Modern Industrial Pneumatics

PN111

Contents
This 4-days course covers the following topics:
• Drives: Cylinders for different drive purposes
• Valves: Various valve types
  (pneumatically/electrically controlled, designs, different mid positions, etc)
• Controls: Pneumatic and electrical control of valves
  - Position control: Limit switches and sensors
  - Speed control: Uses of throttle valves
  - Logic control: AND/OR valves
  - Pressure control: Uses of adjustable pressure sensors
  - Time-dependent control
• Fundamentals of industrial electric controls: Buttons, contacts, relay
• Fundamentals of compressed air supply: Production, preparation, distribution
• Symbolic representation of devices and standards
• Identifying and eliminating faults, including safety aspect
• Cutting installation costs – from single valve to valve terminal

Outcomes
The participant:
• can design, assemble and test basic pneumatic circuits
• can maintain and troubleshoot pneumatic components and basic control systems
• can identify and describe the design, features and operation of pneumatic components
• can identify and explain symbols for pneumatic components
• can interpret technical specifications and data relating to pneumatic components
• understands the fundamentals of compressed air generation

Design and Troubleshooting Industrial Pneumatics

PN121

Contents
This 4 days course covers the following topics:
• Setting up and commissioning pneumatic and electropneumatic systems
• Design and function of pneumatic and electropneumatic circuits
• Understand and set up memory circuits
• Develop basic sequence control system
• Operating modes (AUT/MAN/EMERGENCY STOP)
• Set and coordinate delays
• Describe and set up variable step repetition within a motion sequence using a preset counter
• Select solenoid valves based on the specified requirements
• Familiar with latching circuits with varying performance features
• Detect and eliminate errors in simple electropneumatic controllers

Outcomes
The participant:
• can design, assemble and test advanced pneumatic and electropneumatic circuits
• can identify various types of end-position sensing
• can set up and function of a stepper module
• can set up indirect actuation of cylinders
• can operation valve terminals
• can resolve overlapping signals in sequence controls using the group method
Systematic Safety Improvement in Pneumatic Systems

PN351

Contents
This 2-days course covers the following topics:
• Correct dimensioning
• Operation modes
• Safe designing example
  - Hazardous areas
  - Risk analyses
  - Safety measures
• 10 technical safety functions
• Emergency stop
• Pneumatic safety tips

Outcomes
The participant:
• can recognise the hazards in pneumatic processes
• is able to analyse the risk factors of simple pneumatic designs
• can apply safety measures and safety circuits
• understands the principles of emergency and safety solutions
• can raise the safety of simple pneumatic designs

Modern Industrial Hydraulics

HY511

Contents
This 4-days course covers the following topics:
• Equipment and circuit diagram symbols, reading, and interpreting basic hydraulic circuit diagrams
• Physical principles
• Structure and mode of operation of basic components
• Measuring volumetric flow and pressure
• Technology and characteristic data of valves and drive elements
• Intensive training for industrial practice: setting up systems in accordance with circuit diagrams, commissioning

Outcomes
The participants:
• can design, assemble, and test basic hydraulic circuits
• is able to maintain and troubleshoot basic hydraulic control systems
• can identify and describe the construction, design features, and operation of hydraulic components
• can interpret technical specifications and data relating to hydraulic components and systems
• can interpret safety measures
• is familiar with graphical symbols for hydraulic components
• can perform simple calculations of pressure, flow, and force
### Design and Troubleshooting Industrial Hydraulics

**HY 521**

#### Contents
This 3-day course covers the following topics:
- Important hydraulic components
- Circuit design and reading circuit diagrams
- Hydraulic troubleshooting techniques
- Analysing circuits for troubleshooting
- Hydraulic maintenance approach
- Troubleshooting guides

#### Outcomes
The participant:
- knows the features of important hydraulic components
- can interpret the technical data of the component
- understands how availability of production equipment can be improved
- knows the efficient maintenance methods
- can read and analyse hydraulic circuit diagrams
- can effectively troubleshoot hydraulic circuits
- can safely commission the system

### Proportional Hydraulics

**HY 132**

#### Contents
This 3-day course covers the following topics:
- Structure, function, and characteristic data of proportional way, pressure, and flow control valves
- Generation of set points
- Adapting amplifier electronics to required conditions
- Development and interpretation of proportional hydraulics circuit diagrams
- Intensive practical training through setup of circuits according to circuit diagrams and setting parameters for optimal commissioning
- Procedures for maintenance, troubleshooting and commissioning
- Open- and closed-loop control
- Servo valve technology and control

#### Outcomes
The participant:
- can explain the structure and mode of operation of proportional way, pressure and flow control valves
- is able to interpret the characteristic data of proportional valves
- can choose the right proportional or servo solution for the application
- is able to develop, read and interpret proportional hydraulics circuit diagrams
- can explain the principles of servo valve technology and control
- can explain the difference between open- and closed-loop controls
- is able to identify and solve the most common faults in proportional and servo hydraulics systems
Simatic S7 – Fundamentals

Contents
This 3-days course covers the following topics:
• Basic structure of the Simatic S7 controller
• Roles of the input and output modules
• The 3 programming languages: FUC, LD and IL
• The basic instruction set of Simatic S7
• GRAFCET – Designing an application
• Introduction to networking
• Archiving and restoring PLC programs

Outcomes
The participant:
• can configure and commission a Simatic S7 controller
• can create, read out and change hardware configurations
• can create and commission PLC programs with logic operations and sequences
• can combine various program modules into structured programs
• can isolate and eliminate faults and errors using the diagnostic buffer and status display
• can design, program and implement basic automation tasks

CoDeSys

Contents
This 3-days course covers the following topics:
• Overview of the IEC 61131-3 standard
• Introduction to the Codesys programming environment
• Use of the 2 programming languages LD, SFC
• Use of visualisation
• Working with simulation
• Functions, function blocks and libraries
• Conversion of PLC programs
• Download to PLC
• Use of variable and symbolic operands
• Using the help function
• Aids for troubleshooting

Outcomes
The participant:
• can explain the scope and potential of Codesys
• can explain the positioning of Codesys to other programming environments
• can select the best programming language for a given task
• can identify which products can be programmed with Codesys
• can select appropriate languages for specific tasks and combines them to a complete project
• can create a basic simulation based on the internal SoftPLC from Codesys and test programs
• can create a basic visualisation (for example, of a belt or distribution station)
**Introduction to Mechatronics**

**AUT 211**

**Content**

This 4-days course covers the following topics:
- Basic physical principles
- Fundamentals of mechanics, pneumatics, or hydraulics
- Motion control by electrical engineering
- Motion control by PLC
- Various sensor types and limit switches
- Factory automation simulation using MPS station
- Practical exercises and troubleshooting

**Outcomes**

The participant:
- can troubleshoot basic mechatronic control systems
- can assemble and test basic mechatronic circuits (pneumatic, electrical, and software)
- can install, replace, and commission pneumatic, electropneumatic, electrical, and PLC hardware components
- can use diagnostic software to assist troubleshooting
- can recognise between the different types of programming used in industry
- can download a program and commission a simple PLC control systems
- can identify and describe the operation of pneumatic, electropneumatic, electrical, and PLC components and sensors

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**Mechatronics Advanced**

**AUT 222**

**Content**

This 3-days course covers the following topics:
- Dismantling
- Installation and commissioning
- Programming and commissioning
- Communication between station
- Troubleshooting and maintenance

**Outcomes**

The participant:
- can troubleshoot advanced mechatronic control system
- can assemble and test advanced mechatronic circuits
- can install, replace, and commission pneumatic, electropneumatic, electrical, and PLC hardware components
- can use diagnostic software to assist troubleshooting
- can communicate between PLC using fieldbus
Environment Discovery System (EDS)

Contents
This 2-days course covers the following topics:
• Adjustment of electronic amplifiers
• Data collection
  The following parameters are collected:
  - Filling levels
  - Volume rates
  - Line pressures
  - Electric current/voltage, power
  - Oxygen (O2)
  - Chlorine (Cl2)
• Interpretation of characteristic data parameters
• Automated closed-loop control of pumps
• Automated closed-loop control of valves/flows
• Automated closed-loop control of aeration

Outcomes
The participant:
• can define and supervise goals related to water and wastewater treatment
• can identify relationships within the processes
• can run control systems
• can operate electronic equipment for water and wastewater process control
• can use different control strategies (automated close-loop control)
• can control fill level
• can manage volumetric flow control
• drain control
• aeration control

Total Preventive Maintenance-Pneumatics

Contents
This 3-days course covers the following topics:
• Compressed air preparations
• Function and construction of pneumatic equipments
• Methods for the development of pneumatic systems
• Maintenance requirements of pneumatic systems
• Operation of pneumatic sequencing circuit
• Function and construction of electrical equipments
• ISO standards

Outcomes
The participant:
• understand and demonstrate preventive maintenance of pneumatic equipment
• understand and explain troubleshooting methods
• understand safety and environmental issues relating to compressed air equipment
• understand and explain why correct setting and maintenance of pneumatic equipment leads to increased productivity
Contents
This 4-days course covers the following topics:
• Introduction to mechanical systems
  - Introduction to the mechanical drive systems
  - Safety procedures
  - Key and setscrew fasteners
  - Shaft alignment
  - Bearings, and couplings
• Belt drive systems
  - Introduction to belt drives
  - Pulley installation and alignment
  - Belt installation and tensioning
• Chain drive systems
  - Introduction to chain drives
  - Sprocket installation and alignment
  - Chain installation and tensioning
  - couplings
• Gear drive systems
  - Introduction to gear drives
  - Gear installation and alignment
  - Backlash adjustment
  - Speed, torque, and gear ratios

Outcomes
The participant:
• familiar with mechanical drives, and their roles in industrial applications
• understand the safety procedures
• can install different types of mechanical drives properly and the importance of following specific protocols
• able to indentify the main components of the mechanical drive systems in industrial installations
• calculate the speed, torque, and ratio of mechanical drive systems
• understand the advantages and disadvantages of each mechanical drive system

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