



Course Outline - Electro-Hydraulics I, II and III

Course Topic: Electro-Hydraulics I, II and III

Contact Hours: 120 hours

Course Description:

This course explains automatic control systems and electrical control concepts. It covers the principles of logic elements and functions and assembly of logic circuits. Maintenance techniques and troubleshooting components and systems will be stressed.

Course is delivered using Internet accessed instructional resources and Hands-On activities. Each major topic area has a post exam. Each subtopic includes a 'Self Review' activity. Hands-On activities are graded using rubrics that address multiple areas of performance. An End of Course Exit Exam and practicum accesses the ability to apply course knowledge to typical industrial scenarios.

Course Outcomes and Objectives

EH-1 Demonstrate proper safety practices when working with power/hydraulics systems

1. Identify the safety considerations for hydraulic system installation, operation, and maintenance
2. Explain the pressure control safety considerations
3. Demonstrate the construction and applications of lock-out valves
4. Apply safe working practices when working with hydraulic systems.

EH-2 Identify and explain basic fluid power/hydraulics systems

1. Identify the schematic symbols for the components of an industrial hydraulic system
2. Interpreting ANSI and ISO fluid power symbols, reading basic schematics
3. Applying force, pressure, volume, and flow relationships
4. Recognizing the effects of the general gas laws
5. Hydraulic pumps; types, construction, and operational principles
6. Hydraulic pressure control valves, directional control valves, and flow control valves; applications, operation, and construction
7. Hydraulic system instrumentation; metering, measuring, and monitoring devices.
8. Hydraulic fluids; types, contamination control, filtration, and specifications
9. Hydraulic linear and rotary actuators: operation and construction, including technical and specification information
10. Hydraulic accumulators; types, construction, and operational parameters
11. Hydraulic reservoir and heat exchangers; types, construction, and applications





Course Outline - Electro-Hydraulics I, II and III

12. Applications of pneumatic systems and components used in industrial manufacturing, automation, and auto body assembly.
13. Interpreting ANSI and ISO fluid power symbols, reading basic schematics
14. Applying force, pressure, volume, and flow relationships
15. Recognizing the effects of the general gas laws
16. Define the terms: pressure, flow, force, velocity, horsepower, torque, watts and current as they relate to a pump motor system
17. Using the training simulator, perform the lab procedure to demonstrate the phenomenon of pump cavitation
18. Using the training simulator, perform the lab procedure to demonstrate pump pseudo-cavitation or aeration
19. List causes of system inefficiencies associated with fixed volume pumps
20. Demonstrate the use of unloading valves to relieve system pressure when not needed
21. Match the symbol and function to servo and proportional valves
22. Write a description of the operation of a hydrostatic drive circuit using a schematic. Describe
23. the function of the components and the flow path through the circuit
24. Calculate head pressure
25. Define viscosity and identify typical SUS ratings of hydraulic fluids
26. Identify and list the four basic types of hydraulic fluids, giving the advantages and disadvantages for each
27. Write a description for the application of an accumulator in a system
28. Using the training simulator, construct a circuit using a flow control valve to meter out a cylinder as it extends. As the cylinder extends, observe the pressure intensification at the rod end of the cylinder. Vary the system pressure and record the pressure at the rod end of the cylinder during extension
29. List applications for variable volume pumps
30. Match each type of Pneumatic pressure or vacuum gage, and scale to its proper description.
(Includes: absolute, gauge, atmospheres, Bars, milli-bars, inches of water and inches of mercury)
31. Solve for unknown quantities when given two of the three variables, force, pressure, and area
32. List the different applications of check valves in a given pneumatic diagram
33. Convert readings in P.S.I.A. to the following units using text references:
 - Inches of mercury
 - Inches of water
 - PSIG
 - Bars
 - Atmospheres
34. Sketch, construct, and debug the following circuit: a pneumatic circuit that demonstrates the “AND” function.





Course Outline - Electro-Hydraulics I, II and III

35. Sketch, construct, and debug the following circuit: a pneumatic circuit that demonstrates the "AND" function
36. Using plant working drawings, predict the direction of pneumatic fluid flow when given the state of all directional control valves and predict the circuit response to a change of all adjustable controls
37. Match the operation and application of Electro-pneumatic components to such devices as valves, electrical sensors, transducers and actuators
38. Demonstrate the ability to adjust vacuum generators (ejectors) on material handling applications

39. EH-3 Read and describe power unit schematics and operations

1. Explain the need for contamination control
2. Demonstrate various filtration methods and standards
3. Identify the types, properties, and qualities of hydraulic fluids
4. Hydraulic pump types and capabilities
5. Hydraulic pump applications and controls
6. Reservoir types and construction, sizing hydraulic reservoirs
7. Hydraulic accumulator applications, construction, and gas charge
8. Identifying air compressors
9. Identifying air drying methods
10. Construction and applications of lock-out valves
11. Sizing pneumatic receivers and surge tanks
12. Match typical hydraulic circuits used in industry with proper description
13. Match the schematic symbols for flow control valves
14. Write a description of the operation of a check valve
15. List the conditions that affect flow in a hydraulic system using a system schematic
16. Identify the procedure and safety considerations for depressurizing and pre-charging a gas filled bladder type accumulator
17. From the symbol, identify the flow direction of a check valve
18. List the various types, functions, symbols and features of the following pneumatic valves:
 - Check
 - Directional control
 - Flow control
 - Pressure regulator
 - Sequence"

EH-4 Describe and apply hydraulic circuit connections

1. Types and applications of hydraulic heat exchangers and heaters
2. Identifying and applying fluid conductors, connectors, and fittings
3. Pneumatic distribution system requirements and construction considerations





Course Outline - Electro-Hydraulics I, II and III

4. Identifying and applying fluid conductors, connectors, and fittings

EH-5 Describe and demonstrate basic cylinder circuit function

1. Installation and operation of cylinder indicators
2. Pressure intensifier operation
3. Air over oil cylinder circuits and applications
4. Seal types, applications, and materials of construction
5. Cylinder construction and mounting considerations
6. Air over oil cylinder circuits and applications
7. Installation and operation of cylinder indicators
8. Adjusting cylinder cushions
9. Operational principles of pressure intensifiers
10. Seal types, applications, and materials of construction
11. Sketch, construct, and debug the following circuit: a single acting and a double acting cylinder sequenced so that the single acting cylinder extends second. Uses all pneumatically operated valves with pneumatic limit switches
12. Sketch, construct, and debug the following circuit: a single acting and a double acting cylinder sequenced so that the single acting cylinder extends second. Uses all pneumatically operated valves with a pneumatic sequence valve
13. Sketch, construct, and debug the following circuit: a pneumatic circuit that extends 2 cylinders uses reduced force on the second cylinder
14. Sketch, construct and debug a pneumatic circuit that controls the extend and return of two cylinders. The second cylinder extension is delayed 5 seconds by a timing circuit
15. Sketch, construct, and debug the following circuit: a pneumatic circuit that uses a shuttle valve associated with pneumatic start buttons
16. Sketch, construct, and debug the following Pneumatic circuits (to control a cylinder) providing particular functions such as:
 - Automatic return
 - Logic control (OR, AND, NOT)
 - Speed control
 - Pressure sequencing
 - Reduced actuator forces
 - Timing
17. With the available lab components, sketch, construct, and debug the following Electro-pneumatic circuits providing particular functions such as:
 - Ladder Diagram and Pilot Control
 - Pilot Control of a Single Acting Cylinder
 - Pilot Control of a Double Acting Cylinder





Course Outline - Electro-Hydraulics I, II and III

- Memory Control
 - Automatic Return
 - Latching
 - AND Logic Function
 - OR Logic Function
 - NOT Logic Function
 - Logic Combinations
 - Proximity Sensors
 - Timers
 - Counters
 - Emergency Stop
18. Approximate the change in actuator speed when given a percentage of change in the following:
- CFM
 - Load
 - Compression ratio
 - Actuator volume
19. Sketch the different types of metering circuits and choose the most preferred

EH -6 Identify and describe basic electrical control concepts including basic safety practices

1. Directional valve construction and operation
2. Directional valve construction and operation
3. Types of flow controls and metering methods
4. Match Direction Control valves & types of spools (center condition) with their symbols and their applications
5. Match flow controls (uncompensated, temperature compensated, and pressure compensated) with a description of their operation and symbol
6. Match the components and operation to direct-acting, pilot operated and normally open pressure control valves.
7. Using the training simulator, set the flow rate through the use of a pressure compensated flow control valve. Apply metering adjustments to a cylinder circuit to control the timing of cylinder extend and retract functions
8. Using the training simulator, design a circuit using a flow control valve to bleed off a portion of the pump's flow. Apply this design to control a cylinder's rate of extension and retraction
9. Using the training simulator, construct a circuit to extend and return a cylinder with the same time using a regenerative circuit
10. Match the schematic symbols for specific types of directional control valves including pilots and operators.
11. Label the ports on a directional control valve





Course Outline - Electro-Hydraulics I, II and III

12. Trace the various flow paths through the directional control valve using a system schematic
13. List centering conditions commonly used in directional control valves.
14. List piloting arrangements commonly used with directional control valves
15. List the different kinds of directional control valve configurations that can be used to control the operation of a hydraulic cylinder using a system schematic
16. Label the functions of ports on a flow control valve
17. Apply metering adjustments to a cylinder circuit to control the timing of cylinder extend and retract functions
18. Using the training simulator, construct a circuit to control the shaft speed of a hydraulic motor. Monitor the shaft rpm under varying loads. Demonstrate both meter in and meter out techniques
19. Match the following characteristics of a directional control valve when given its schematic symbol:
 - Number of positions
 - Number of ways and ports
 - Center condition
 - Methods of control
 - Methods of actuation
 - Detent action (if used)
 - Centering of offset mechanism (if used)"
20. Match the method of control associated with the following types of flow control valves:
 - Ball valve
 - Needle valve
 - Globe valve
 - Fixed orifice

EH -7 Identify and describe basic logic elements and functions

1. Pressure control circuits and applications
2. In-line and pilot operated check valve construction and circuit applications
3. Types of flow controls and metering methods
4. Cylinder construction and mounting considerations
5. Pressure intensifier operation
6. Identifying and adjusting pressure switches
7. Flow meter, monitor, and switch operation and applications
8. Hydraulic system instrumentation; metering, measuring, and monitoring devices
9. Identifying and adjusting pressure switches
10. Identifying and adjusting pressure control valves
11. In-line and pilot operated check valve construction and circuit applications
12. Match the following Pressure control valves with their symbol and their applications:





Course Outline - Electro-Hydraulics I, II and III

- Relief (direct operating and pilot operated)
- Two-stage relief
- Pressure reducing
- Sequence
- Unloading & counterbalance"

13. Identify the type of drains associated with each type of pressure control valve
14. Write a description of the operation of a direct-acting poppet type pressure control valve
15. Using the training simulator, set the maximum system pressure by adjusting the pressure relief valve
16. Using the training simulator, connect a normally open (passing) pressure reducing valve with gage to trainer's pressure and drain ports on the header. Adjust and monitor valves operation
17. Using the training simulator, build a circuit with a pressure reducing valve, so that a cylinder will extend at a pressure which is lower than the relief valve setting
18. Using the training simulator, connect a normally closed (non-passing) sequence valve to a flow control valve(s), gage, pressure, and drain header to achieve prescribed sequencing and timing of multiple cylinders
19. Construct a circuit to demonstrate a counterbalance operation
20. Write a description of the operation of a pressure-compensated flow control valve, and trace the path of the fluid through the valve
21. Differentiate the physical operation between Lapped Spool Valves and Poppet Valves

EH-8 Demonstrate the assembly of power/hydraulics systems

1. Hydraulic system fabrication; fluid conductors, connectors, and fittings
2. Installation parameters of hydraulic systems and components
3. Write a description of the operation of a pressure-compensated flow control valve, and trace the path of the fluid through the valve
4. Match the correct tubing, hosing, and fittings to specific hydraulic Applications
5. Sketch, construct, and debug the following circuit: a standard single- acting cylinder circuit controlled by a 2 position, 3-way valve. (Manual operation)
6. Sketch, construct, and debug the following circuit: a standard double-acting cylinder circuit controlled by a 5 ported, 2 position directional control valve (electrically controlled)
7. Sketch, construct, and debug the following circuit: a Two-hand start and auto pneumatic circuit controlling a double acting cylinder
8. Sketch, construct, and debug a pneumatic circuit that demonstrates the proper use of a quick exhaust valve

EH-9 Demonstrate power/hydraulics systems maintenance techniques





Course Outline - Electro-Hydraulics I, II and III

1. Understanding the need for contamination control
2. Applying filtration methods and standards
3. Adjusting cylinder cushions
4. Identifying and adjusting pressure switches
5. Understanding the need for contamination control
6. Applying pneumatic filtration methods and standards
7. Applications and adjustment of pneumatic lubricators
8. Adjusting cylinder cushions
9. Match symptoms of pump/tank malfunction, such as cavitation and aeration, with likely causes
10. Using product literature and internet researched material, list the details to correctly maintain hydraulic power units (fixed / variable pumps, reservoirs, filters, strainers and gauges (includes P.M. considerations)
11. Sketch a circuit that reflects bypass filtration
12. Given the results of an oil analysis, identify the most probable causes for any poor ratings
13. Using plant working drawings perform the following:
 - Identify the proper name and function of all pneumatic components
 - Identify the circuit action if any component fails in an open or closed position
 - Select which indicators and manual valve operators could be used to isolate the failed component
 - Identify the possible danger associated with spring off-set directional control valves (when power is removed)
14. Match the following pneumatic terms to their definitions and applications:
 - Isothermal
 - Absorption
 - Adiabatic
 - Adsorption
 - Desiccant
15. Match the following components with a description of their function and their symbol:
 - Mufflers
 - Silencers
 - Filters
 - Lubricators
 - FRLs

EH-10 Demonstrate power/hydraulics systems troubleshooting techniques Objectives

1. Identifying types and operational principles of pressure gauges and transducers
2. Types and operational parameters of hydraulic motors





Course Outline - Electro-Hydraulics I, II and III

3. Identifying types and operational principles of pressure gauges and transducers
4. Troubleshoot using hydraulic circuit drawings and fault-finding charts as a systematic aid to fault-finding
5. Given plant working drawings (with and without manifolds) and the state of all directional control operators, draw all paths for fluid flow and predict the circuit response associated with all adjustments
6. Troubleshoot hydraulic circuits using hydraulic test equipment to determine the nature and origin of faults
7. Disassemble, rebuild, and reassemble selected fluid power components
8. List the long term symptoms associated with a lack of preventive maintenance of the following:
 - Dryers
 - Lubricators
 - Filters
 - Air receivers
 - Coalescing filters
 - F-R-L

EH-11 Fluid Power Motor Circuit Functions

1. Sizing pneumatic motors
2. Match the circuit function of the following pressure control valves to their symbols and names:
 - Regulator
 - Sequence valve
 - Venting regulator
 - Pilot controlled regulator
 - Pressure relief valve

Content Outline:

Outcome 1 – Describe Troubleshooting concepts FPEH -10-1,2

Objective 1 – Define hydraulic and pneumatic troubleshooting and explain the importance

Objective 2 – Describe two levels of troubleshooting and give applications

Objective 3 – Describe two methods of testing components and give applications of each

Objective 4 – Describe troubleshooting safety rules including safe dress

Objective 5 – Describe the function of Lockout/Tagout

Skill 1 – Perform Lockout/Tagout of a system

Outcome 2 – Perform Maintenance operations EH-3-4,5 EH-10-2, EH-11-1





Course Outline - Electro-Hydraulics I, II and III

Objective 1 – Describe how to set a pressure -compensated pump

Skill 1 – Adjust a pressure-compensator on a pressure-compensated pump

Objective 2 – Describe the function of automatic and manual modes of operation

Skill 2 – Use manual mode to operate an actuator

Objective 3 – Describe the procedure to shut down a system for maintenance

Skill 3 – Shut down a system for maintenance

Objective 4 – Describe how to adjust the maximum volume stop on a pressure-compensated pump

Skill 4 – Adjust the maximum volume stop on a pressure-compensated pump

Objective 5 – Define cavitation and pseudo-cavitation and give causes of each

Skill 5 – Recognize the sound of cavitation

Objective 6 – Describe flow vs. pressure characteristics

Skill 6 – Measure and graph flow vs pressure for a pressure-compensated pump

Objective 7 – Describe the effect of wear on flow vs. pressure characteristics

Objective 8 – Describe the function of a case drain

Skill 7 – Measure case drain flow

Outcome 3 – Perform in-circuit component testing EH-10, EH-7-B-7, EH-9, EH-10

Objective 1 – Describe four types of in-circuit component tests and give applications

Objective 2 – Describe three troubleshooting measurements and give applications

Objective 3 – Describe the construction of 3 types of pressure test points

Electro Fluid Power part 2 Page 2

Objective 4 – Describe four types of in-circuit component tests and give applications

Skill 1 – Use a pressure test point to check system pressure

Objective 5 – Describe three ways to use flow meter to troubleshoot a hydraulic system

Objective 6 – Describe two methods of measuring flow

Skill 2 – Test a hydraulic system by measuring fluid flow

Skill 3 – Troubleshoot a pressure-compensated vane pump using an in-circuit test

Outcome 4 – Perform Actuator troubleshooting EH-5-1,2,3,4,5,7,8, EH-9, EH-10

Objective 1 – Describe the symptoms and causes of cylinder failure

Objective 2 – Describe how to inspect and troubleshoot cylinder

Skill 1 – Troubleshoot a cylinder using an in-circuit test

Objective 3 – Describe the function and operation of an air-over-oil system

Objective 4 – Describe how to troubleshoot an air-over-oil system

Skill 2 – Balance the air-over-oil tanks in an air-over-oil system

Skill 3 – Troubleshoot an air-over-oil system





Course Outline - Electro-Hydraulics I, II and III

Objective 5 – Describe the symptoms of motor and rotary actuator failure and their causes

Objective 6 – Describe how to inspect and troubleshoot motors and rotary actuators

Skill 4 – Troubleshoot a motor using an in-circuit test

Skill 5 – Troubleshoot a rotary actuator using an in-circuit test

Outcome 5 – Perform DCV, flow control valve and check valve troubleshooting EH-7-A-1,2,3, EH-7-B-2, EH-9, EH-10

Objective 1 – Describe the symptoms of direct-operated DCV failure

Skill 1 – Troubleshoot a direct-operated DCV failure using an in-circuit test

Objective 2 – Describe the function and operation of a sandwich valve

Skill 2 – Adjust a flow control sandwich valve

Skill 3 – Adjust a cross cushion relief sandwich valve

Objective 3 – Describe the function and operation of pilot-operated DCV's

Objective 4 – Describe the function and operation of DCV pilot choke

Skill 4 – Adjust DCV pilot chokes

Skill 5 – Troubleshoot a pilot-operated DCV using an in-circuit test

Objective 5 – Describe the symptoms of flow control valve failure

Skill 6 – Troubleshoot a flow control valve using an in-circuit test

Skill 7 – Adjust and operate a pressure-compensated flow control

Skill 8 – Troubleshoot a pressure-compensated flow control using an in-circuit test

Objective 7 – Describe the function and operation of pilot-operated DCV's

Objective 8 – Describe the function and operation of DCV pilot choke

Skill 4 – Adjust DCV pilot chokes

Skill 5 – Troubleshoot a pilot-operated DCV using an in-circuit test

Objective 9 – Describe the symptoms of check valve failure

Skill 6 – Troubleshoot a check valve using an in-circuit test

Objective 10 – Describe the symptoms of pilot-operated check valve failure

Skill 6 – Troubleshoot a pilot-operated check valve using an in-circuit test

Outcome 6 – Perform pressure control valve troubleshooting EH-7-B- 1,5,6,7,8,11

Objective 1 – Describe operation of a subplate-mounted relief valve

Objective 2 – Describe how to change the operating range of a pressure control valve

Skill 1 – Change the operating range of a pressure control valve

Skill 2 – Remotely control a subplate-mounted relief valve using a direct-operated relief valve

Objective 3 – Describe the symptoms of relief valve failure

Skill 3 – Troubleshoot a relief valve using an in-circuit test

Objective 4 – Describe the construction and operation of a pilot-operated pressure-reducing





Course Outline - Electro-Hydraulics I, II and III

valve

Skill 4 – Change the operating range a pilot-operated pressure-reducing valve

Objective 5 – Describe the symptoms of pressure-reducing valve failure

Skill 5 – Troubleshoot a pressure-reducing valve using an in-circuit test

Objective 6 – Describe the function and operation of pilot-operated DCV's

Objective 7 – Describe the function, construction and 4 configurations of an "R" series pressure control valve

Objective 8 – Describe the function and operation an unloader valve

Skill 6 – Adjust and operate an unloader valve Electro Fluid Power part 2 Page 3

Skill 7 – Change the operating range of an unloader valve

Objective 9 – Describe the symptoms of unloader valve failure

Skill 8 – Troubleshoot an unloader valve using an in-circuit test

Objective 10 – Describe the function and operation a counterbalance valve

Objective 11 – Describe the function and operation of an internally-piloted counterbalance valve

Objective 12 – Describe the function and operation of an externally-piloted counterbalance valve

Skill 9 – Operate and adjust a counterbalance valve

Objective 10 – Describe the symptoms of counterbalance valve failure

Skill 6 – Troubleshoot a counterbalance valve using an in-circuit test

Outcome 7 – Perform vacuum system troubleshooting EH-9, EH-10

Objective 1 – Describe the symptoms of vacuum cup failure

Objective 2 – Describe the symptoms of vacuum generator failure

Objective 3 – Describe how to troubleshoot a vacuum generator

Skill 1 – Troubleshoot a vacuum generator using an in-circuit test

Objective 4 – Describe the function and operation of a vacuum switch

Objective 5 – Describe how to set the set point of a vacuum switch

Skill 2 – adjust the set point of a pressure switch

Objective 6 – Describe the symptoms of vacuum switch failure

Skill 3 – Troubleshoot a vacuum switch using an in-circuit test

Outcome 8 – Define and describe how to troubleshooting fluid power systems EH-9, EH-10

Objective 1 – Define hydraulic and pneumatic troubleshooting

Objective 2 – Describe four methods of system level troubleshooting

Objective 3 – Describe the function and construction of a troubleshooting flowchart

Objective 4 – Describe how to use a troubleshooting flowchart

Objective 5 – Describe how to use PLC I/O indicators to troubleshoot a fluid power system





Course Outline - Electro-Hydraulics I, II and III

Skill 1 – Troubleshoot a fluid power system using PLC indicator lights

Outcome 9 – Apply Electro-Fluid Power Components and Systems EH-6, EH-7-A

Objective 1 - Connect and operate circuits using power devices

Skill 1 – Use the manual override of solenoid-operated Hydraulic and pneumatic valves to manually jog a cylinder

Skill 2 – Connect and operate circuits using solenoid-operated valves

Skill 3 – Replace a system fuse

Objective 2 – Connect and operate circuits using control relays

Skill 4 – Connect and operate circuits using relays in different applications

Objective 3 – Connect and operate circuits for sequencing control

Skill 5 – Design a logic circuit that uses a limit switch to sequence an event

Skill 6 – Design and connect sequence circuits using different control component devices

Objective 4 – Connect and operate circuits using timer control

Skill 7 – Connect and operate a control circuit to perform an unloaded start of a motor

Skill 8 – Connect and operate a control circuit to perform time-driven sequencing

Skill 9 – Design a control circuit to perform a cylinder dwell

Skill 10 – Design a cylinder reciprocation circuit that uses a photoelectric sensor

Skill 11 – Design a cylinder reciprocation circuit that uses a safety interlock

Skill 12 – Connect and operate an emergency stop control circuit

Skill 13 – Connect and operate a cycle stop control circuit

Skill 14 – Connect and operate a circuit that has automatic and manual modes of operation

Skill 13 – Connect and operate a rapid traverse-slow feed relay circuit

Manufacturing lab – classroom demonstrations

Practicum 1 – Troubleshoot systems level faults

Objective 1 – Describe how to troubleshoot zero system pressure

Skill 1 – Troubleshoot zero system pressure

Objective 2 – Describe how to troubleshoot low system pressure

Skill 2 – Troubleshoot low system pressure

Objective 3 – Describe how to troubleshoot high system pressure

Skill 3 – Troubleshoot high system pressure

Objective 4 – Describe how to troubleshoot a hot hydraulic system

Objective 5 – Describe how to troubleshoot vibration in a hydraulic system





Course Outline - Electro-Hydraulics I, II and III

Skill 4 – Troubleshoot vibration in a hydraulic system

Practicum 2 – Troubleshoot machine sequence faults

Objective 1 - Describe how to troubleshoot an actuator that will not move

Skill 1 – Troubleshoot an actuator that will not move

Objective 2 - Describe how to troubleshoot an actuator that moves out of sequence

Objective 3 - Describe how to troubleshoot a pressure change problem in a multiple pressure circuit

Skill 2 – Troubleshoot a pressure change problem in a multiple pressure circuit

Objective 4 - Describe how to troubleshoot a speed change problem in a multiple speed circuit

Skill 3 – troubleshoot a speed change problem in a multiple speed circuit

Practicum 3 – Troubleshoot machine performance faults

Objective 1 – Describe how to troubleshoot erratic actuator movement

Skill 1 – Troubleshoot erratic actuator movement

Objective 2 – Describe how to troubleshoot slow actuator speed

Skill 2 – Troubleshoot slow actuator speed

Objective 3 – Describe how to troubleshoot fast actuator speed

Skill 3 – Troubleshoot fast actuator speed

Objective 4 – Describe how to troubleshoot incorrect acceleration or deceleration

Skill 4 – Troubleshoot incorrect acceleration or deceleration



Course Outline - Electro-Hydraulics I, II and III

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