410E control station without hot standby
+ CPU 410E
+ Includes 1 CPU with 100 PO available
+ Limit 200 control objects (PO)
+ Rack 9 slots
+ Power supply: 220VAC/10A
- 01 Network Switch
- Switching and protection equipment

II. Software Programming

1. PCS 7 software
- 01 PCS 7 License package for 6 computers
- 01 IL License package connecting S7-400 to S7-1500
- 01 License for report export station
- 01 License supports reading data to export reports

2. SIMATIC STEP 7 Proessional software

01 License for 1 user

3. SIMATIC WinCC Professional software
- 01 License for 6 users

7. Auxiliary equipment system for practice and system control training

Include:

- 01 set of teacher desks including:
  + 01 teacher desk
  + 01 Server set
  + 01 27" monitor
- 01 LAN system connecting all devices in the room
  + Network cables connect computers and practice systems
  + Switch
  + The whole thing is run in a wiring conduit
- 01 low noise air compressor
  + Operating voltage: 220VAC, 50Hz
  + Capacity: 600W
  + Tank volume: 25l
- 01 Principle diagram panel system
  + Includes 04 principle diagram panels corresponding to 04 main stations (feeding station, mixing station, heating station, filling station)
  The panels are equipped with lights from the inside and indicator lights corresponding to the devices on the actual model to increase the vividness of the model.
- 01 display screen bracket set
  + 01 standard screen mounting bracket
  + 01 43" screen
  + 04 23.8" screens
- System programming and control training package

J. PNEUMATIC TRAINING ROOM

FUNCTION

- Identify pneumatic elements in practice
- Learn the operating principles and control principles of pneumatic elements
- Practice connecting and operating pneumatic control circuits

Basic level pneumatics training set

Basic electro-pneumatics training set

Advance level pneumatics training set

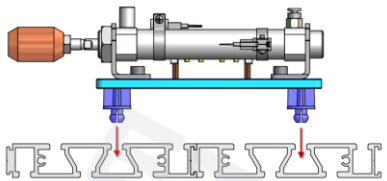
Advance electro-pneumatics training set

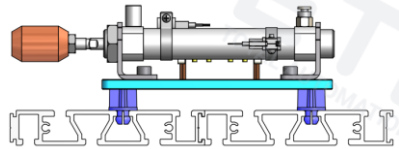
Table with Chair

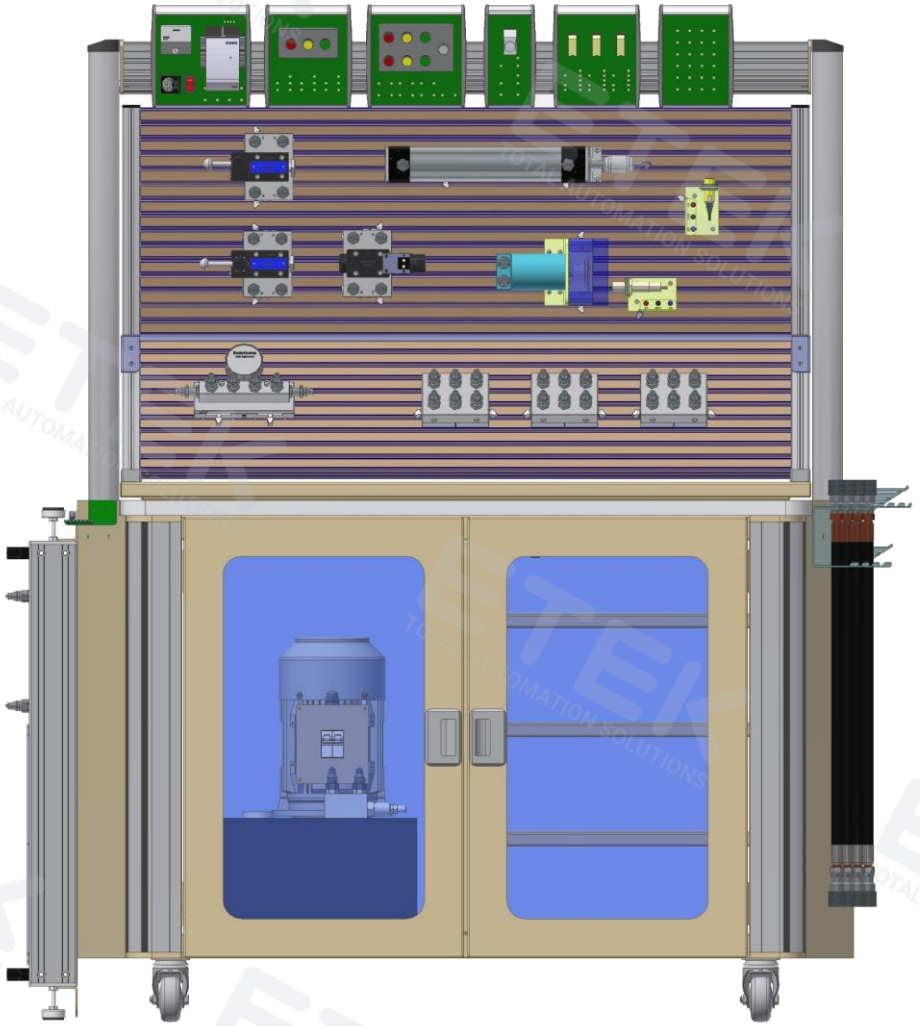
J. PNEUMATIC TRAINING ROOM

ETEK
TOTAL AUTOMATION SOLUTIONS

Solution for mounting pneumatic modules in practice:







J. PNEUMATIC TRAINING ROOM

1. Basic level pneumatics training set

- **Training content:**

- Cylinder delay control
- Practice connecting compressed air circuits:
+ Bar feeding equipment
+ Product classification
+ Parcel parcel division
+ Station for classifying pieces of material vertically
+ Metal edge folding machine
+ Stamp machine
+ Feeding the measuring machine
+ Redirection station for working objects
+ Paint box vibrator
+ Supply and divide materials
+ Heat plastic welding machine
+ Stone screening machine
+ Camera case clamping mechanism
+ Feeding station for Laser cutting machines
+ Semi-automatic internal grinding machine

J. PNEUMATIC TRAINING ROOM

2. Basic electro-pneumatics training set

- **Training content:**

- Connecting compressed air circuits:

+ Theory of compressed air
+ Sorting equipment
+ Switching device
+ Object rotation mechanism on conveyor belt
+ Lid closing mechanism
+ Assembly station
+ Cutting machine structure
+ Barrel tilt control
+ Tilting mechanism
Product redirection device
+ Impeller valve control structure
+ The bar feeder uses gravity
+ Gravity feeder has many grooves
+ Conveyor control device
+ Product labeling rotary table
+ Sliding table
+ Clamping device
+ Direction reversing device
+ Pressing equipment
+ Heat sealing equipment
+ Moving station
+ Product classification (throttle valve practice)
+ Classification equipment (OR valve practice)
+ Stamping equipment (AND valve practice)
+ Bar feeding device (time relay practice)

J. PNEUMATIC TRAINING ROOM

3. Advanced pneumatic training set

- **Training content:**

- Connecting compressed air circuits:
+ Theory of compressed air
+ Control the oven door
+ Rotate step by step
+ Embryo separation structure
+ Wood block drilling set
+ Drill bit with 4 drill bits
+ Drill bit with weight-based feeding mechanism
+ Design of compressed air counter
+ Door opening and closing mechanism
+ Transporting embryos
+ Calculate cylinder force

J. PNEUMATIC TRAINING ROOM

4. Advanced electro-pneumatic training set

- **Training content:**

- Practice connecting and operating compressed air circuits:

+ Bench drilling machine
+ Punch holes for metal strips
+ Filling equipment
+ Stamping equipment
+ Stamping equipment
+ Embossing equipment
+ Hole drilling and boring equipment
+ Loading station
+ Vaati clamping mechanism (vise)
+ Embryo separation structure
+ Calculate cylinder force
+ Cutting machine structure - PLC programming
+ Gravity-based feeding structure with many compartments - PLC programming
+ Product labeling rotary table – PLC programming
+ Sliding table – PLC programming
+ Vest clamping mechanism – PLC programming
+ Pressing equipment – PLC programming
+ Moving equipment – PLC programmingz

K. HYDRAULIC TRAINING ROOM

FUNCTION

- Identify hydraulic elements in practice
- Learn the operating principles and control principles of hydraulic elements
- Practice connecting and operating hydraulic control circuits

Basic Hydraulic training set

Basic Electro-hydraulic training set

Advance Hydraulic training set

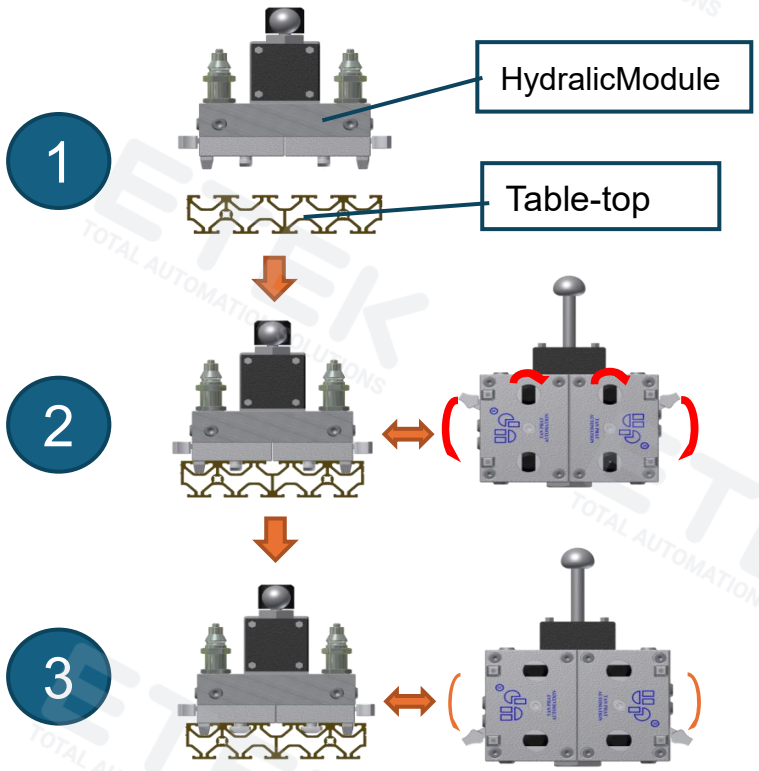
Advance Electro-hydraulic training set

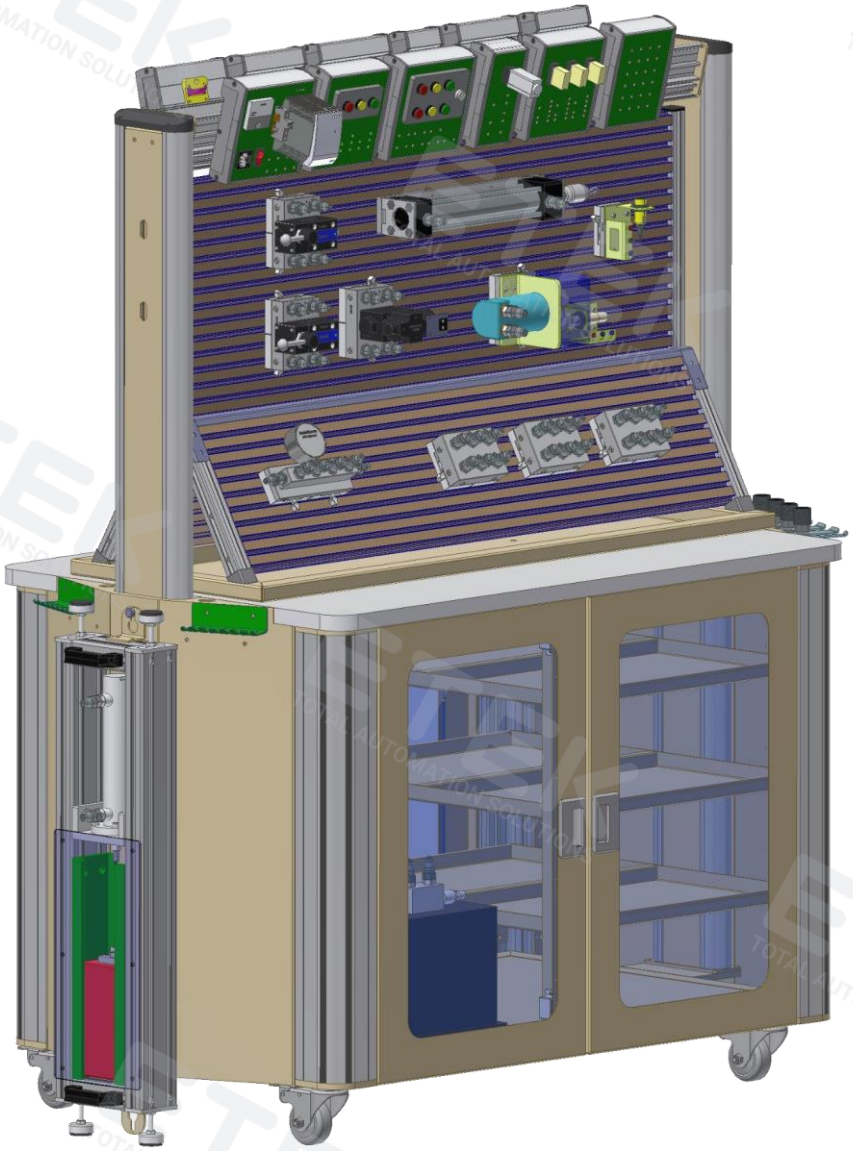
Hydraulic Servo Trainer (linear hydraulic control)

Table with Chair

K. HYDRAULIC TRAINING ROOM

Solution for mounting hydraulic modules in practice:





K. HYDRAULIC TRAINING ROOM

1. Basic Hydraulic training set

- **Training content:**
  + *Lesson 1: Automatic lathe*
  + *Lesson 2: Package lifting equipment*
  + *Lesson 3: Detailed punching machine*
  + *Lesson 4: Equipment for loading blanks for rolling machines*
  + *Lesson 5: Equipment for lifting the heat treatment furnace lid*
  + *Lesson 6: Controlling the kiln door*
  + *Lesson 7: Equipment to increase conveyor belt tension*
  + *Lesson 8: Equipment for opening and closing frozen warehouse doors*
  + *Lesson 9: Machining station with turntable*
  + *Lesson 10: Paint booth*
  + *Lesson 11: Embossing machine*
  + *Lesson 12: Surface grinder*
  + *Lesson 13: Drilling machine*
  + *Lesson 14: Combustion chamber door opening and closing device*
  + *Lesson 15: Equipment for lifting and lowering ferry bridges*
  + *Lesson 16: Operating containers*
  + *Lesson 17: Pressing machine*
  + *Lesson 18: Assembly equipment*
  + *Lesson 19: Calculation for assembled equipment*

K. HYDRAULIC TRAINING ROOM

2. Electro-hydraulic training set

- **Training content:**
  + *Lesson 1: Arranging equipment*
  + *Lesson 2: Classifying products on the conveyor belt*
  + *Lesson 3: Lift station*
  + *Lesson 4: Corrugated iron bending equipment*
  + *Lesson 5: Detailed pressing and assembling equipment*
  + *Lesson 6: Pressing machine*
  + *Lesson 7: Door control*
  + *Lesson 8: Cutting equipment*
  + *Lesson 9: Feeding equipment for drilling machines*
  + *Lesson 10: Pressing machine*
  + *Lesson 11: Loading equipment*
  + *Lesson 12: Assembly equipment*

K. HYDRAULIC TRAINING ROOM

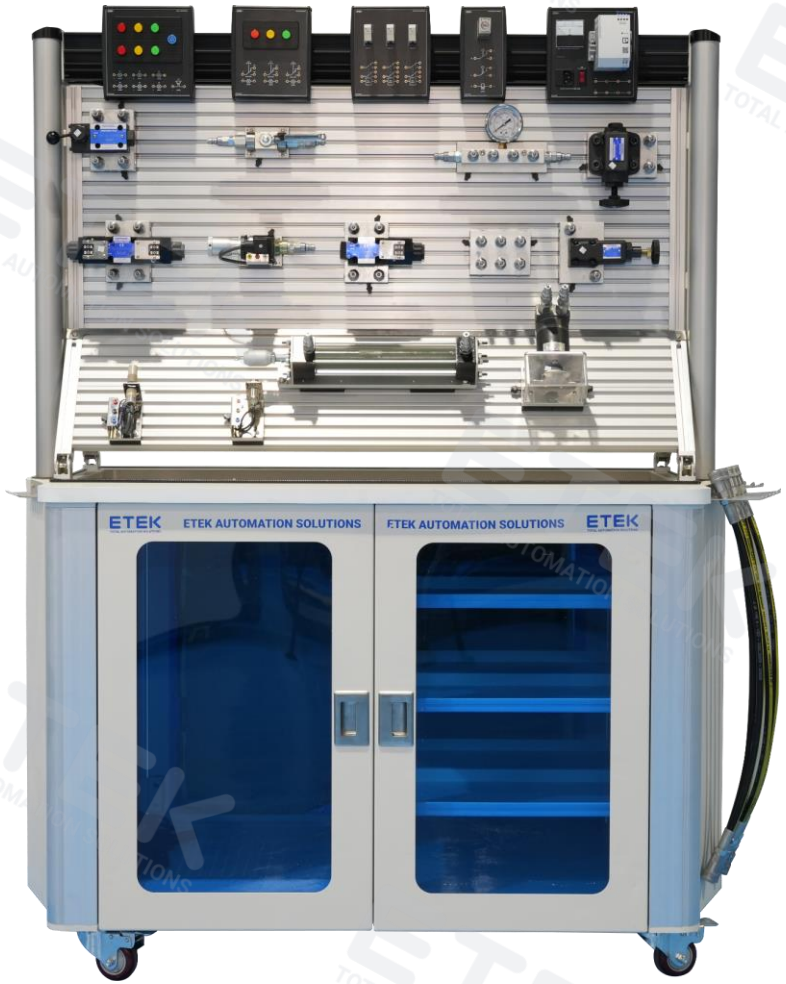
3. Advanced hydraulics training set

- **Training content:**

+ Lesson 1: Pipe winding roller control system for tank trucks
+ Lesson 2: Rough grinding machine table control device
+ Lesson 3: Lifting equipment with two cylinders
+ Lesson 4: Fast running equipment for drilling machines
+ Lesson 5: Control system for deburring press machine
+ Lesson 6: Gearbox casing clamping device
+ Lesson 7: Plastic injection molding machine
+ Lesson 8: Steel pipe bending machine
Lesson 9: Single cylinder press
+ Lesson 10: Machining center
+ Lesson 11: Magnetic crane
+ Lesson 12: Edge bending machine
+ Lesson 13: Earth drilling machine

K. HYDRAULIC TRAINING ROOM

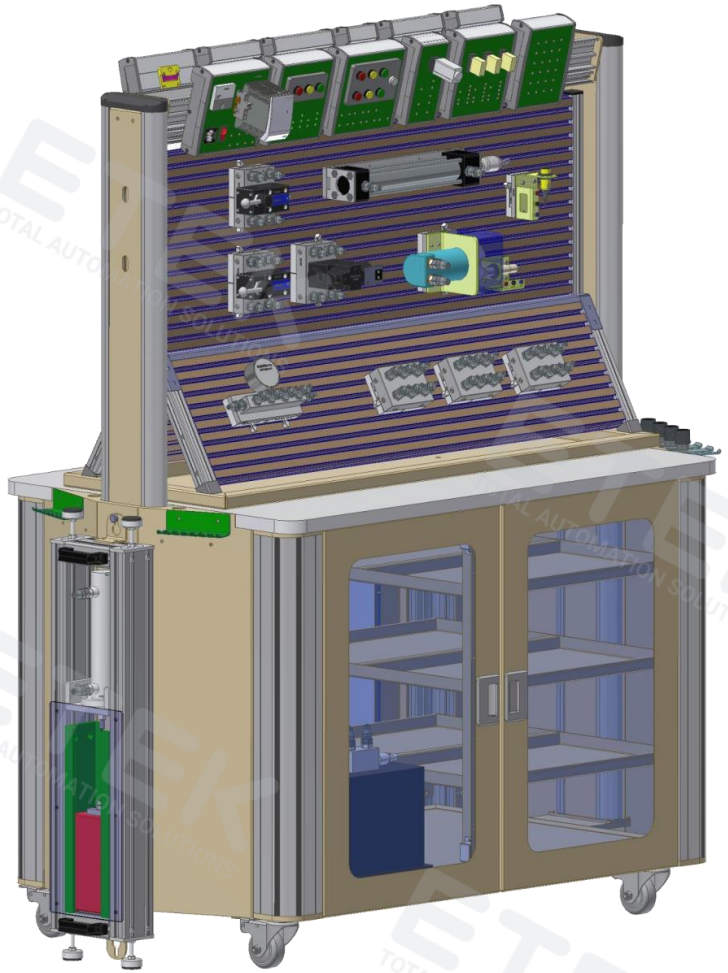
4. Advanced electrohydraulic training set



- **Training content:**
  + *Lesson 1: Van Shut-off*
  + *Lesson 2: Clamp set*
  + *Lesson 3: Milling machine*
  + *Lesson 4: Pressing machine*
  + *Lesson 5: Bending machine*
  + *Lesson 6: Broaching machine*
  + *Lesson 7: The drying oven operates continuously*
  + *Lesson 8: Polishing machine*
  + *Lesson 9: Equipment to increase conveyor belt tension*
  + *Lesson 10: Equipment for lifting and lowering bridges onto ferries*

K. HYDRAULIC TRAINING ROOM

5. Hydraulic Servo Trainer (linear hydraulic control)



Training content:

- Adjust and observe parameter values of the hydraulic Servo unit
- Build a PID model for hydraulic speed and position control
- Adjust PID parameters
- Controls and mechanical structures are electrically coupled
- Application of sensors and hydraulic components on automatic systems
- Dashboard applications
- Pairing/installation application
- Diagnose, detect and repair

6. Magnetic pneumatic and hydraulic element symbols

Training content:

- Used to practice pneumatic and hydraulic diagrams.

- Magnetic symbols of pneumatic and hydraulic elements are mounted on iron boards to serve lectures or to assemble into complete pneumatic and hydraulic diagrams.

L. INDUSTRIAL ROBOT TRAINING ROOM

FUNCTION

- Learn the structure
- Safe use of robots Robot coordinate system, Robot Calib
- Setting robot parameters
- Programming basic movement commands
- Program advanced movement commands (follow lines, draw, simulate glue ..)
- Change the work plane
- Programming conditional commands
- Simple subroutine
- Write pick and place robot programs using IO robot

Basic robot programming model

6-axis industrial robot model

7-axis Robot Station

LED Bulbs Production System

Table with Chair

L. INDUSTRIAL ROBOT TRAINING ROOM

1. Basic robot programming model

Training content:

- Learn the structure of Robot
- Safe use of robots Robot coordinate system, Robot Calib
- Setting robot parameters
- Programming basic movement commands
- Program advanced movement commands (follow lines, draw, simulate glue ..)
- Change the work plane
- Programming conditional commands
- Simple subroutine
- Write, pick and place robot programs using IO robot

1. Robot

2. Basic training

3. Pick& plate

4. Writing and drawing

5. Conveying

6. Pen holder

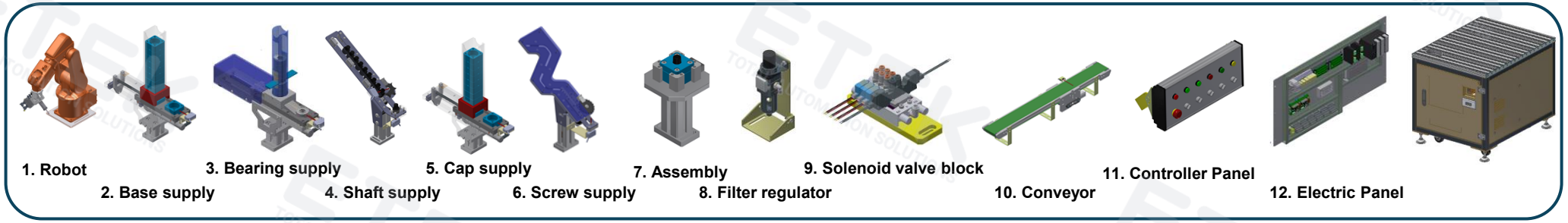
7. Table

L. INDUSTRIAL ROBOT TRAINING ROOM

2. 6-axis industrial robot model

Training content:

- Practice connecting, programming industrial robots
- Practice connecting, programming PLC
- Practice robot-PLC communication
- Practice programming checking and sorting with camera
- Practice adjusting the speed of motorized conveyors
- Practice installing sensor adjustment
- Practice setting up and running a full system in industry



L. INDUSTRIAL ROBOT TRAINING ROOM

3. 7-axis Robot Station

- **Training content:**

- Practice connecting, programming industrial robots
- Practice connecting, programming PLC
- Practice robot-PLC communication
- Practice programming checking and sorting with camera
- Practice adjusting the speed of motorized conveyors
- Practice installing sensor adjustment
- Practice setting up and running a full system in industry

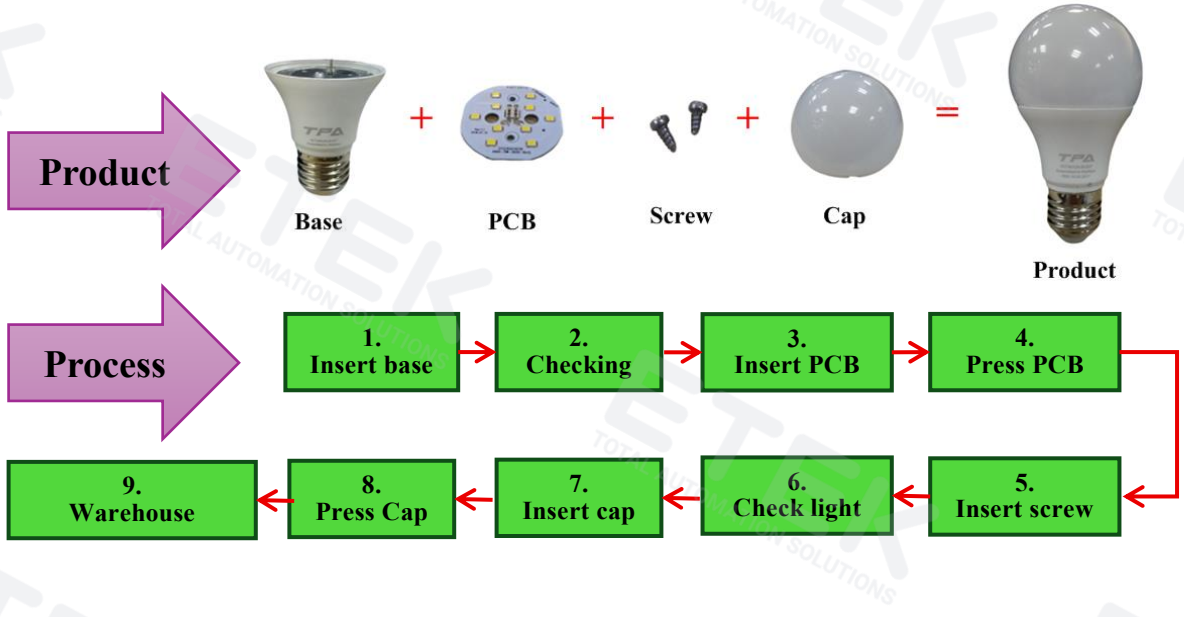
4. LED Bulbs Production System

- **Training content:**

- Practice connecting, programming collaborative robots
- Practice connecting, programming industrial robots
- Practice connecting, programming single axis and two axis robot
- Vision programing
+ Camera calibrate
+ Measurement
+ Defect detection
+ Communication with robot
+ Pattern matching, barcode, QRcode reading… (software practice)
- Kind of popular mechanisms in industrial
- Practice connecting, programming PLC
- Practice robot-PLC communication
- HMI programing and communication
- Pneumatic technology
- Practice adjusting the speed of motorized conveyors
- Practice installing sensor adjustment
- Practice setting up and running a full system in industry
- Set up and running a full system in industry

L. INDUSTRIAL ROBOT TRAINING ROOM

4. LED Bulbs Production System



IOT Dashboard

1. Base Supply .St

2. PCB Supply. St

3. Screw Supply .St

4. Cap Supply .St

5. Packaging .St

6. Central processing turntable

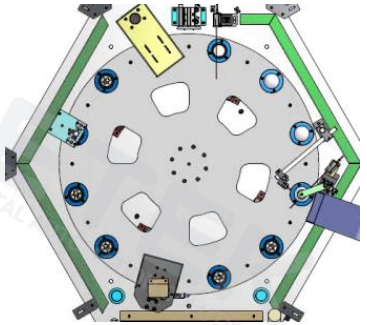
L. INDUSTRIAL ROBOT TRAINING ROOM

4. LED Bulbs Production System

a. Base Supply Station

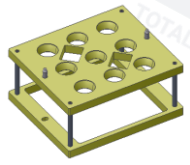
Working process

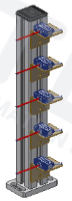
Base

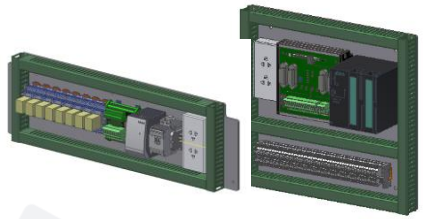


Sequent process

1. Home
Robot Moves
2. Position (4)
3. Clamp Jig
Robot Moves
4. Position (2)
5. Check Base on the Jig
6. Clamp Base
Robot Moves
7. Drop base into the turntable position
Continue
8. Pick up the empty Jig
9. Place of empty tray
10. Continue (1) to (9)
11. Finish, Robot will stop and report over base







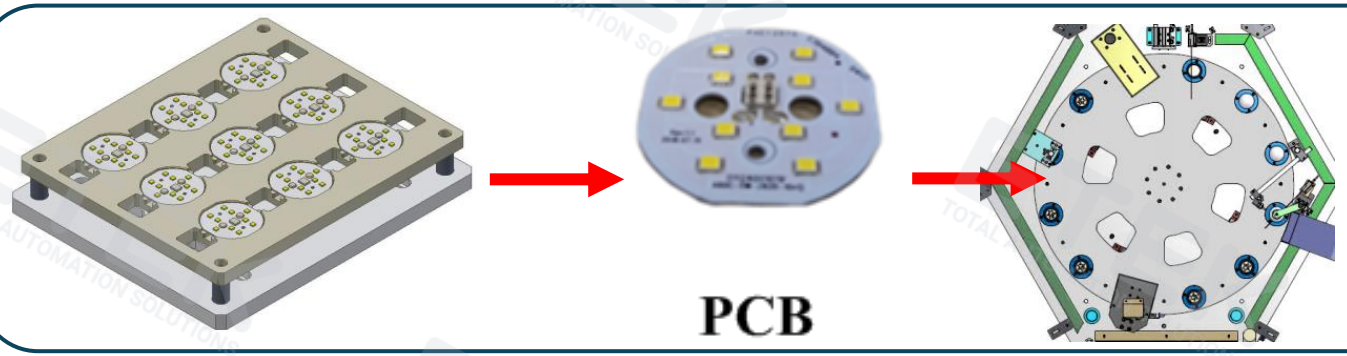
2. JIG 3. Sensors 4. Controller Panel 5. Electric Panel 6. Table

L. INDUSTRIAL ROBOT TRAINING ROOM

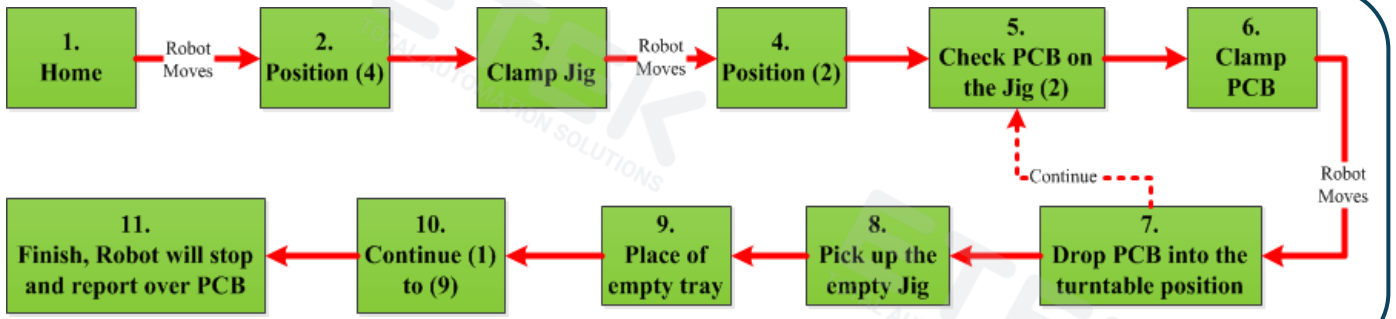
4. LED Bulbs Production System

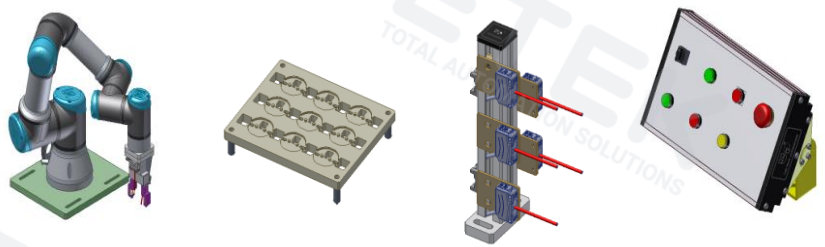
b. PCB Supply Station

Working process



Sequent process





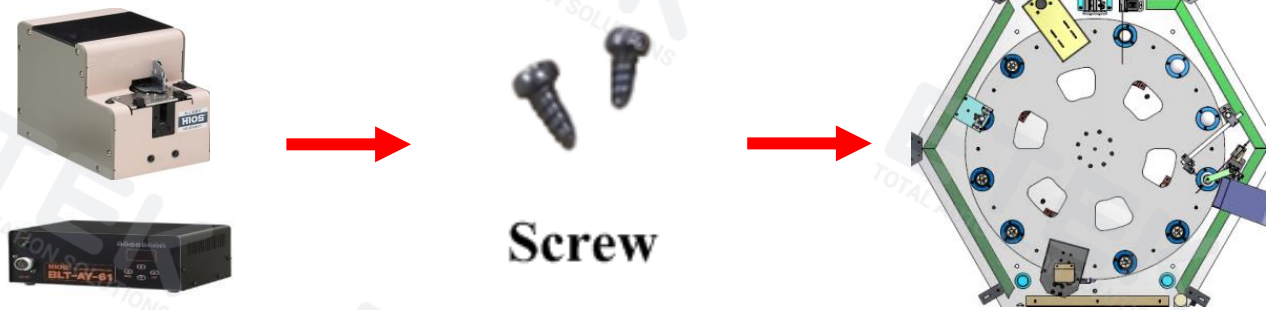
2. JIG 3. Sensors 4. Controller Panel 5. Electric Panel 6. Table

L. INDUSTRIAL ROBOT TRAINING ROOM

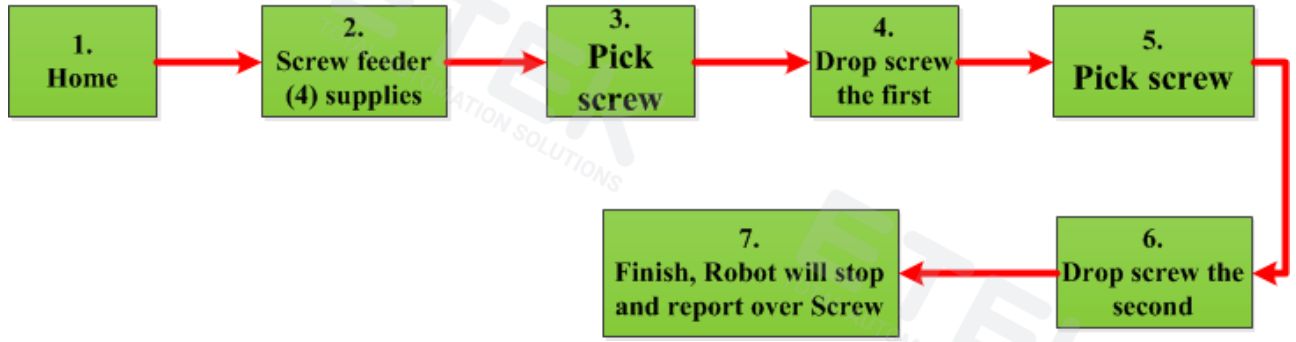
4. LED Bulbs Production System

c. Screwdriver Supply Station

Working process



Sequent process



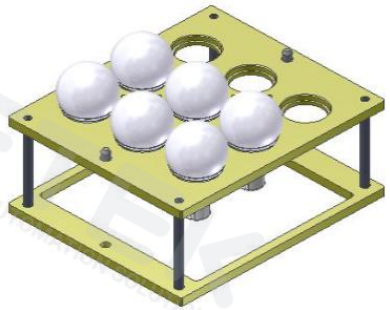
2. Screw Feeder 3. Driver 4. Controller Panel 5. Electric Panel 6. Table

L. INDUSTRIAL ROBOT TRAINING ROOM

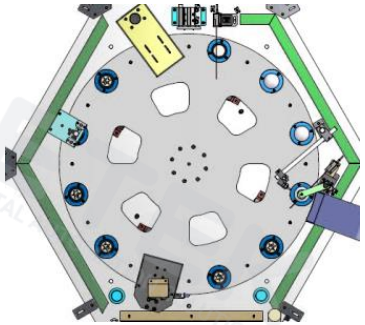
4. LED Bulbs Production System

d. Cap Supply Station

Working process



Cap



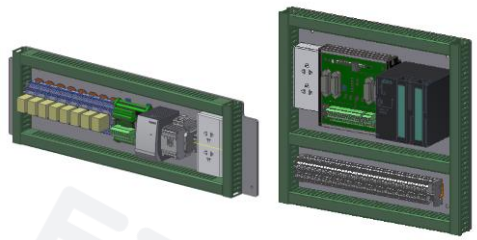
Sequent process

1. Home
2. Position (3)
3. Check Cap on the Jig
4. Clamp Cap
5. Drop Cap into the turntable position
6. Pick up the empty Jig
7. Place of empty tray
8. Continue (1) to (7)
9. Finish, Robot will stop and report over Cap

1. Robot UR3

2. Jig

3. Sensors 4. Controller Panel



5. Electric Panel

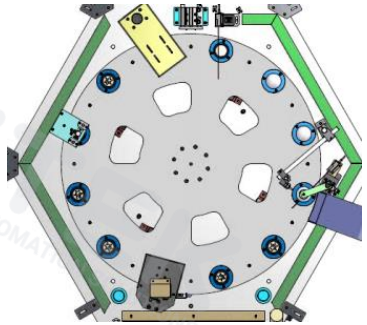
6. Table

L. INDUSTRIAL ROBOT TRAINING ROOM

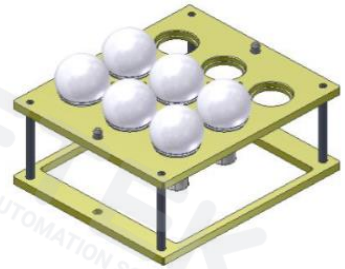
4. LED Bulbs Production System

e. Warehouse Station

Working process



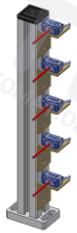
Product



Sequent process

1. Pick product → 2. Transfer to jig → 3. 2 axis robot pick product from jig → 4. 2 axis robot place product to warehouse → 5. Oder (HMI) → 6. 2 axis robot pick product from warehouse → 7. 2 axis robot place product to output conveyor

2. Jig



3. Sensors

4. Controller Panel

5. Electric Panel

6. Table

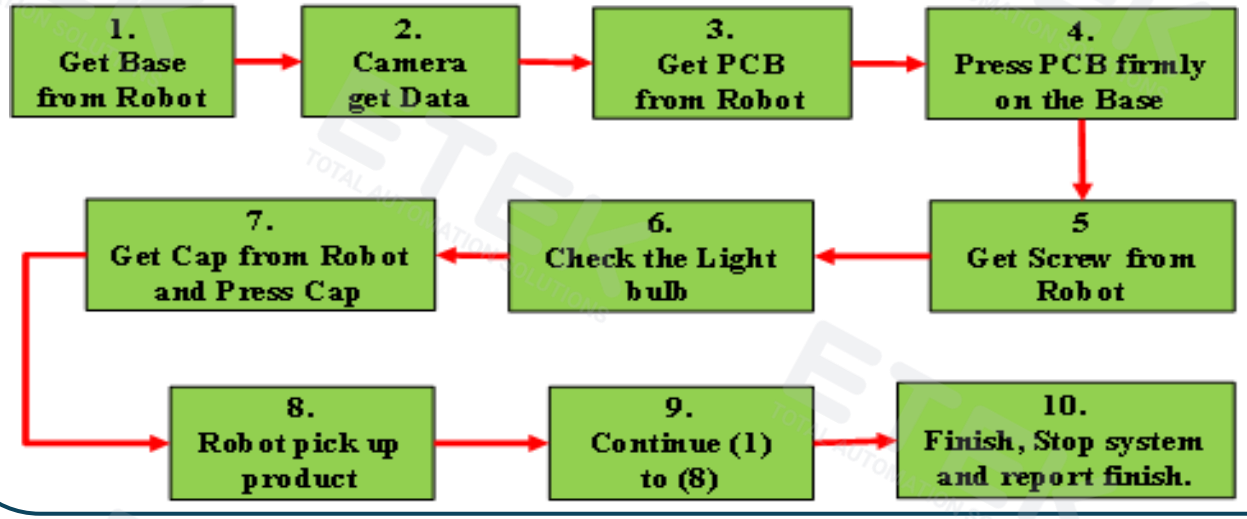
L. INDUSTRIAL ROBOT TRAINING ROOM

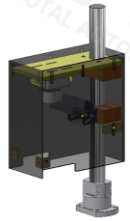
4. LED Bulbs Production System

f. Central Processing Turntable

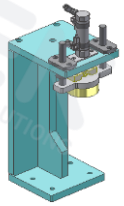
Working process

Sequent process

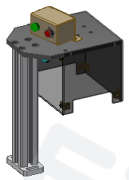




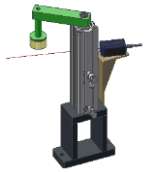
1. Vision module (Cognex…)



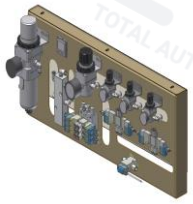
2. Press PCB



3. Check Light



4. Press Cap



5. Pneumatic Panel

6. Control cabinet

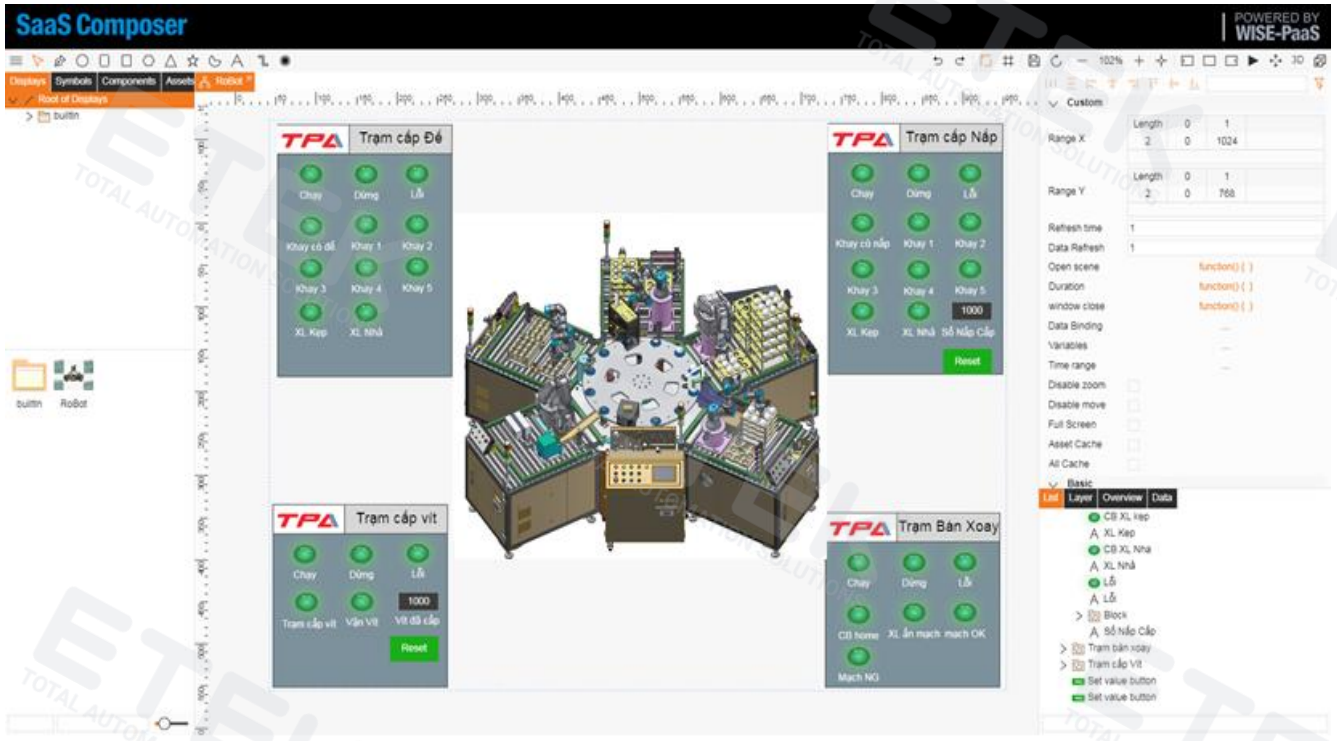
7. Electric Panel

8. Turntable

L. INDUSTRIAL ROBOT TRAINING ROOM

4. LED Bulbs Production System

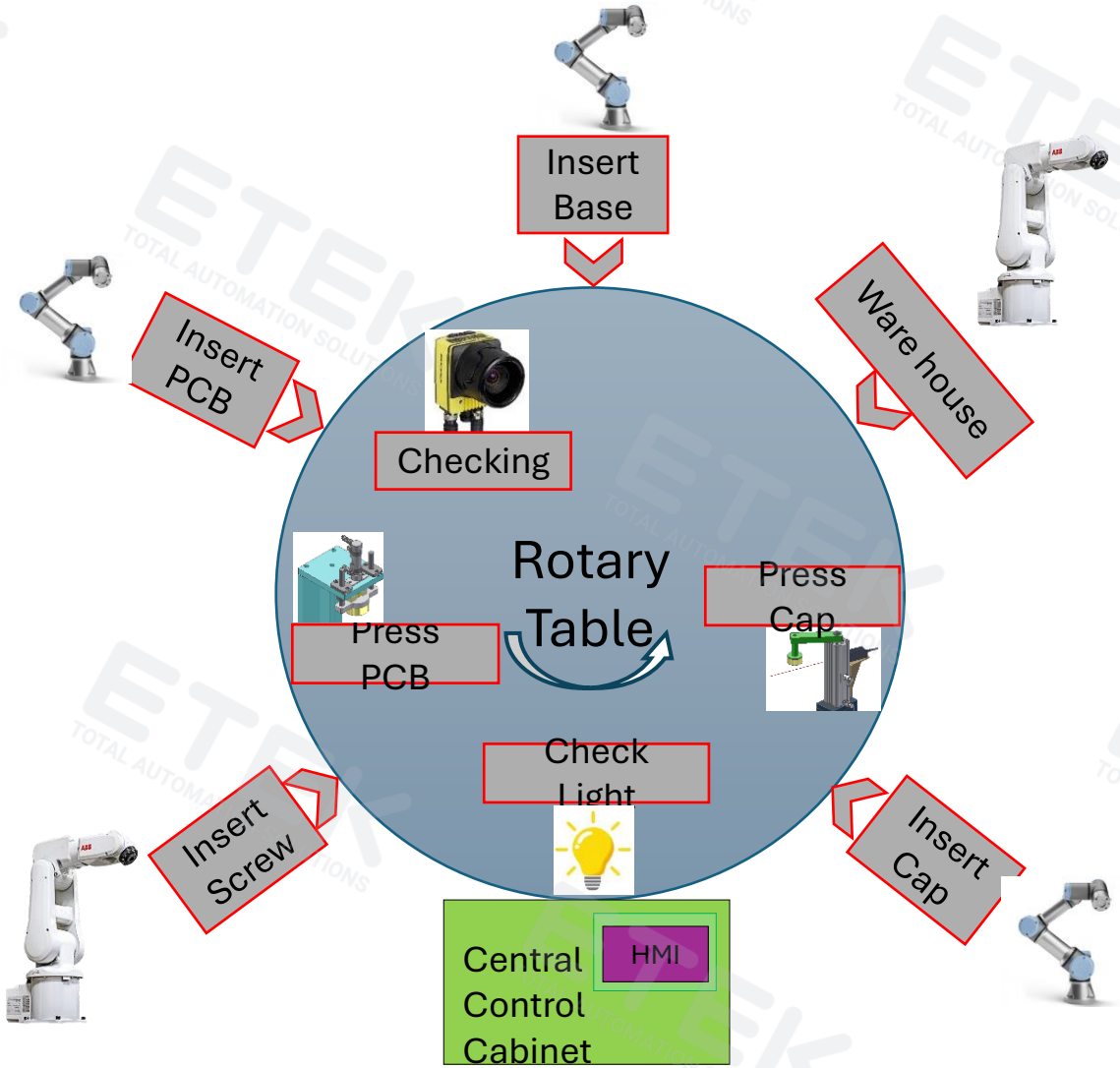
IoT Dashboard

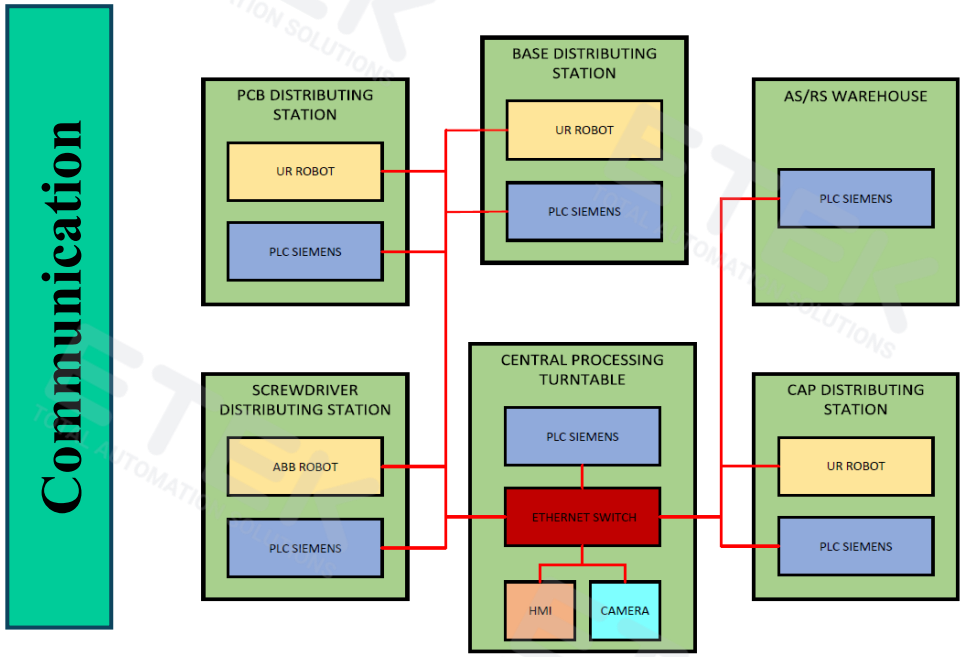


L. INDUSTRIAL ROBOT TRAINING ROOM

4. LED Bulbs Production System

Layout Production And Communication





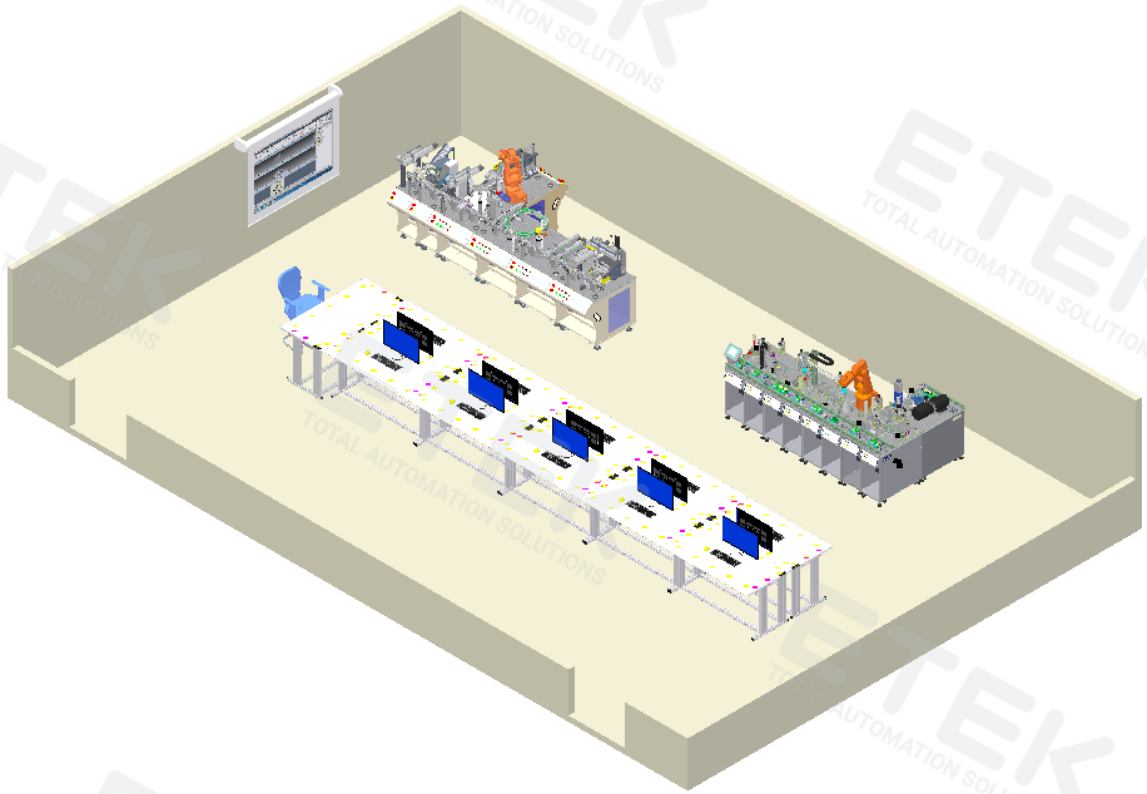
- The sensor signals, cylinders... in each station are transmitted to the PLC and IoT Wireless I/O Module. PLC will then transmit data to the Robot and PLC of Central processing turntable station according to Ethernet IP connection.
- UR robot and ABB robot connect and receive camera data according to TCP/IP connection.

M. FLEXIBLE PRODUCTION SYSTEM TRAINING ROOM

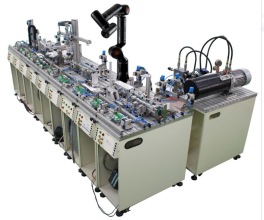
ETEK
TOTAL AUTOMATION SOLUTIONS

FUNCTION

- Learn the structure of a mechatronic system
- Practice mechanical alignment, installation and alignment of sensors
- Practice installation and troubleshooting of each station
- Practice writing PLC control programs for the station
- Practice connecting, programming industrial robots
- Connect the I/O inputs and outputs of the PLC to the system
- Expanded training content:
+ Collect remote station management data via web server
+ Collect and update the positions of workpieces on different stations
+ Simulate and collect system signals using a remote management interface connected via the internet



Mechatronics 4.0
desktop training system



Mechatronic installation and
maintenance practice system - MPS

Flexible manufacturing
systems and Industry 4.0

Table with
Chair

M. FLEXIBLE PRODUCTION SYSTEM TRAINING ROOM

1. Mechatronics 4.0 desktop training system

Training content:

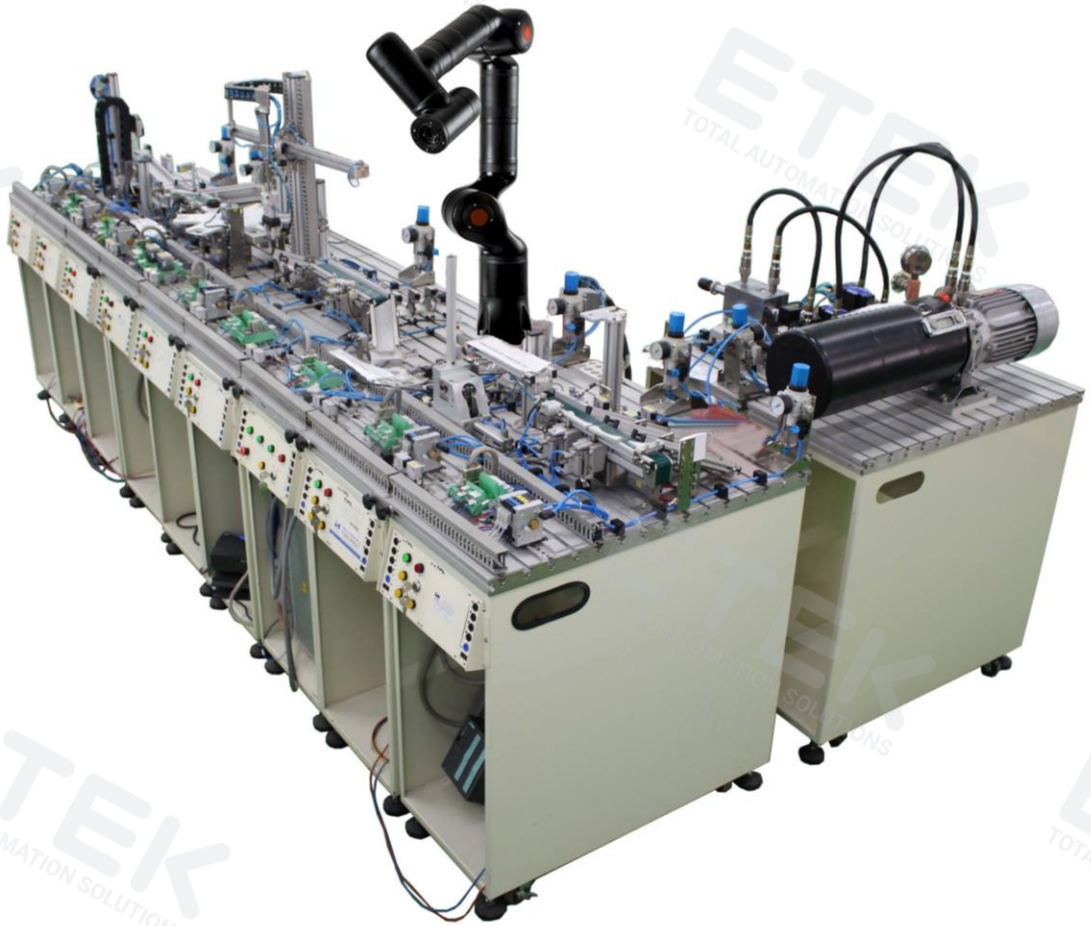
- Learn the structures of a flexible production line
- Practice surveying, installing, and aligning hardware devices
- Practice configuring devices and linking stations on software
- Practice PLC programming
- Practice programming SCADA monitoring interface

M. FLEXIBLE PRODUCTION SYSTEM TRAINING ROOM

2. Mechatronic installation and maintenance practice system - MPS

Training content:

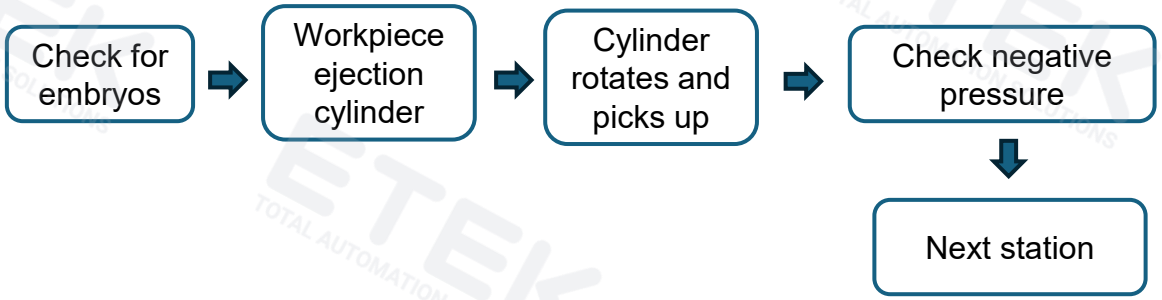
- Overall knowledge of mechatronics: Sensors, pneumatics, hydraulics, PLC, industrial communication networks, IOT.
- Disassembly, installation and connection of mechatronic modules (according to the national and international skills competition program)
- PLC programming to control independent stations
- Programming inter-station communication, complete system control
- Control and monitor the system via Cloud server

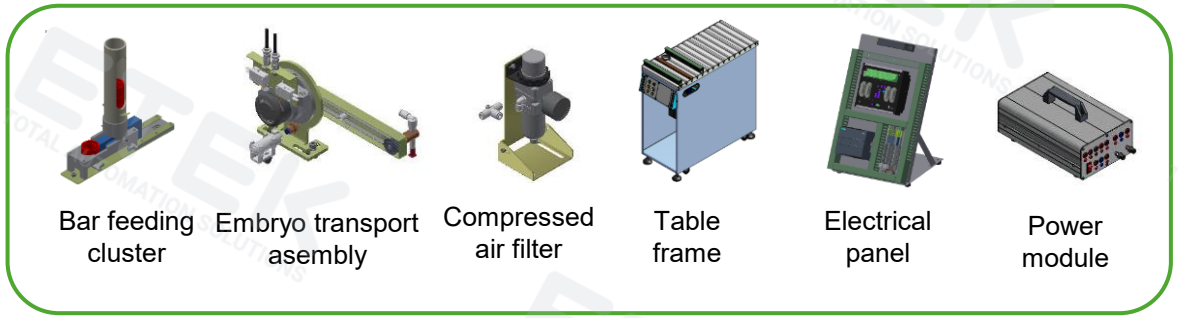


2. Mechatronic installation and maintenance practice system - MPS

2.1. SUPPLY TRAINING STATION

Process:

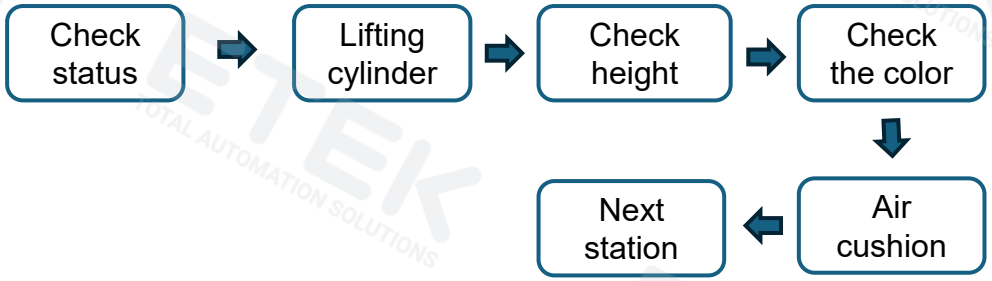


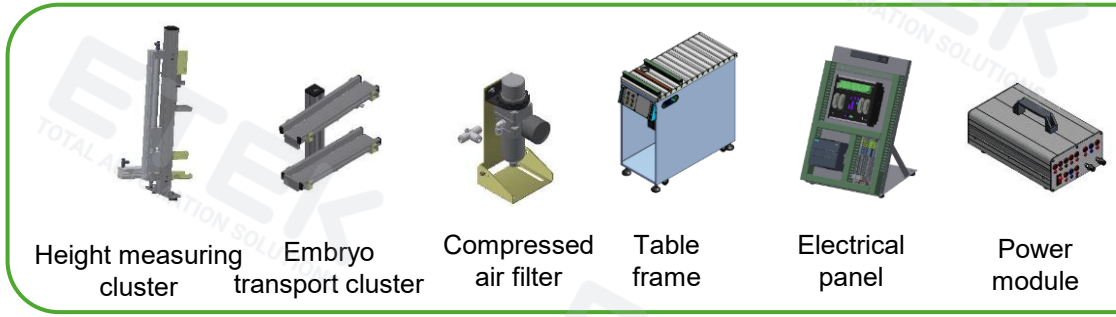


2. Mechatronic installation and maintenance practice system - MPS

2.2. TESTING TRAINING STATION

Process:

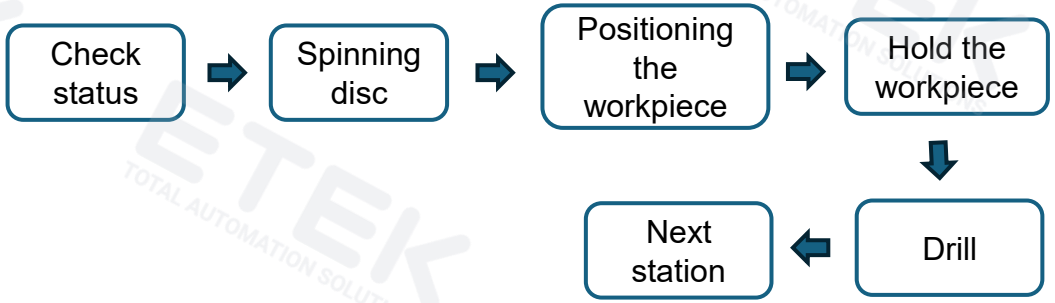


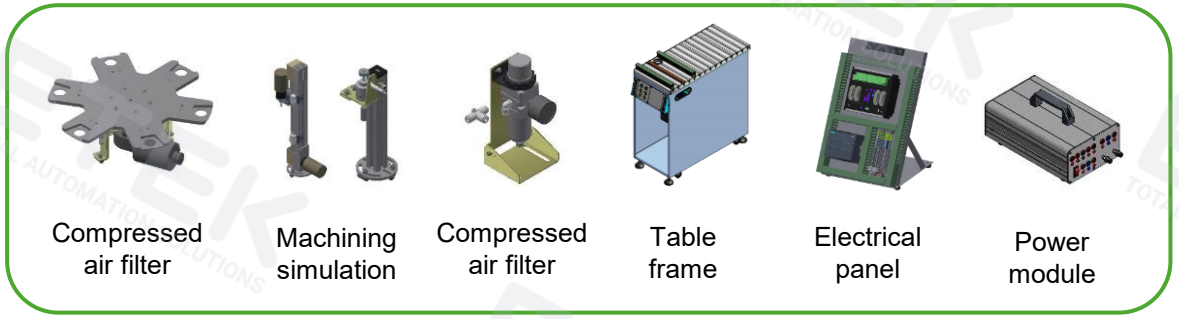


2. Mechatronic installation and maintenance practice system - MPS

2.3. PROCESSING TRAINING STATION

Process:

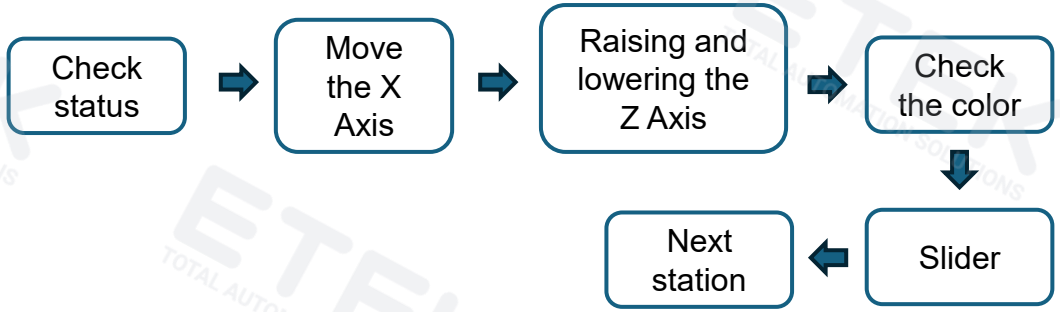


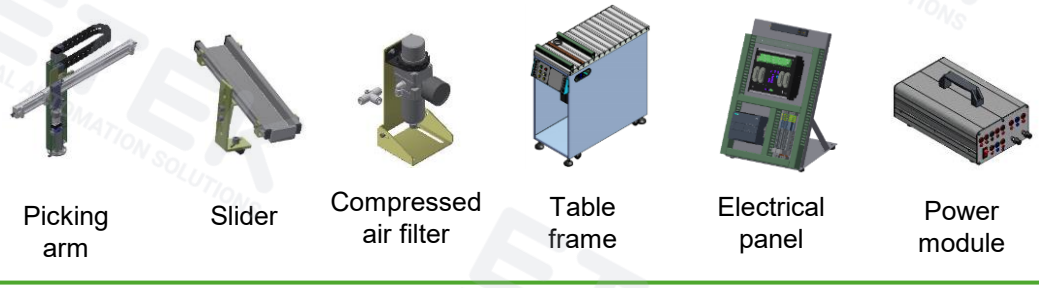


2. Mechatronic installation and maintenance practice system - MPS

2.4. PICKING TRAINING STATION

Process:

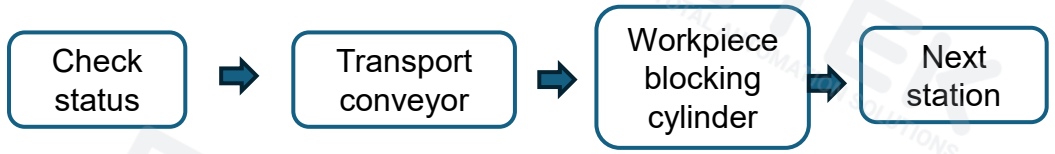


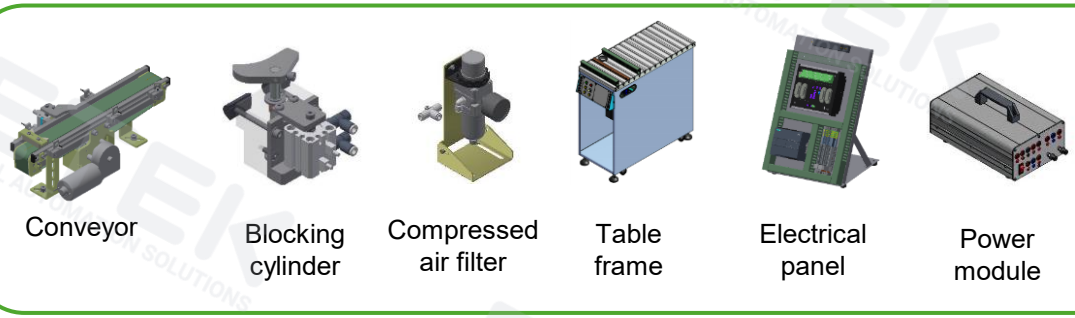


2. Mechatronic installation and maintenance practice system - MPS

2.5. BUFFERING TRAINING STATION

Process:

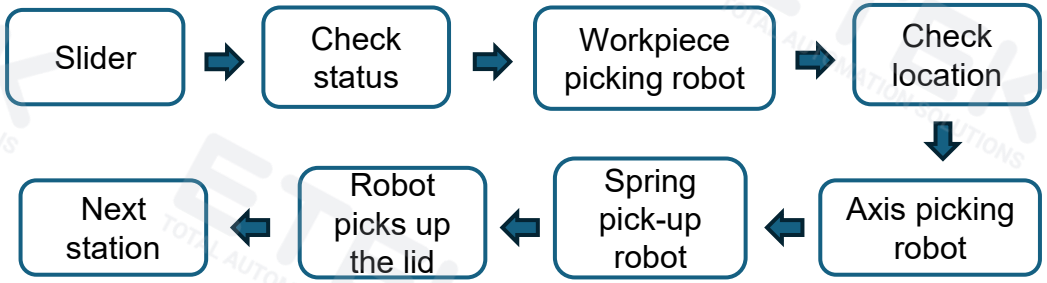


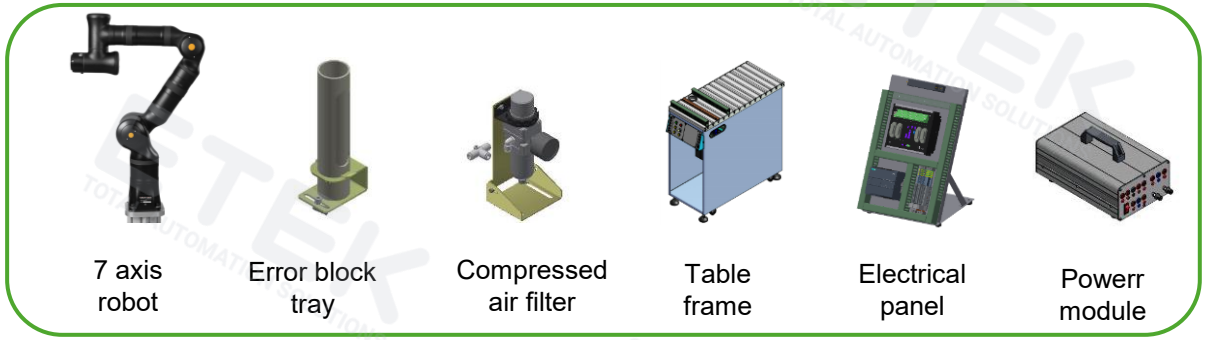


2. Mechatronic installation and maintenance practice system - MPS

2.6. ROBOT TRAINING STATION

Process:



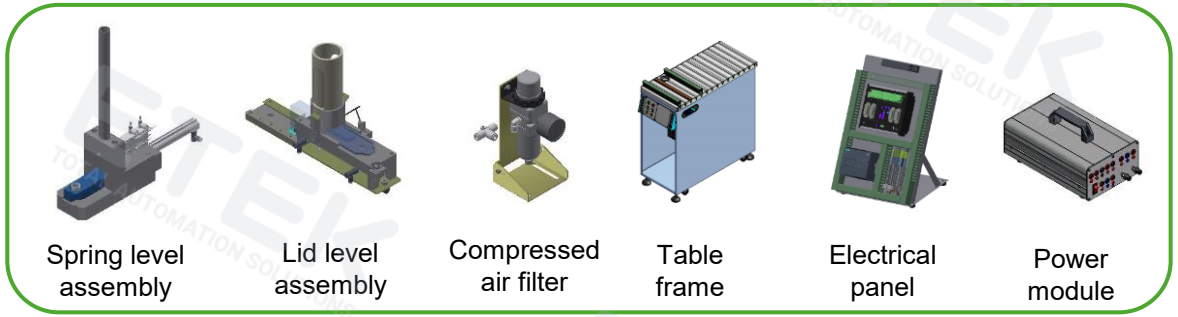


2. Mechatronic installation and maintenance practice system - MPS

2.7. ASSEMBLY TRAINING STATION

Process:

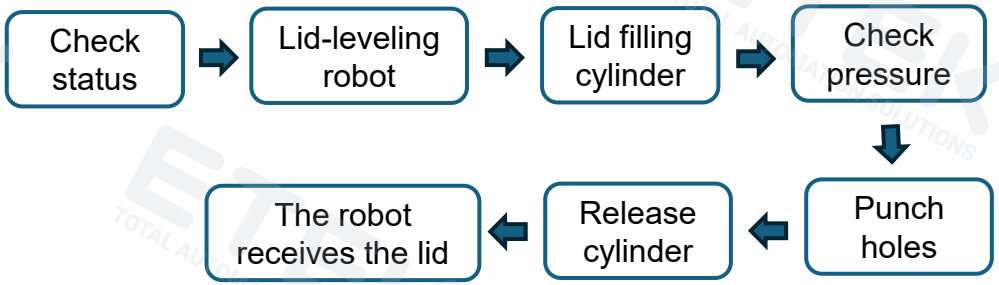
Check status → Spring level silane → Lid supply cylinder → Shaft level

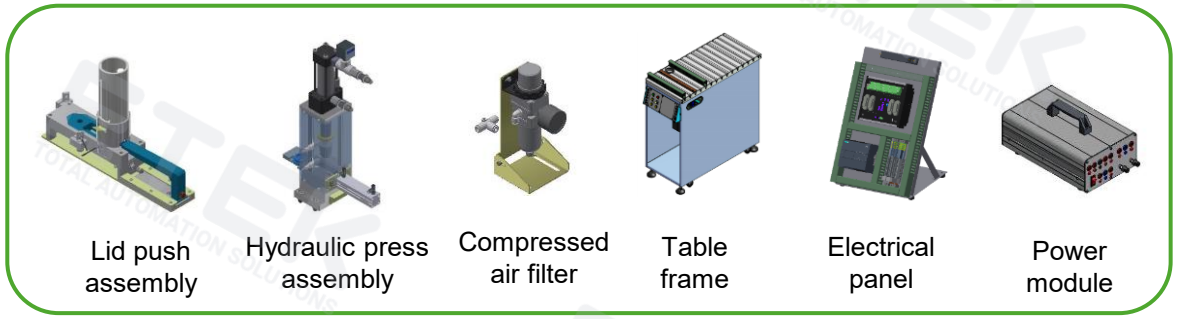


2. Mechatronic installation and maintenance practice system - MPS

2.8. HYDRAULIC PUNCHING TRAINING STATION

Process:

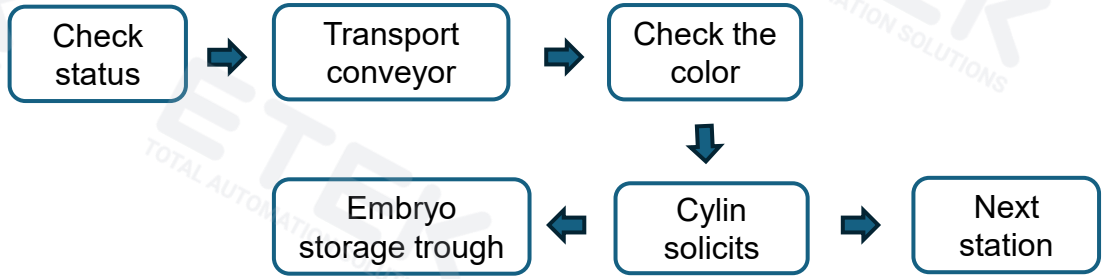


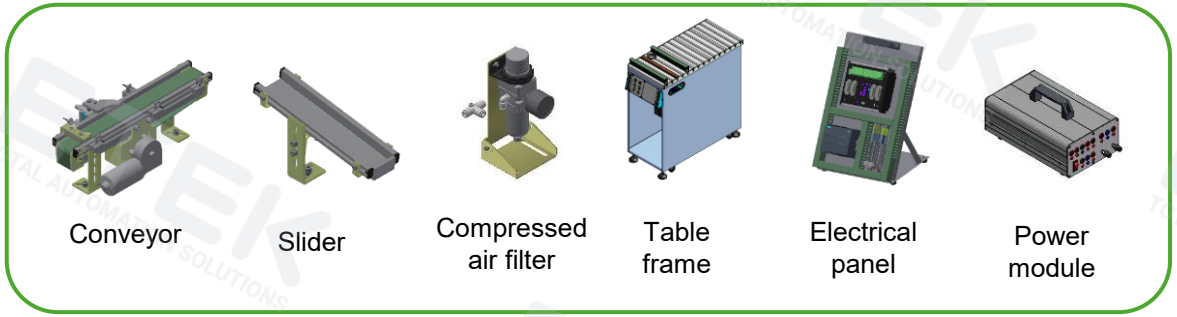


2. Mechatronic installation and maintenance practice system - MPS

2.9. SORTING TRAINING STATION

Process:

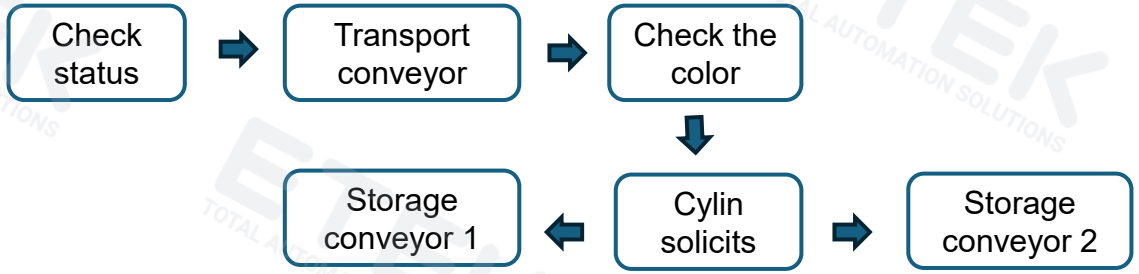


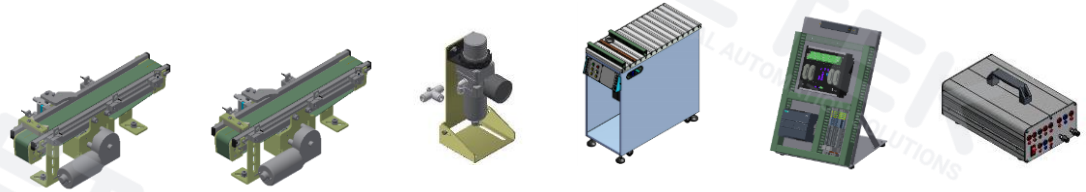


2. Mechatronic installation and maintenance practice system - MPS

2.10. STORING TRAINING STATION

Process:





M. FLEXIBLE PRODUCTION SYSTEM TRAINING ROOM

3. Flexible manufacturing systems and Industry 4.0

Training content:

- Learn the structure of a mechatronic station in a flexible L. INDUSTRIAL ROBOT PRACTICE ROOM
- Introducing pneumatic elements, sensors, and electrical devices
- Introduce the structure and operating principles of electrical control modules
- Practice mechanical alignment, installation and alignment of sensors
- Practice installation and troubleshooting of each station
- Practice writing PLC control programs for bar feeding stations
- Connect the I/O inputs and outputs of the PLC to the system
- Expanded training content:

+ Learn about how to collect data of a basic industrial model system
+ Collect the operating status of sensors
+ Collect the operating status of the cylinders
+ Detect errors during operation and product supply
+ Collect and update the positions of workpieces on different stations
+ Programming the system monitoring interface via the IPC platform
+ Comes with 4.0 software licenses

M. FLEXIBLE PRODUCTION SYSTEM TRAINING ROOM

3. Flexible manufacturing systems and Industry 4.0

3.1 Modular Mechatronics System – mMS4.0 Station 1 – Material Transport and Identification

Training content:

- Get familiar with PLC systems and programs
- Learn about emergency stop circuits
- Detect materials using sensors
- Visualize and operate device functions
- Visualize system status
- One step and automatic mode

3. Flexible manufacturing systems and Industry 4.0

3.2 Modular Mechatronics System – mMS4.0 Station 2 – Material Processing

Training content:

- Learn and operate equipment
- Learn about emergency stop circuits
- Transporting materials using electric drive technology
- Move materials using pneumatic transmission and vacuum technology
- PLC programming (IPC) according to IEC 61131-3 standard
- Reset PLC program (IPC) – emergency stop circuit
- PLC program stapler (IPC)
- PLC program port - loading press
- PLC program – press with two-handed trigger
- PLC program port - unloading press
- Program the entire process for Station 2

3. Flexible manufacturing systems and Industry 4.0

3.3 Modular Mechatronics System – mMS4.0 Station 3 – High Rack Warehouse

Training content:

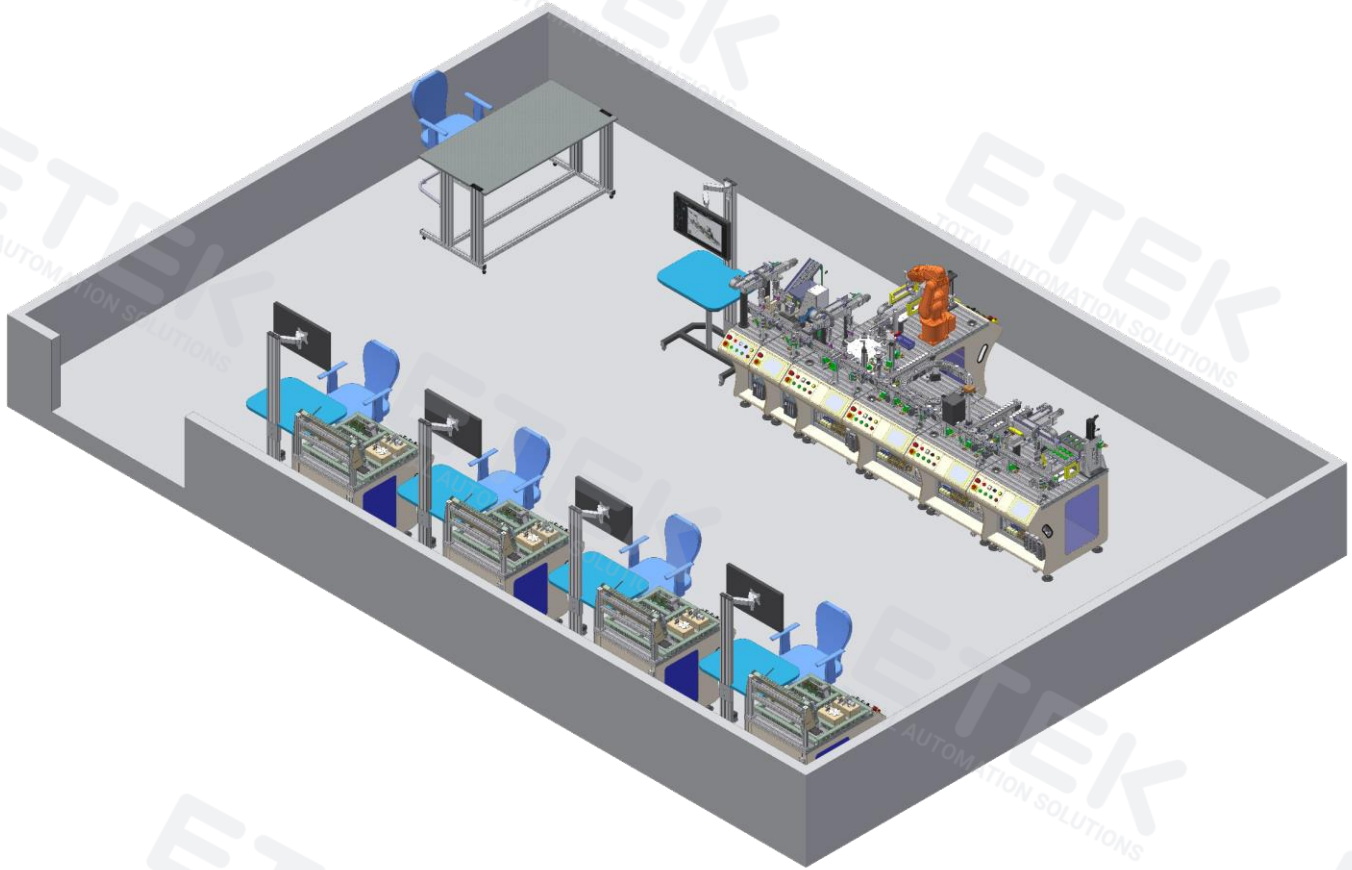
- Familiar with PLC system and program (IPC)
- Learn about emergency stop circuits
- Electric servo shaft operation
- Monitor and control the drive controller using PLC
- Connect power
- Move to a specific point
- Loading and storing workpieces (cartesian robot)
- PLC programming according to IEC 61131-3 standards

O. IOT AND SMART FATORY TRAINING ROOM

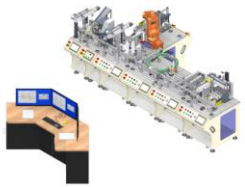
ETEK
TOTAL AUTOMATION SOLUTIONS

FUNCTION

- Build a hardware structure to collect production information in the field
+ Collect data from PLC
+ Collect data using Remote IO
+ Collect data using Wireless IO
+ Collect data using Smart Sensor
- Building system monitoring software
+ Configure IoT system, MQTT platform
+ Processing data on the Cloud
+ Build Dashboard to display data
+ Build graphs displaying data
- System control programming
+ PLC programming to control the system
+ Programming HMI interface

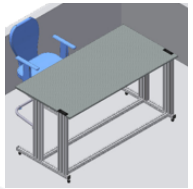


Industrial IoT architecture training set



Mechatronics training system - Smart Factory

Computer desk with wheel

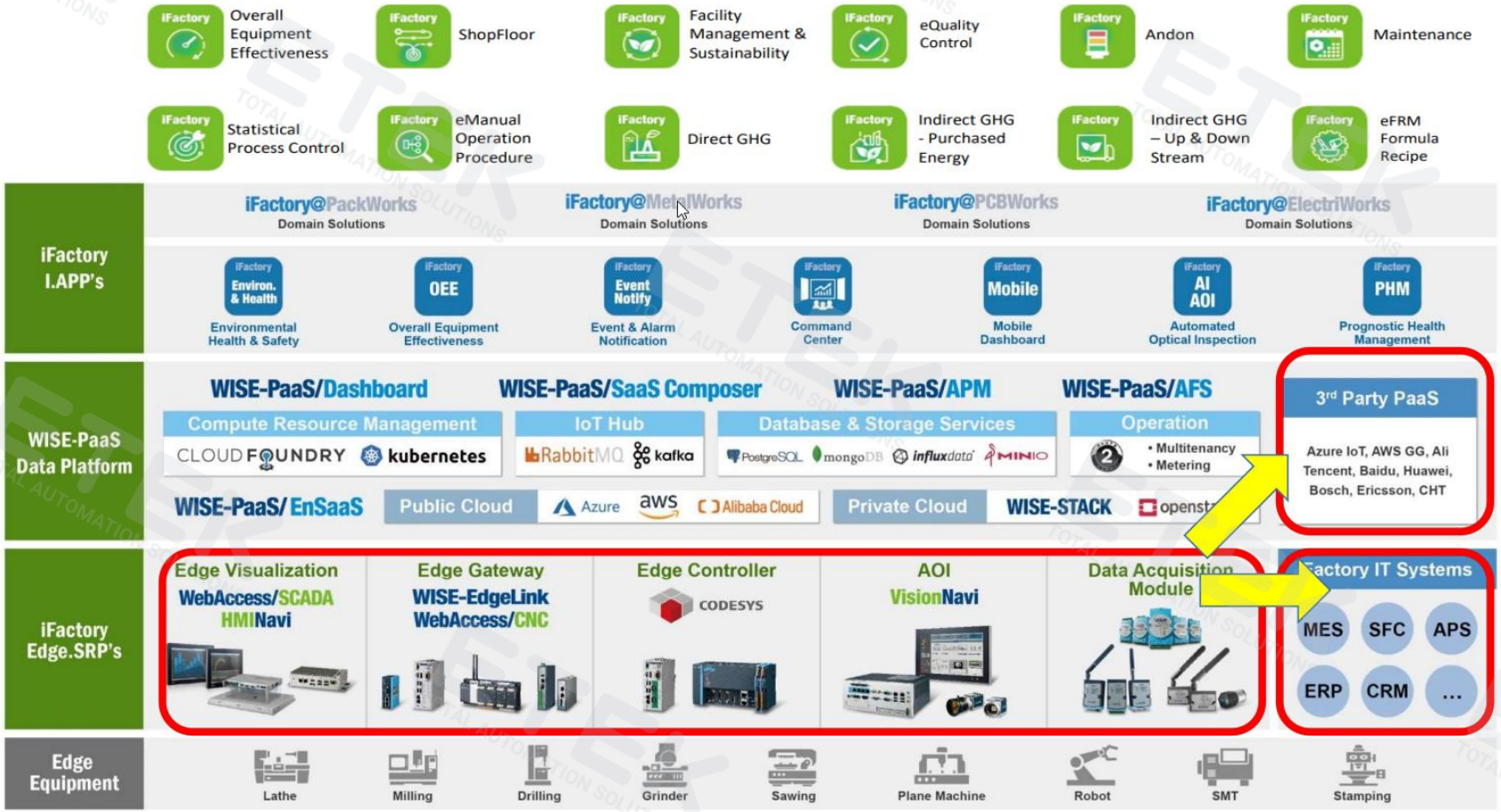


Teacher Table with Chair

O. IOT AND SMART FATORY TRAINING ROOM

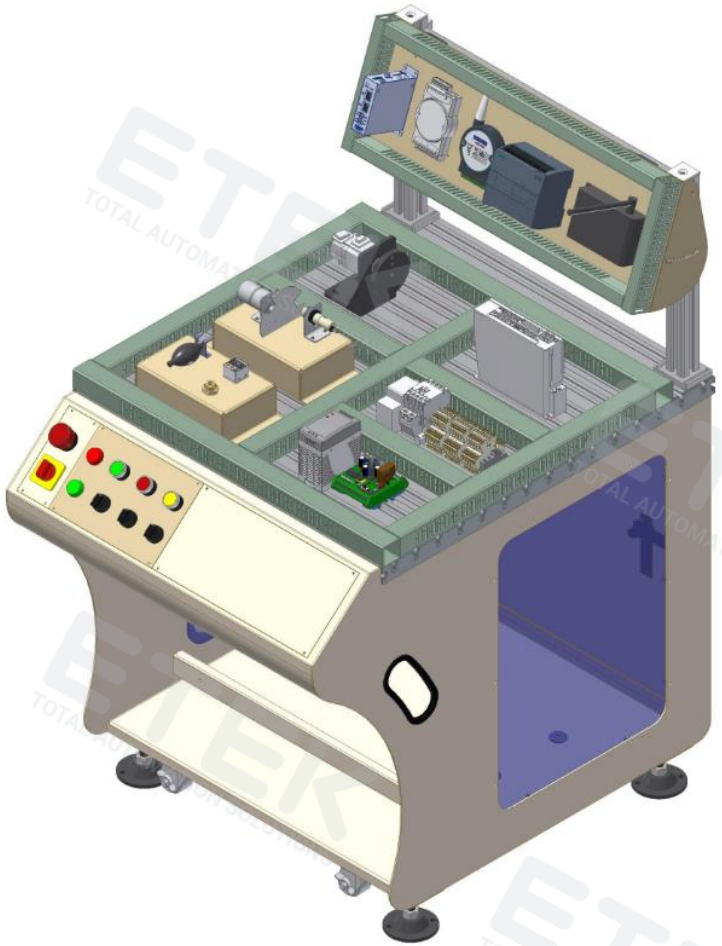
ETEK
TOTAL AUTOMATION SOLUTIONS

Smart Factory funtion



O. IOT AND SMART FATORY TRAINING ROOM

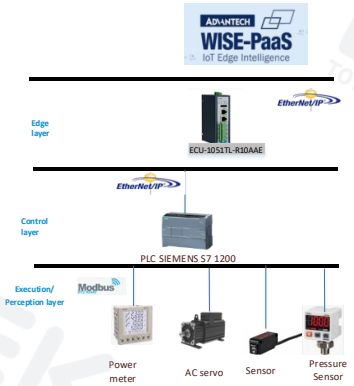
1. Industrial IoT architecture training set



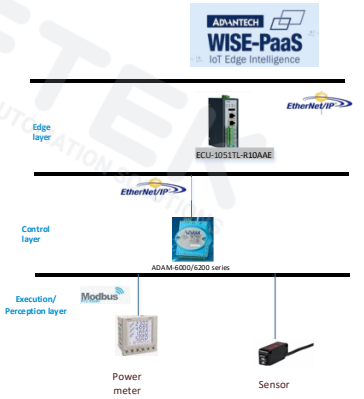
Training Contents

- Build a hardware structure to collect production information in the field
  + Collect data from PLC
  + Collect data using Remote IO
  + Collect data using Wireless IO
  + Collect data using Smart Sensor
- Building system monitoring software
  + Configure IoT system, MQTT platform
  + Processing data on the Cloud
  + Build Dashboard to display data
  + Build graphs displaying data

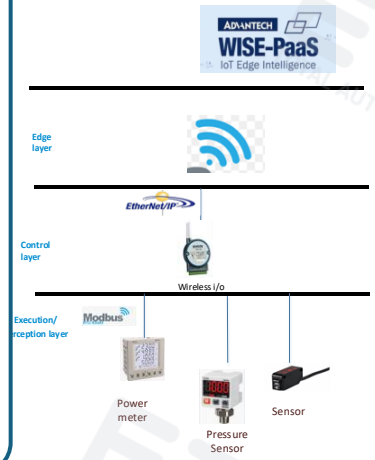
System architecture



PLC



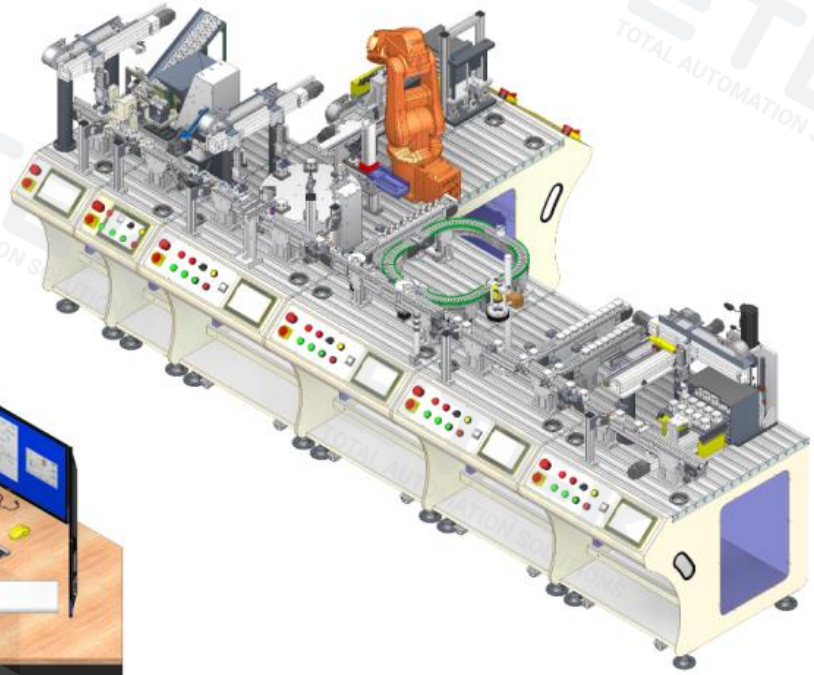
Remote IO

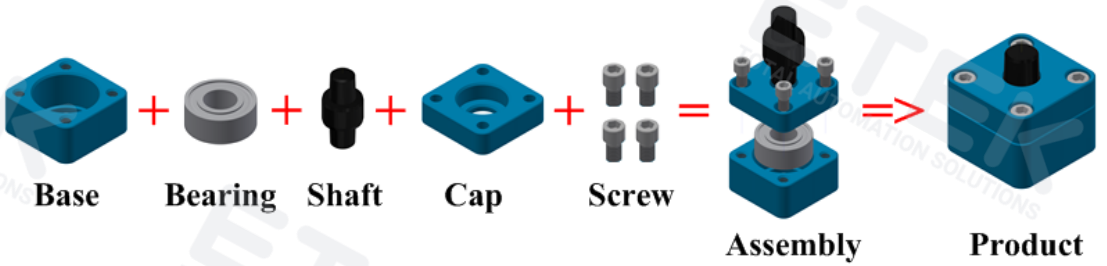


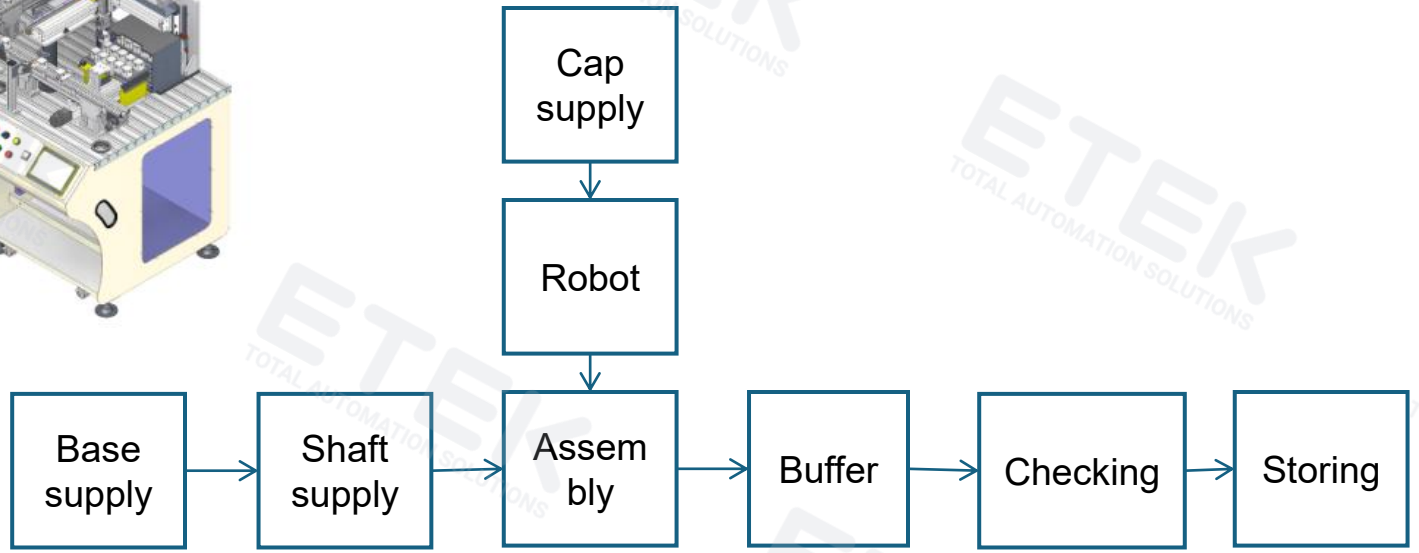
Wireless IO

Smart sensor

2. Digital-twin and Smart Factory practice system

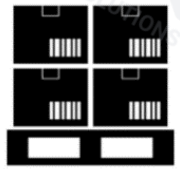






2. Digital-twin and Smart Factory practice system

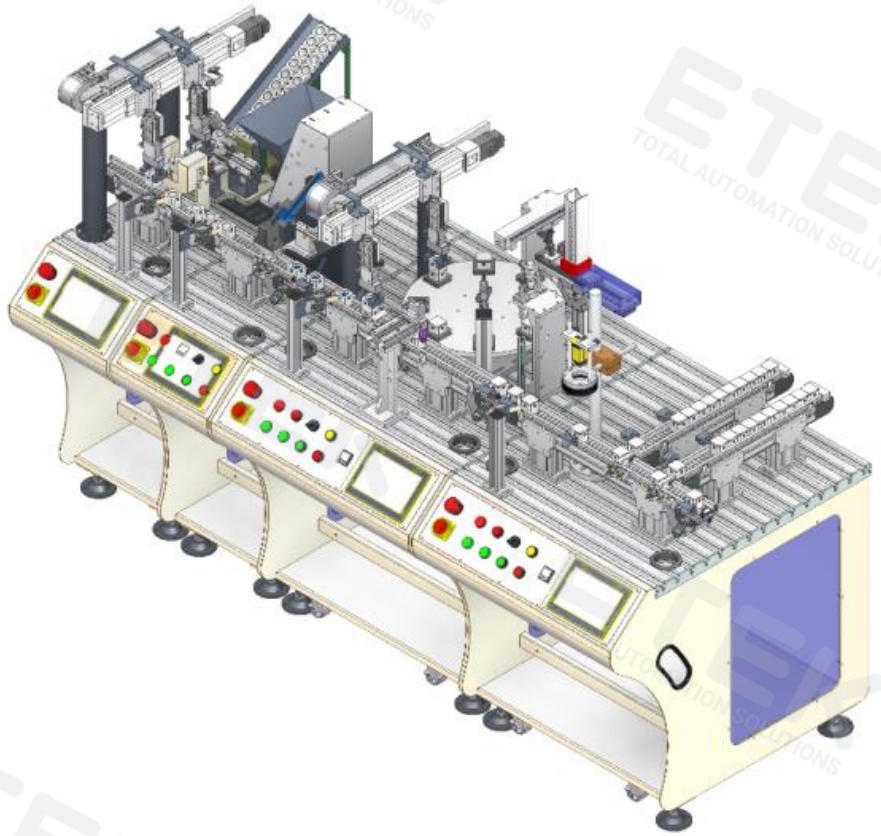
- ☑ ***Assemble over 40 configurations***
- ☑ ***Practice grouping***
- ☑ ***Diverse problems***



8 Packing configuration

11 Checking configuration

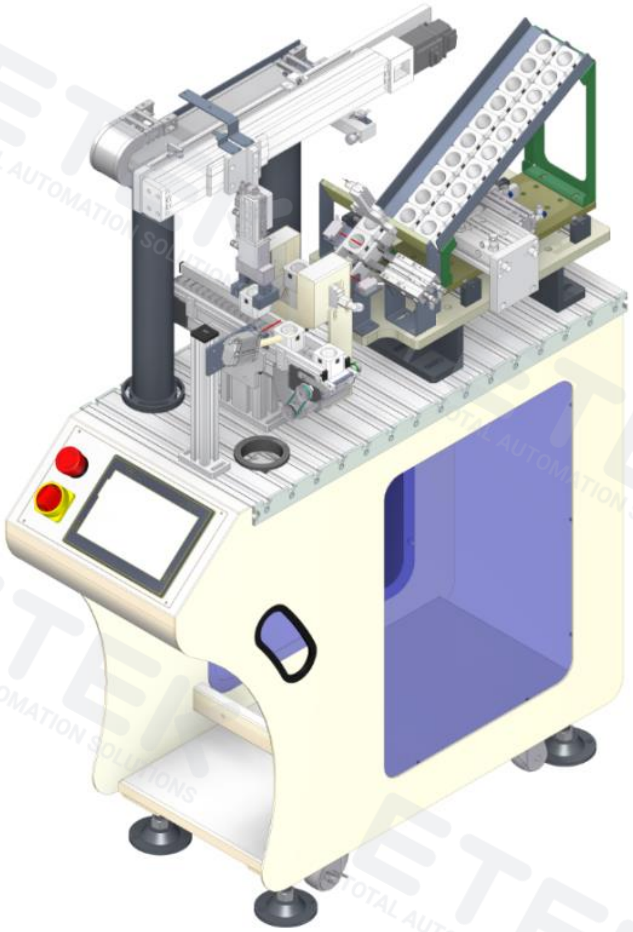
20 Assemble configuration

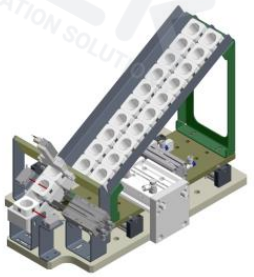


Example: Test assembly configuration, stations 1-2-3-6

2. Digital-twin and Smart Factory practice system

a. Base supply training station

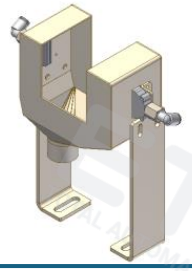




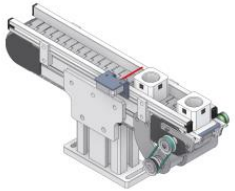
Base supply

1 axis robot

Split cylinder



air cleaning

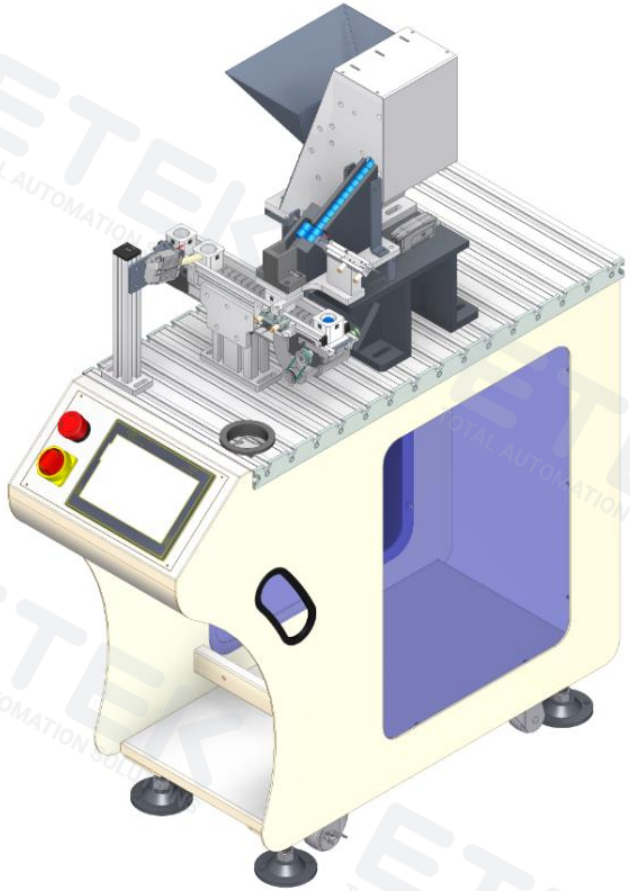


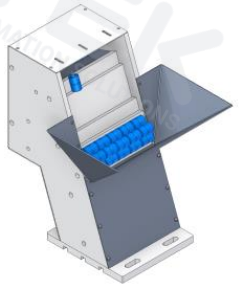
Conveyor

Frame

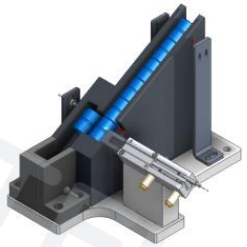
2. Digital-twin and Smart Factory practice system

b. Shaft supply training station



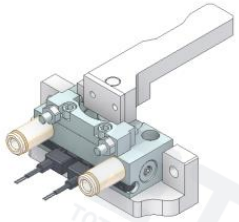


Shaft supply

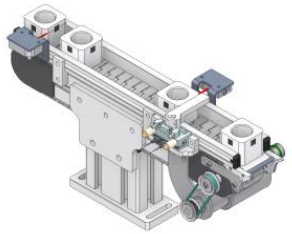


Product guide

Split cylinder



Holding cylinder

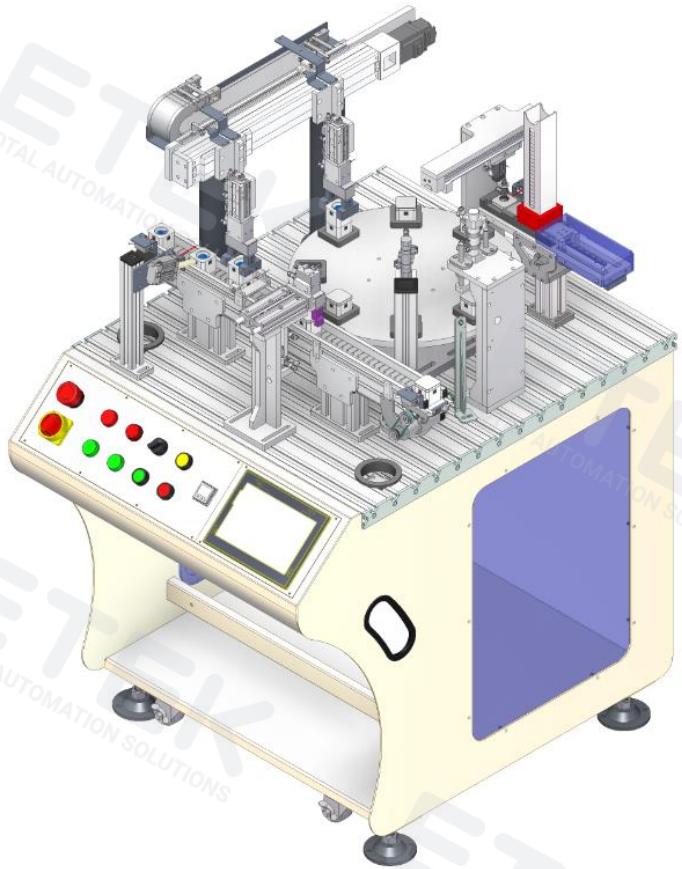


Conveyor

Frame

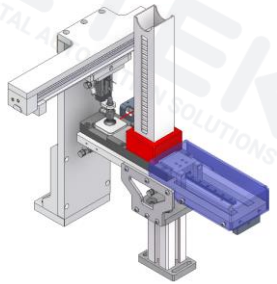
2. Digital-twin and Smart Factory practice system

c. Assembly training station

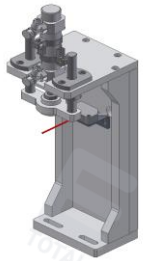


1 axis robot

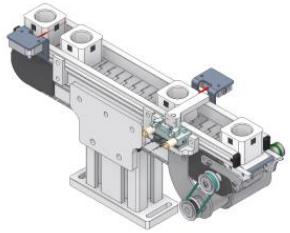
Turntable



Cap supply



Cap pressor

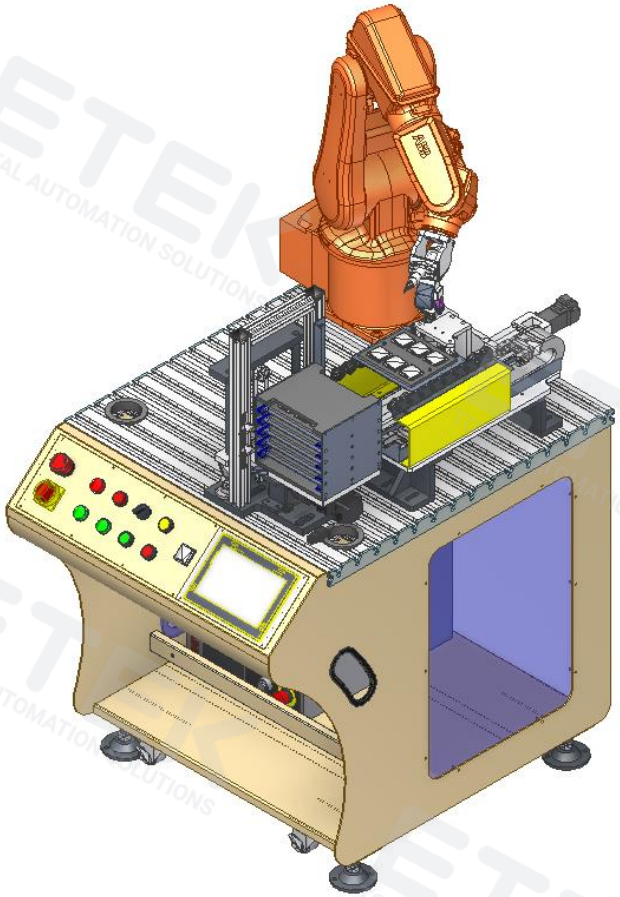


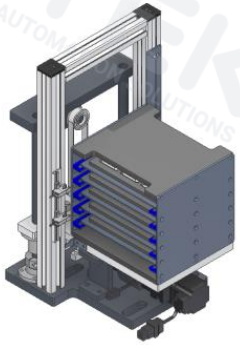
Conveyor

Frame

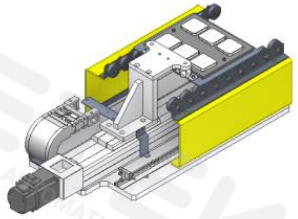
2. Digital-twin and Smart Factory practice system

d. robot station

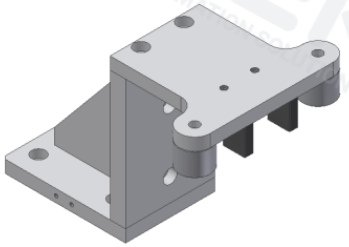




Tray lift

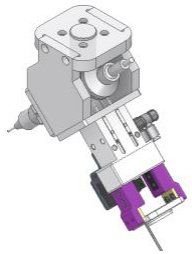


Tray transporter



Tray holder

Robot

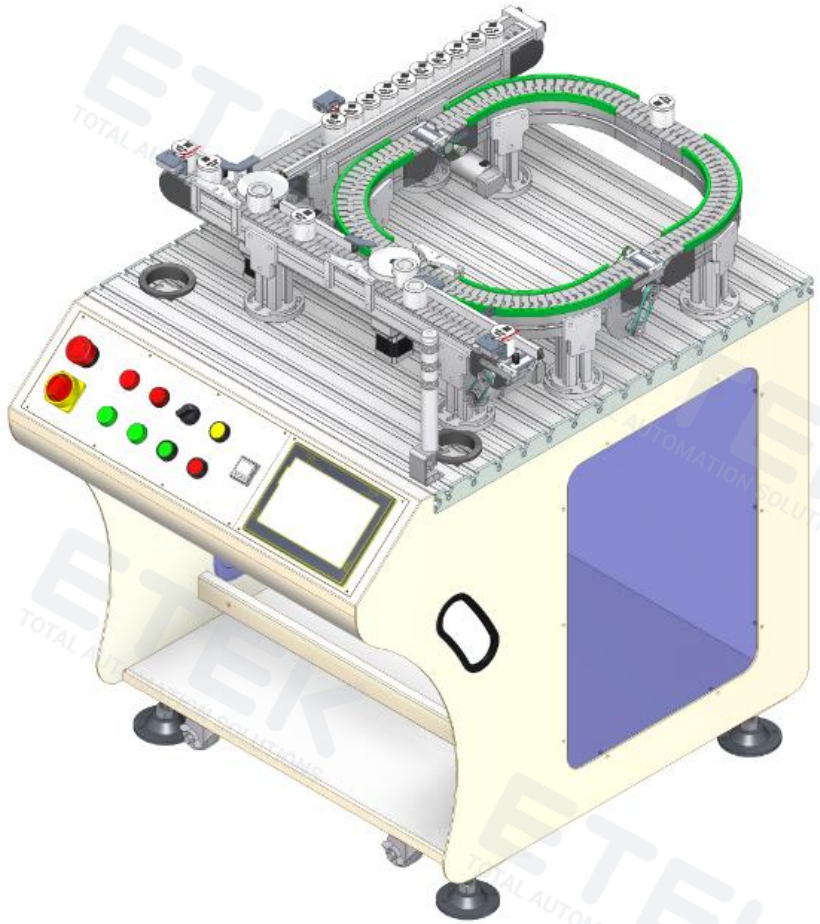


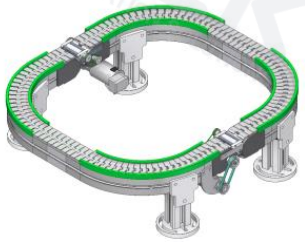
Gripper

Frame

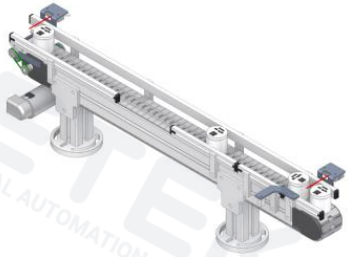
2. Digital-twin and Smart Factory practice system

e. Buffer training station

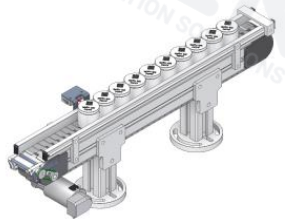




Closed loop conveyor

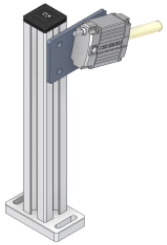


Input conveyor



Error conveyor

Navigation

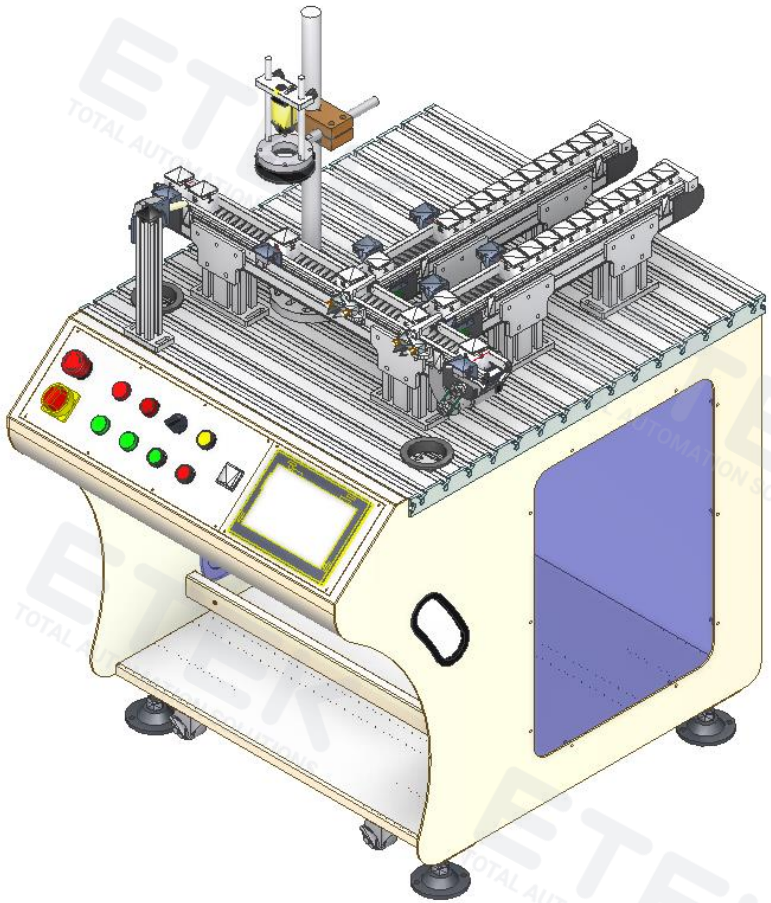


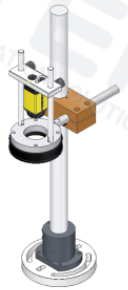
Barcode reader

Frame

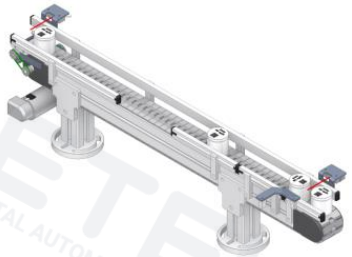
2. Digital-twin and Smart Factory practice system

f. Vision training station

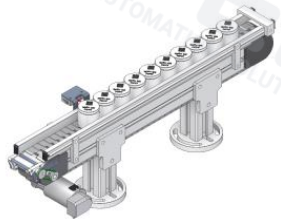




Camera



Input conveyor



Error conveyor

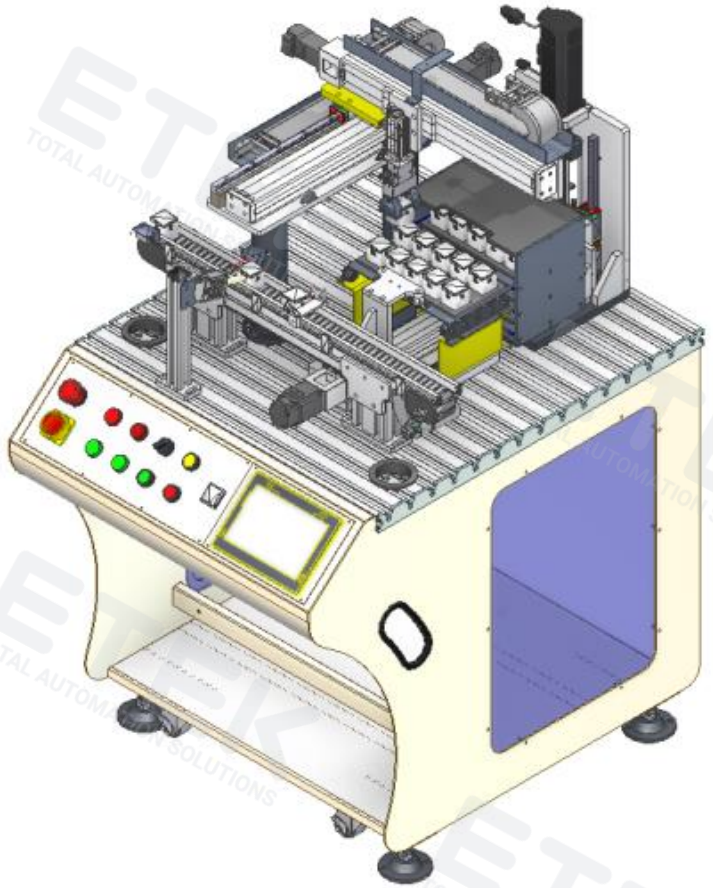
navigation

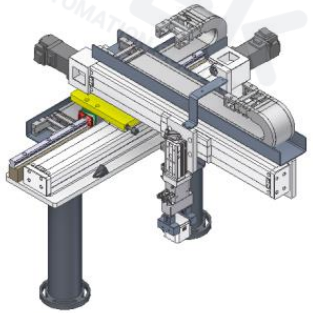
Barcode reader

Frame

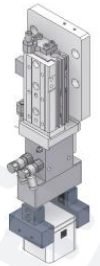
2. Digital-twin and Smart Factory practice system

g. Storage training station

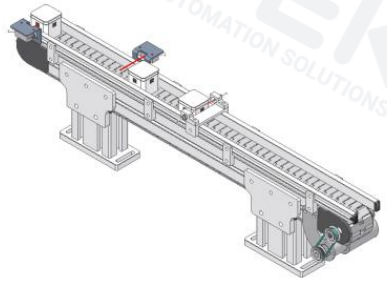




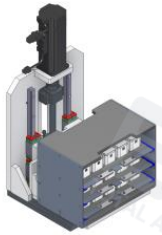
2 axes robot



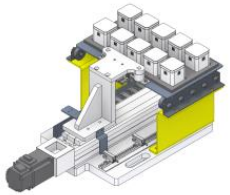
Gripper



Conveyor



Tray lift



Tray transport robot

Frame

2. Digital-twin and Smart Factory practice system

Digital factory simulation software suite

Visual Components simulation software

- Visual Compoments Premium 4.5: Simple Intuitive, Powerful software. Verify automatior solutions accurately
- Design: There are 3D design models available fo use (available libraries) and you can also builc your own 3D models according to CAD (import intc
- Model and program: Visually define operating processes with easy-to-use tools or progran robots with Teaching right in the software
- Simulation: Experience a simulation line and watcl the simulated behavior of components anc processes in action
- Evaluation: Perform simulation modeling studies tc evaluate factors such as collisions, blockages, anc design unknowns
- Optimization: When detecting abnormalities, you can quickly change the simulation design anc repeat testing to optimize the production line.
- Share: Can export simulation activity and share results for multiple users to access
- The software connects to the Siemens S7 PLC to visualize the simulation model

2. Digital-twin and Smart Factory practice system

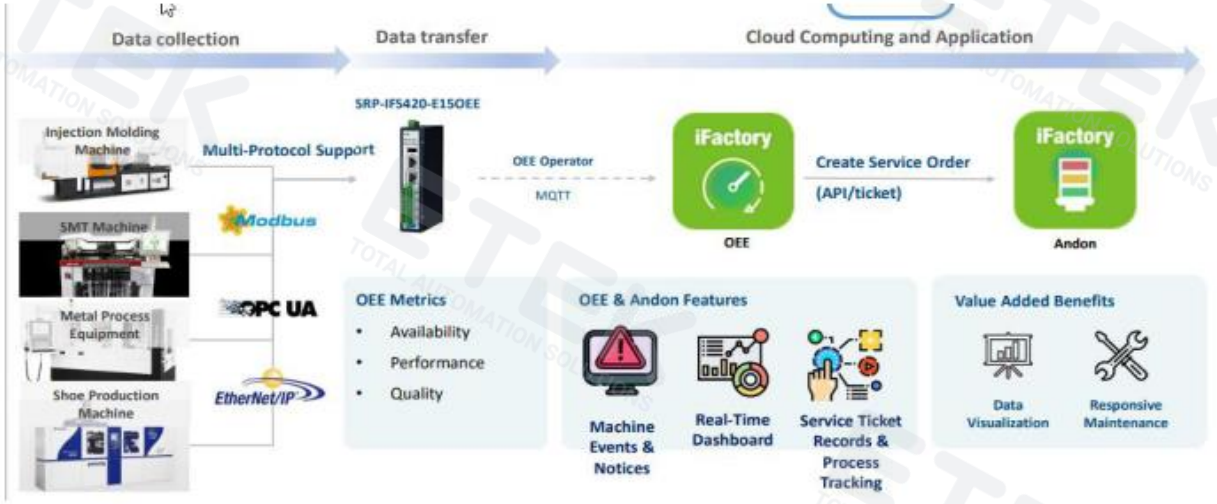
Software toolkit to build smart factory functions

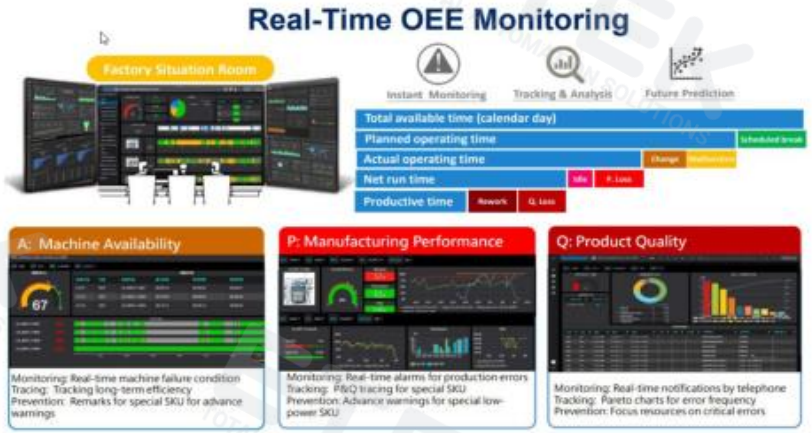
a. Manage and monitor OEE & Andon performance

1. OEE machine performance monitoring software
Calculated on the following indicators:
- Index A: Represents machine availability
- P index: Shows production efficiency
- Q index: Product quality indicator

Based on the indicators, users can evaluate and Flexible system optimization to meet requirements production demand

2. Andon software
- Visually display the error and the machine location where the error occurred
- Statistics on error frequency
- Calculate losses based on time and frequency
- Provide events and notifications about the machine
- Document service requests and monitor the process





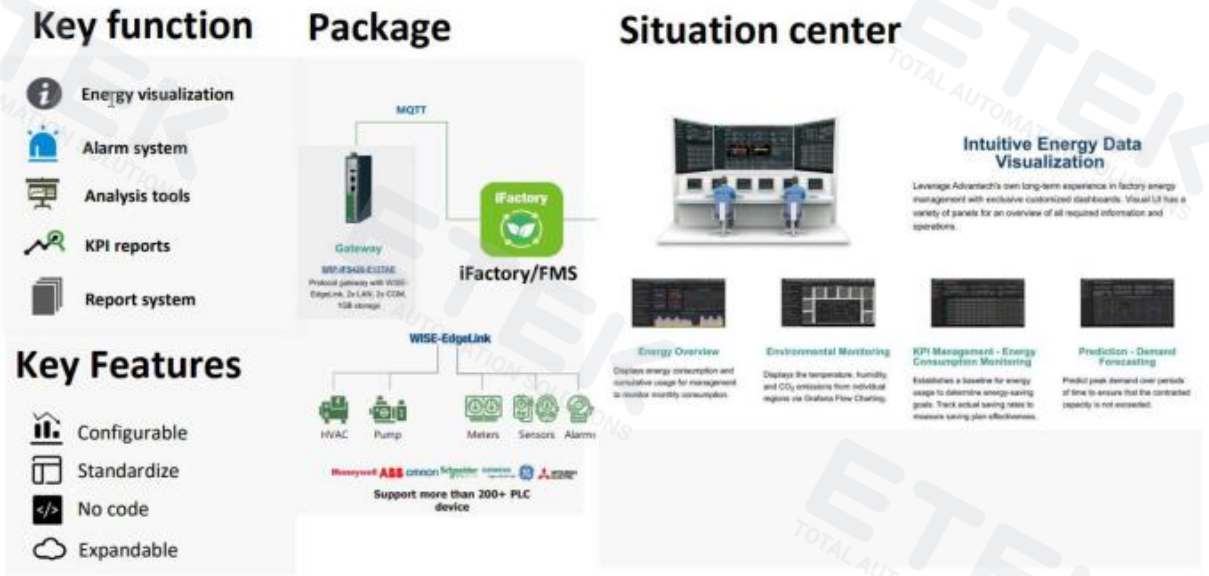
ETEK TOTAL AUTOMATION SOLUTIONS

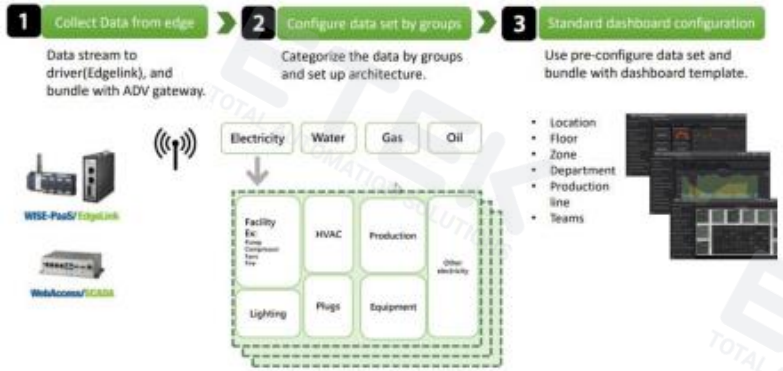
2. Digital-twin and Smart Factory practice system

Software toolkit to build smart factory functions

b. FMS energy monitoring management

- Real-time display of energy used in machines, lines, and areas: Electricity, compressed air
- Energy usage chart during periods of time: Peak, off-peak
- Manage total energy usage
- Energy distribution assessment
- Optimize system costs
- Detect signs of abnormal energy usage, early warnings of possible errors
- Monitor the energy area in the factory





2. Digital-twin and Smart Factory practice system

Software toolkit to build smart factory functions

c. Maintenance and prediction

- Real-time display of machine information: Temperature, vibration, energy consumption
- Visualize abnormal signs and mutation states that can cause errors
- Assess the current health of the machine
- Predict machine condition in the future
- Root cause analysis
- Develop a detailed maintenance plan and schedule system maintenance

ETEK
TOTAL AUTOMATION SOLUTIONS

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