TRAINING PROGRAM SYLLABUS

Applied Electro-Pneumatics for Industry

(Elektropneumatik Terapan untuk Industri)

---

1. General Information

Training Program Name : Applied Electro-Pneumatics for Industry

Program Code : PM031.01

Training Category : Automation & Control

Program Graduate Profile :

1. Industrial automation practitioners capable of operating pneumatic and electro-pneumatic systems safely and in accordance with established procedures.
2. Technicians capable of assembling, operating, and performing basic maintenance on pneumatic and electro-pneumatic circuits for industrial applications.
3. Automation personnel capable of applying sensors, electrical control components, sequential control, and basic logic in electro-pneumatic systems.
4. Practitioners capable of integrating electro-pneumatic systems with industrial control processes and supporting reliable, efficient system operation.

Short Description : A practical training program designed to develop participants' knowledge and skills in pneumatic and electro-pneumatic systems, sequential control, industrial operation, maintenance, and application.

---

2. Detailed Description

Duration : 32 JP

Full Description : Applied Electro-Pneumatics for Industry is a practical training program that develops participants' understanding and applied skills in pneumatic and electro-pneumatic systems for industrial automation. The program covers pneumatic principles and components, basic and advanced pneumatic circuits, sequential control and signal conflict, electro-pneumatic components and control, sensors and logic, system operation and maintenance, and industry-oriented electro-pneumatic projects. Learning emphasizes safe operation, correct circuit assembly, systematic troubleshooting, and integration with industrial control systems to support process efficiency, productivity, and operational reliability.

Participant Requirements : Participants should have basic knowledge of electrical systems or pneumatics and an interest in industrial automation.

Certification : Training Completion Certificate.

Trainer Qualifications : The trainer is a practitioner and/or subject-matter expert with experience in industrial automation, mechatronics, pneumatic and electro-pneumatic systems, and control systems.

Learning Outcomes :

1. Explain the fundamental principles, components, and functions of pneumatic and electro-pneumatic systems and operate them safely in accordance with industrial procedures.
2. Assemble and operate basic and sequential pneumatic and electro-pneumatic control circuits using appropriate components, sensors, and control logic.
3. Perform systematic inspection, basic maintenance, and troubleshooting to support reliable electro-pneumatic system operation.
4. Integrate electro-pneumatic systems with industrial control processes and apply them in industry-oriented automation projects.

---

3. Training Materials

Module 1 : Pneumatic Fundamentals

Topic 1.1 : Basic Pneumatic Principles and Components

Summary : This topic introduces the fundamental principles of pneumatics as an automation technology that uses compressed air, including pressure and force characteristics as well as the advantages and limitations of pneumatic systems. Participants also study the basic structure of pneumatic systems and the functions of key components such as compressors, reservoirs, air dryers, air service units, directional control valves, and actuators as a foundation for understanding industrial pneumatic systems.

Topic Learning Outcomes : 1. Explain the fundamental principles, components, and functions of pneumatic and electro-pneumatic systems and operate them safely in accordance with industrial procedures.

1.1. Explain basic pneumatic principles and identify the functions and characteristics of major pneumatic components used in industrial systems.

Topic Duration : 4 JP

Learning Method : Theory, Discussion, Demonstration & Hands-on Practice

Assessment Method : Concept test and pneumatic-component identification/ selection exercise.

Assessment Indicators : Participants are able to explain fundamental pneumatic principles, identify key pneumatic components, and select components according to basic system requirements.

Assessment Weight : 12%

Topic 1.2 : Basic Pneumatic Circuits

Summary : This topic covers the construction and interpretation of basic pneumatic circuits, including direct and indirect actuation of single-acting and double-acting cylinders. Participants study signal flow, power circuits, component identification and numbering, sequential diagrams, and the relationship between valves, actuators, pressure, and airflow in determining system performance.

Topic Learning Outcomes : 2. Assemble and operate basic and sequential pneumatic and electro-pneumatic control circuits using appropriate components, sensors, and control logic.

1.2. Interpret, assemble, and operate basic pneumatic circuits using correct component arrangement and signal flow.

Topic Duration : 4 JP

Learning Method : Theory, Discussion, Demonstration & Hands-on Practice

Assessment Method : Circuit-reading, assembly, and operation practice.

Assessment Indicators : Participants are able to interpret pneumatic diagrams, assemble basic circuits correctly, and operate single-acting and double-acting cylinder circuits safely.

Assessment Weight : 13%

Module 2 : Advanced Pneumatic Control

Topic 2.1 : Sequential Control and Signal Conflict

Summary : This topic covers sequential pneumatic control and signal-conflict problems in circuits involving two or more actuators. Participants study cutting-off signals, signal switching, overlapping signals, and the use of components such as roller valves, pressure sequence valves, timers, and memory valves to analyze and resolve signal conflicts in automated processes.

Topic Learning Outcomes : 2. Assemble and operate basic and sequential pneumatic and electro-pneumatic control circuits using appropriate components, sensors, and control logic.

2.1. Analyze sequential pneumatic circuits and apply appropriate methods to identify and resolve signal-conflict conditions.

Topic Duration : 4 JP

Learning Method : Theory, Demonstration & Hands-on Practice

Assessment Method : Sequential-control case study and practical signal-conflict troubleshooting.

Assessment Indicators : Participants are able to identify sources of signal conflict, explain their effects, and apply appropriate pneumatic control strategies to restore the intended sequence.

Assessment Weight : 12%

Topic 2.2 : Cascade and Stepper Sequence

Summary : This topic covers the Cascade and Stepper Sequence methods for developing sequential pneumatic control systems. Participants learn to define motion sequences, divide circuits into groups, prepare motion diagrams and signal-flow diagrams, and construct control circuits in which only one control line is active at each stage of the process.

Topic Learning Outcomes : 2. Assemble and operate basic and sequential pneumatic and electro-pneumatic control circuits using appropriate components, sensors, and control logic.

2.2. Develop and implement sequential pneumatic control using Cascade and Stepper Sequence methods based on defined motion sequences.

Topic Duration : 4 JP

Learning Method : Theory, Demonstration & Hands-on Practice

Assessment Method : Sequential-circuit design and practical implementation using Cascade and Stepper Sequence methods.

Assessment Indicators : Participants are able to define actuator sequences, group the sequence correctly, prepare control diagrams, and implement a functional sequential pneumatic circuit.

Assessment Weight : 13%

Module 3 : Electro-Pneumatic Control Systems

Topic 3.1 : Electro-Pneumatic Components and Control

Summary : This topic introduces electro-pneumatics as a system in which pneumatic energy provides the driving force while electrical or electronic signals provide the control. Participants study key system elements such as power supplies, push buttons, switches, limit switches, relays, contactors, solenoid valves, sensors, and actuators, as well as the relationship between input, processing, control, and output elements in an electro-pneumatic system.

Topic Learning Outcomes : 2. Assemble and operate basic and sequential pneumatic and electro-pneumatic control circuits using appropriate components, sensors, and control logic.

3.1. Explain the structure and function of electro-pneumatic control elements and assemble basic electrical-pneumatic control circuits safely.

Topic Duration : 4 JP

Learning Method : Discussion, Case Studies & Hands-on Practice

Assessment Method : Component-identification, wiring, and electro-pneumatic circuit assembly practice.

Assessment Indicators : Participants are able to identify control elements, explain input-processing-output relationships, and assemble a basic electro-pneumatic control circuit correctly.

Assessment Weight : 12%

Topic 3.2 : Sensors, Logic, and Sequential Control

Summary : This topic covers the use of sensors and control logic in electro-pneumatic systems. Participants study proximity sensors, relays, solenoids, series and parallel circuits, holding/latching circuits, AND/OR logic functions, and sequential control circuits to produce automatic responses based on input conditions and process sequences.

Topic Learning Outcomes : 2. Assemble and operate basic and sequential pneumatic and electro-pneumatic control circuits using appropriate components, sensors, and control logic.

3.2. Apply sensors, relay logic, and sequential control principles to develop automatic electro-pneumatic responses based on process conditions.

Topic Duration : 4 JP

Learning Method : Discussion, Case Studies & Hands-on Practice

Assessment Method : Sensor and control-logic practical exercise with sequential electro-pneumatic circuits.

Assessment Indicators : Participants are able to select and apply sensors, construct basic logic and holding circuits, and operate a sequential electro-pneumatic control system according to defined conditions.

Assessment Weight : 13%

Module 4 : Industrial Electro-Pneumatic Applications

Topic 4.1 : System Operation and Maintenance

Summary : This topic covers the operation and basic maintenance of electro-pneumatic systems, with attention to component condition, air quality, operating pressure, leakage, connections, and system response. Participants learn systematic component inspection, circuit documentation, fault identification, preventive actions, and routine maintenance practices to support reliable system operation.

Topic Learning Outcomes : 3. Perform systematic inspection, basic maintenance, and troubleshooting to support reliable electro-pneumatic system operation.

4.1. Operate, inspect, and perform basic maintenance and troubleshooting on electro-pneumatic systems using systematic procedures.

Topic Duration : 4 JP

Learning Method : Theory & Hands-on Practice

Assessment Method : System-operation, inspection, and basic troubleshooting practice.

Assessment Indicators : Participants are able to operate the system according to procedure, identify basic faults or abnormal conditions, and perform appropriate inspection and routine maintenance actions.

Assessment Weight : 12%

Topic 4.2 : Industrial Electro-Pneumatic Project

Summary : This topic integrates participants' ability to interpret diagrams, develop control circuits, select components, perform wiring, operate, and evaluate electro-pneumatic systems through industry-oriented application cases. Practical references include stamping devices, conveyor transfer systems, assembling devices, quenching machines, clamping units, press systems, and workpiece transfer systems.

Topic Learning Outcomes : 4. Integrate electro-pneumatic systems with industrial control processes and apply them in industry-oriented automation projects.

4.2. Design, assemble, operate, and evaluate an industry-oriented electro-pneumatic application based on defined process requirements.

Topic Duration : 4 JP

Learning Method : Theory, Hands-on Practice & Project-Based Learning

Assessment Method : Integrated electro-pneumatic project, system demonstration, and performance review.

Assessment Indicators : Participants are able to develop and assemble a functional electro-pneumatic application, demonstrate correct operation, and explain the relationship between the circuit design and the intended industrial process.

Assessment Weight : 13%

Target Participants : Industrial automation technicians; operators of pneumatic-based machinery; vocational instructors in mechatronics; and personnel involved in industrial automation and maintenance.

Learning Media & Facilities : Pneumatic components (cylinders, valves, etc.); electrical and electronic components; training modules; control panels / trainer kits; installation and testing tools; and industrial automation practice equipment.

Program Advantages : Industry-oriented content; progressive learning from pneumatic fundamentals to electro-pneumatic applications; a balanced combination of theory and hands-on practice; practical troubleshooting and maintenance; project-based learning; and learning outcomes focused on applied automation competencies and work readiness.

TRAINING PROGRAM SYLLABUS APPROVAL PAGE

Applied Electro-Pneumatics for Industry

Prepared by,
Noppy Ardita Putri
Research and Development
Date : 05/10/2026

Reviewed by,
YM. Astomo Dwi Setyawan, S.T., M.T.
Trainer / Expert
Date : 05/10/2026

Approved by,
Margareta Ratnawati, S.T., M.M.
Operational Manager
Date : 05/10/2026