Industrial Automation Training System

Model: ZF-MTS902

General descriptions:

With 6 stations modular production system, mechatronics training includes distributing testing, processing, handling, assembly and storing stations that can be operated separately or integrally.

The modular production systems allow varying simulation of real production processes that exist in industry field.

The system is universal, industry based, modular and flexible for further expansion.

Students can learn the entire process of production such as feeding, processing, etc.

Each stations simplifies the training of operation and can be expanded sequentially step by step through building complete automated procedure.

Learning contents:

- Sensors
- Mechanical automation
- PLC program development
- Sequential control
- Installation diagnostic
- Pneumatic
- Drives
- Electronics
- Industrial safety

A. Distributing Station:

A double-acting air cylinder pushes work pieces out individually. The cylinder is integrated into a work piece feeding module, cylinder and gravity feed magazine included. This feeder can carry up to six cylindrical work pieces. With a through-beam fiber optic sensor, it can monitor whether the work pieces is placed in the proper position. The handling arm module consists a rotary air cylinder and a mechanism. It moves the work pieces to next station. Two proximity switches detect the positions of the rotary cylinder. Various actuators used in this stations are industrial components.

The following modules and components are included.

Work pieces feeding module: cylindrical feeder, infeed cylinder, work piece fixture. Handling arm module; swivel arm, suction cup support, suction cup, rotary cylinder
Pneumatic module: air service unit, valve unit
Controller module: MITSUBISHI PLC main unit, I/O boards, power supply unit, control panel
Workstation module: mounting plate, steel frame
Learning contents:
PLC programming
Pneumatic control circuits
PLC sequential control
Cylinder speed adjustment and positioning
Cylinder rotational angle adjustment
Handling technology
Sensor applications
Feeding mechanism
Industrial standard safety

Main Component:

- Structural composition: basal plate, electric control cabinet, PLC hung box, Operation panel, charging barrel, magnetic valves, vacuum chuck, parallel lines groove. I/O switch over Module, Air controller.
- Double-acting cylinder (flow control valve, magnetic sensors)
- Work piece sensors: fiber optic sensor
- Place sensors: fiber optic sensor
- 5/2 WAY single acting solenoid valve

Technical Parameter

- Work Principle: The storage ware supply work piece to module station in order, it is a whole System. The first station is the most basic module of the whole work process.
- control cabinet main circuit power supply: single phase AC220V ± 10% 50Hz
- control cabinet control loop power supply: DC24V
- Temperature: -10 ℃ ~ 40 ℃; Environmental humidity: ≤ 90% (25 ℃)
- Dimensions : length × width × height = 500mm × 800mm × 1150mm
- air supply pressure: 0.5 ~ 0.6Mpa
- machine capacity: ≤ 1KVA

B. Testing Station:

The testing station detects the materials, color, air tight and height of work pieces. All basics types of industrial sensor like optical, inductive and capacitive sensors are contained in the station. A slide double-acting air cylinder raises the work piece to the pre-set position and then a parallel rod double-acting air cylinder moves the analogue measuring module to measure its height. After being measured, the incurrent work pieces are rejected and sent to the discard chute by a double-acting air cylinder. On the contrary, the correct ones are transferred to the next station by the vacuum suction cup. By this way, users can short work pieces according to different materials. Color, air tight and height.

The following modules and components are included:
Air tight testing module: vacuum generator, air tight testing cup, z-axis cylinder, R-axis cylinder
Materials sorting module: inductive, capacitive and optical sensors.
Lifter module: lift cylinder, L-shaped work piece fixture, push cylinder
Height testing module: linear potentiometer, potentiometer drive cylinder
Pneumatic module: air service unit, valve unite
Controller module: MITSUBISHI PLC main unite, A/D converter unite, 8 inputs expands unit, I/O boards, power supply unite, control panel
Workstation module: Mounting plate, steel frame

Learning contents:

- Materials sorting
- Air testing
- Height testing
- Linear potentiometer property
- A/D converter
- PLC programming

- Cylinder speed adjustment and positioning
- Cylinder rotational angle adjustment
- Sensor applications
- Pneumatic control circuits
- PLC sequential control
- Vacuum technology
- Industrial safety

Main component:

- Structural composition: basal plate, electric control cabinet, PLC hung box, Operation panel, charging barrel, magnetic valves, vacuum chuck, parallel lines groove. I/O switch over Module, Air controller.
- Rod less cylinder
- Work piece height detect module
- Work piece material detect

Technical Parameter

- Work Principle: Inductive sensors detect metal, using the reflection principle Photoelectric sensors test the existence of the work piece Capacitance sensor devices detect the color and material artifacts, Then, photoelectric sensor to judge three kinds of work piece height
- Control cabinet main circuit power supply: single phase AC220V ± 10% 50Hz;
- Control cabinet power supply control loop: DC24V
- Temperature: -10 ℃ ~ 40 ℃;
- Environmental humidity: ≤ 90% (25 ℃);
- Dimensions: length × width × height : =500mm × 800mm × 1320mm
- Air supply pressure: 0.5 ~ 0.6Mpa
- Weight: Approximately 50 Kg
- Machine capacity: ≤ 1KVA

C. **Processing Station:**

A rotary index, driven by an electric gear motor, tests the work pieces and feeds two different processing modules with the work pieces. One of processing module is “Drilling”.

For safety reasons, the drilling process if operated in a simulated way after an inductive proximity switch detect whether the work piece is put correctly on the rotary index table. The other processing is “drill-hole-checking” which adopt a double-acting air cylinder. At this station, according to the pre-se cylinder time, the programming of two processes is executed simultaneously.

The following module and components are included:

Index table module: rotary index table, worm and gear

Drill and clamp module: drill spindle drive motor, drill feed cylinder, chuck, clamp cylinder

Inspection module: drill hole checker, checker drive cylinder

Pneumatic module: air service module, valve unit

Controller module: MITSBISHI PLC main unit, I/O boards, power supply unit, control panel

Workstation module: mounting plate, steel frame

Learning contents:

- Rotary index table positioning
- DC motor driving
- Worm and gear mechanism
- PLC programming
- Drilling and clamping control
- Drill hole checking
- Cylinder speed adjustment and positioning
- Pneumatic control circuits
- PLC sequential control
- Sensor applications
- Industrial safety

Main component:

- Structural composition: basal plate, electric control cabinet, PLC hung box, Operation panel, charging barrel, magnetic valves, vacuum chuck, parallel lines groove. I/O switch over Module, Air controller.
- DC Gear Motor
- Use motor Control Relay
- 90° detection sensor

- Capacitive sensors
- detect the arrived work piece Controlled turntable

Technical Parameter

- Work Principle: Capacitance sensor confirm the work piece reach to turntable, then turntable rotate 90 degrees to the work piece brought to the appropriate processing location.
- control cabinet main circuit power supply:
- single phase AC220V ± 10% 50Hz;
- control cabinet power supply control loop: DC24V
- temperature: -10 ℃ ~ 40 ℃;
- Environmental humidity: ≤ 90% (25 ℃);
- Dimensions: length × width × height : =500mm × 800mm × 1200mm
- Air supply pressure: 0.5 ~ 0.6Mpa
- weight: Approximately 50 Kg
- machine capacity: ≤ 1KVA

D. Handling Station:

The handling station adopts industrial handling module. The work pieces are positioned fest by a 3-axis handling robot. The 3-axis robot consists of one hollow-rod double-acting air cylinder, one parallel-rod double acting air cylinder, one rotary air cylinder and vacuum suction cup. It transfers the work pieces to the next station.

The following modules and components are included:
3-axis robot module: Z-axis cylinder, Y-axis cylinder, R-axis cylinder, vacuum generator, suction cup
Pneumatic module: air service unit, valve unit
Controller module: MITSBISHI PLC main unit, I/O boards, power supply unit, control panel
Workstation module: mounting plate, steel frame

Learning contents:

- PLC programming
- Pneumatic control circuits
- PLC sequential control
- Sensor applications
- Robotic arm speed adjustment and position
- Rotational angle adjustment
- Industrial safety
- Vacuum technology
- Handling technology

Main component:

- Structural composition: basal plate, electric control cabinet, PLC hung box, Operation panel, charging barrel, magnetic valves, vacuum chuck, parallel lines groove. I/O switch over Module, Air controller.
- Lift cylinder
- 2 axis Out cylinder
- Swing cylinder
- Air finger
- Main electrical components: Warning lights, Emergency light, Button signs Φ22, Fiber optic sensor Amplifiers minimum 6 bets. Illuminated push button reset, two position switch knob.

Technical Parameter

- Work Principle: Pneumatic finger suck the work piece from the previous station, then transmitted to the next (assembly station).
- control cabinet main circuit power supply: single phase AC220V ± 10% 50Hz;
- control cabinet power supply control loop: DC24V
- temperature: -10 ℃ ~ 40 ℃;
- Environmental humidity: ≤ 90% (25 ℃);
- Dimensions: length × width × height = 500mm × 800mm × 1140mm
- air supply pressure: 0.5 ~ 0.6Mpa
- weight: Approximately 50 Kg
- machine capacity: ≤ 1KVA

E. Assembly Station:

The assembly station work together with the handling station for the assembly process: the perfect work piece, transferred from handling station, is pushed by the first double-acting air cylinder to the right position. The second double acting air cylinder bring the

matching parts to the correct position for pressing and then the third one presses parts into work pieces. It is an essential and important part of drive and control technology for mechatronics training.

The following modules and components are included:
Transfer module: transfer slide track push cylinder
Matching part feeding module: matching parts feeder, feed cylinder
Press module: press bed, press drive cylinder
Pneumatic module: air service unite, valve unit
Controller module: MITSBISHI PLC main unit, I/O boards, power supply unit, control panel
Workstation module: mounting plate, steel frame

Learning contents:

- PLC programming
- Pneumatic control circuits
- PLC sequential control
- Sensor applications
- Cylinder speed adjustment and positioning
- Press machine operation
- Feeding control
- Transfer control
- Industrial safety

Main component:

- Structural composition: basal plate, electric control cabinet, PLC hung box, Operation panel, charging barrel, magnetic valves, vacuum chuck, parallel lines groove. I/O switch over Module, Air controller.
- Double-acting cylinder (magnetic switch device with location)
- 5/2 way single acting solenoid valve
- Capacitive sensor
- Main electrical components: Warning lights, Emergency light, Button signs Φ22, Fiber optic sensor Amplifiers minimum 6 bets. Illuminated push button reset, two position switch knob.

Technical Parameter

- Work Principle: Assembly and extrusion work piece transferred from the previous station, next station take the work piece.
- control cabinet main circuit power supply: single phase AC220V ± 10% 50Hz;
- control cabinet power supply control loop: DC24V
- temperature: -10 ℃ ~ 40 ℃;
- Environmental humidity: ≤ 90% (25 ℃);
- Dimensions: length × width × height = 500mm × 800mm × 1170mm
- air supply pressure: 0.5 ~ 0.6Mpa
- weight: Approximately 50 Kg
- machine capacity: ≤ 1KVA

F. Storing Station:

This station controls the storage of the finished products at the assembly station by 4-axis robot with parallel gripper. The 4-axis robot controls the movement of the positions of axis according to the different output. And then the robot stores the finished products based on users setting for the warehouse.

The following modules and components are included:
4-axis robot module: X-axis drive motor, Y-axis cylinder, Z-axis cylinder, R-axis cylinder, motor-driven slide base and lead – screw, parallel gripper
Storage module: 6 storage locations
Pneumatic module: air service unite, valve unit
Controller module: MITSBISHI PLC main unit, I/O boards, power supply unit, control panel
Workstation module: mounting plate, steel frame

Learning contents:

- Electric drive
- PLC programming
- Lead screw driving
- Automatic storage operation
- Pneumatic control circuits
- PLC sequential control

- Sensor applications
- Robot arm speed adjustment and positioning
- Rotational angle adjustment
- Industrial safety

Main component:

- Structural composition: basal plate, electric control cabinet, PLC hung box, Operation panel, charging barrel, magnetic valves, vacuum chuck, parallel lines groove. I/O switch over Module, Air controller.
- DC gear motor, relay control, position proximity sensor
- DC motor device (ball screw). Vertical movement cylinder, dual-axis flexible-cylinder, rotary Cylinder, pneumatic fingers, transmission pole control by a DC motor, this control using the relay.
- Main electrical components: Warning lights, Emergency light, Button signs Φ22, Fiber optic sensor Amplifiers minimum 6 bets. Illuminated push button reset, two position switch knob.

Technical Parameter

- **Work Principle:** Put work piece stored in the corresponding positions on the storage.
- control cabinet main circuit power supply : single phase AC220V ± 10% 50Hz;
- control cabinet power supply control loop: DC24V
- temperature: -10 ℃ ~ 40 ℃;
- Environmental humidity: ≤ 90% (25 ℃);
- Dimensions: length × width × height = 500mm × 800mm × 1200mm
- air supply pressure: 0.5 ~ 0.6Mpa
- weight: Approximately 50 Kg
- machine capacity: ≤ 1KVA

Accessories:

- 1 set of courseware
- 1 set of work piece
- (Four kind of different work pieces)
- 1 set of matching part
- 12 pieces of 25-pin data cable
- 1 set of PLC software CD (necessary but optional)
- 1 piece of USB to RS422 cable (necessary but optional)