

# PNEUMATIC/ELECTRO-PNEUMATIC SYSTEMS AND PRINCIPLES

*Learn about the real world of the hybrid technology of electro-pneumatics. Gain the knowledge to successfully install, maintain and troubleshoot electro-pneumatic systems and components. In many instances this knowledge can create cost savings.*

After a brief introduction to compressed air technology, dive right into the electrical ladder diagram, components and symbols.

Through hands-on exercises, learn about the control of pneumatic actuators, latching of electrical signals, logic controls, timers, and counters. All the hands-on exercises are real world applications and can be used on most of the industry's automated equipment.

Designed for engineering, maintenance, operations and management personnel who directly or indirectly encounter pneumatic power control and systems during the course of their daily functions, such as, installing, maintaining, troubleshooting, buying, or specifying pneumatic power equipment.

## COURSE OUTCOMES

- Hybrid technology of electro-pneumatics.
- Install, maintain and troubleshoot electro-pneumatic systems and components.
- Learn about the control of pneumatic actuators, latching of electrical signals, logic controls, timers, and counters.

## CLASS FORMAT:

Lab + classroom

The participant is able to “learn-by-doing” in the course; this knowledge can be transferred to the workplace.

## STANDARD CLASS SIZE:

NTT recommends a class of no more than 12 participants for the best results

## NTT PROVIDES:

- 3-days (24 contact hours) of on-site instruction
- Textbooks and lab manuals
- Classroom consumables
- Completion certificates
- Shipping and instructor travel logistics

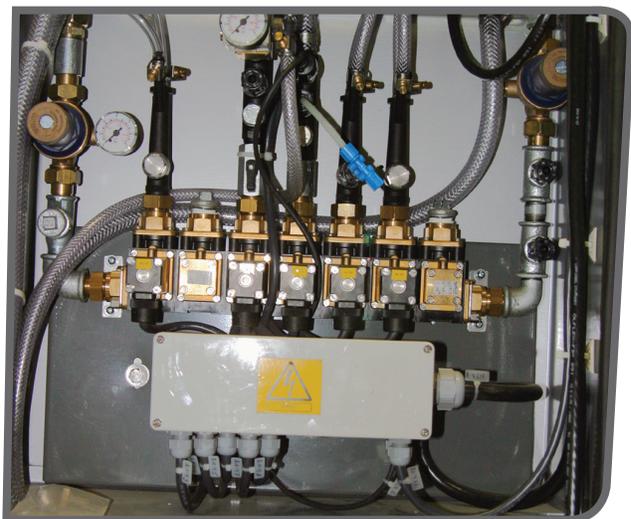
## CLIENT PROVIDES:

- Classroom, with easy access, of 750 square feet or greater
- Projection screen, white board and/or flip charts
- A dock facility or a forklift to unload the training equipment
- A pallet jack to move the crates around after they have been unloaded may also be needed
- Please place this equipment in the training room for the NTT instructor to test and setup prior to the start of class

## SHIPPING

2 crates at 2,000 pounds

- 2 crates at 49" x 35" x 76"



# PNEUMATIC/ELECTRO-PNEUMATIC SYSTEMS AND PRINCIPLES

## COURSE AGENDA

### INTRODUCTION TO PNEUMATICS

- Principles
- Control of pressure and flow
- Compressed air production
- Compressed air preparation
- Compressed air distribution

### INTRODUCTION TO THE ELECTRIC

#### LADDER DIAGRAM

- History
- Understanding

#### LADDER DIAGRAMS

- The power source
- The rails
- The rungs and lines
- Arrangement of control elements
- Load arrangements
- Short-circuit protection
- Tracing signals through rungs
- Terminal strips and wire numbers

### COMPONENTS

- Control transformer
- Control elements and switches
- Industrial electrical systems
- Normally open vs. normally closed

### SOLENOID VALVES

- Direct actuated
- Pilot actuated
- Electrical ratings
- Surge suppression
- Troubleshooting solenoid valves

### CONTROL OF ACTUATORS

- Pilot control of actuator
- Directional control valves
- Ladder diagrams using relays
- Memory control of an actuator
- Single solenoid valves
- Double solenoid valves
- Automatic return
- Actuator position sensors
- Reed switch, magnetic field sensors, inductive sensors, capacitive sensors, optical sensors, ultrasonic sensors

### LATCHING ELECTRICAL SIGNALS

- “Dominant on” and “Dominant off”

### LOGIC CONTROLS

- Logic “AND” function
- Logic “OR” function
- Logic “NOT” function
- Logic combination
- Sequence control
- Shift register control

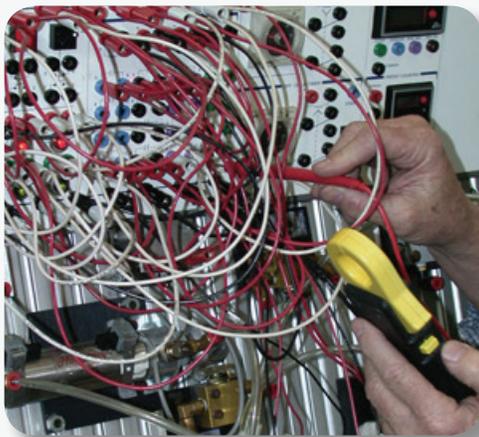
### TIMERS

- On-delay
- Off-delay
- Types of time-delay relays

### COUNTERS

- Modes of operation
- Programmable counters

### EMERGENCY STOPS



Students will build pneumatic circuits from fluid power circuit diagrams incorporating regulators, various directional valves, pressure and vacuum gauges, actuators, vacuum generators, limit switches and quick exhausts.



Students will learn to read electrical ladder diagrams, and then create electrical control circuits for the pneumatic systems using solenoid valves as well as switches, relays, timers, counters, LED's and sensors.