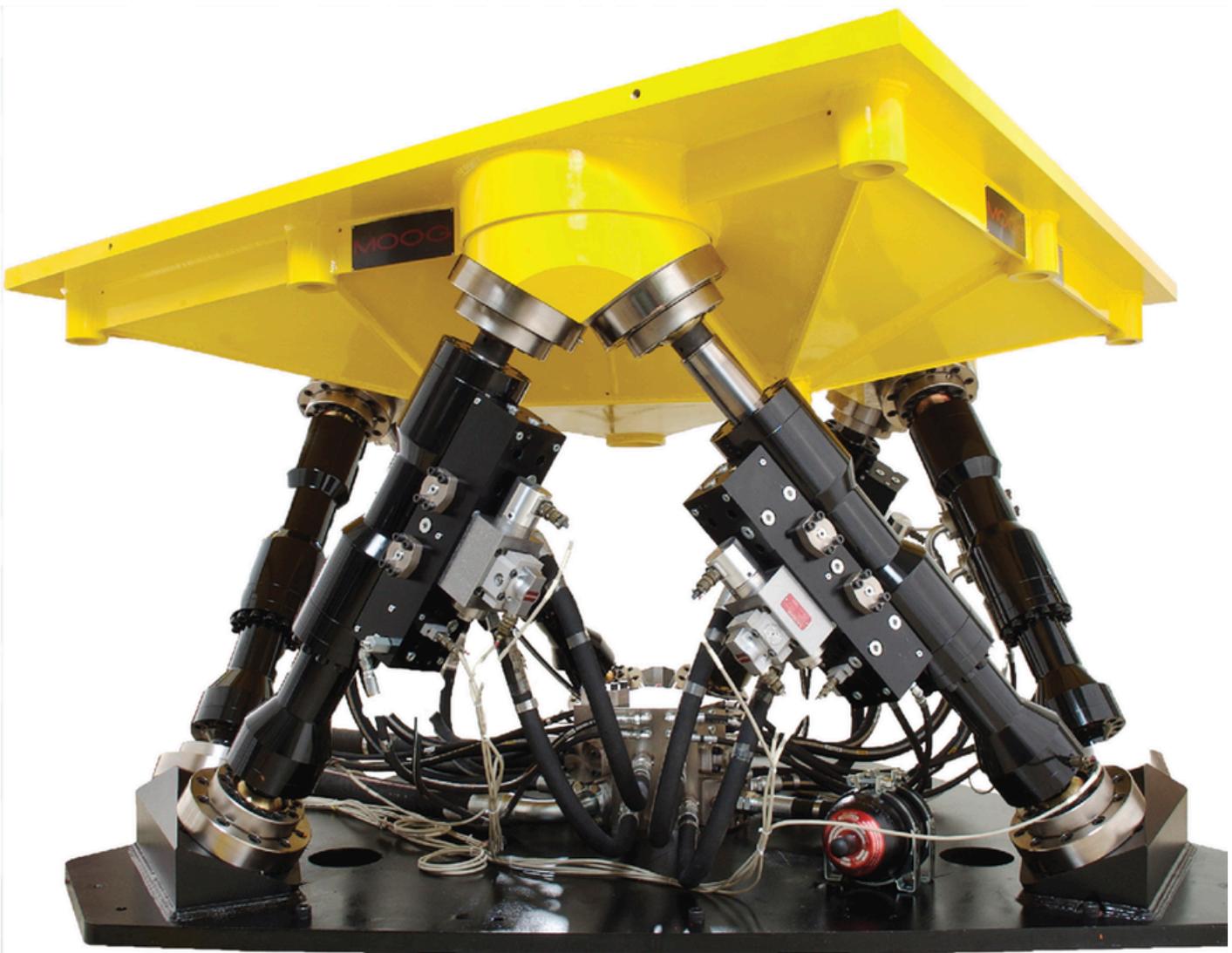


Electronic Controls Specialist



What You Need to Know

Electronic Controls Specialist

WHAT YOU NEED TO KNOW

The ECS certification is designed to review and test the understanding, specification, and application of the full breadth of electronics used in fluid power, from simple sensors and limits to HMIs, controllers, and networks. It includes a brief review of applicable pneumatic and hydraulic principles, as well as in-depth examples for both mobile and industrial fluid power equipment.

Understand Electrical/Electronic Principles

- Understand the Basics of Atomic Theory as it Relates to Electrical Principles.
- Understand Basic Fluid Power and Electrical Symbols and Their Analogies.
- Understand Pascal's Law
- Understand Electromotive Force, Voltage, Current, and Resistance.
- Understand Ohm's and Watt's Law.
- Understand Instruments for Measuring Voltage, Current, and Resistance.
- Understand Basic Electrical Calculations for Electromotive Force/Voltage, Current, and Resistance in a Series Circuit.
- Understand Basic Electrical Calculations for Electromotive Force/Voltage, Current, and Resistance in a Parallel Circuit.
- Understand Basic Electrical Calculations for Electromotive Force (Voltage), Current, and Resistance in a Series-Parallel Circuit.
- Understand Kirchhoff's Voltage and Current Law as Applied to Series and Parallel Circuits.
- Understand the Properties of and Basic Electrical Calculations for Inductance.
- Understand the Properties of and Basic Electrical Calculations for Capacitance.
- Understand the Properties and Basic Calculations for Alternating Current.
- Understand the Relationship of Voltage to Current in Inductive and Capacitive Circuits.
- Understand the Relationship of Reactive Power, Apparent Power, Real Power, and Power Factor.
- Understand the Characteristics and Applications of Single and Three Phase Power.
- Understand Single and Three-Phase Power Generation.
- Understand DC Power Generation.

Understand Electrical Devices and Control Circuits

- Understand Switch Terminology.
- Understand the Function of Manually Actuated Switches
- Understand the Function of Mechanically Actuated Switches.
- Understand the Function of Pressure, Temperature, and Flow Actuated Switches.
- Understand the Function of Magnetically Actuated Switches.
- Understand the Function of Proximity Sensors.
- Understand the Function of Joysticks, Potentiometers and Rheostats.
- Understand the Function of Switching Relays.
- Understand the Function of Timer Relays.
- Understand the Function of Counter Relays.
- Understand the Function of Pilot Light.
- Understand the Function of Solenoids.
- Understand the function of AC Solenoids.
- Understand the Factors Impacting Solenoid Reliability.
- Understand the Basic Operation and Types of Electric Motors.
- Understand the Operation and Types of Single-Phase Electric Motors.
- Understand the Operation and Types of Three-Phase Electric Motors.
- Understand Electric Motor Terms and Definitions.
- Understand NEMA Electric Motor Design Characteristics.
- Understand the Different Types of Motor Starters.
- Understand the Process for Sizing an Electric Motor in a Fluid Power System.
- Understand the Process of Reversing Motor Direction of Rotation.
- Understand the Basic Operation of Variable Speed Drives (VFD).
- Understand Transducer Terms and Definitions.
- Understand the Function of Pressure and Force Transducers
- Understand the Function of Temperature Transducers.
- Understand the Function of Flow Transducers.
- Understand the Function of Linear Position Transducers.

Electronic Controls Specialist

WHAT YOU NEED TO KNOW

Understand Electrical Devices and Control Circuits (cont)

- Understand the Function of Magnetic Rotary Position Transducers.
- Understand the Function of Optical Encoders.
- Understand the Function of Transformers.
- Understand the Function of Control Transformers
- Understand the Function of Power Supplies.
- Understand the Function of Batteries.
- Understand the Function of Fuses and Circuit Breakers.
- Understand the Function of Disconnects, Contactors and Motor Starters.
- Understand the Function of Semiconductors Used in Electrical Circuits.
- Given Basic Electrical Schematic, Reads and Interprets Electrical Schematics.
- Control Circuits and Control Logic are Integral Parts of Electronic Systems Used to Manage and Manipulate Signals and Functions.
- Given Operating Environment Conditions; Specifies Wire and Cable Requirements for an Application.
- Understand NEMA and IEC Enclosure and Ingress Ratings

Interacting with Controllers

- Given Known Fluid Power System Environmental, Operational and Performance Criteria; Selects the Proper Controller Architecture for an Application.
- Given Known Fluid Power System Operational and Performance Criteria; Specifies Controller Performance Parameters for an Application.
- Given Known Fluid Power System Operational and Performance Criteria; Selects Controller Interface Hardware Based on Operational and Performance Specifications.

Understand IEC 61131-3 Logic Programming

- Given the Need to Optimize Fluid Power System Performance and to Trace Data Flow; Selects, Implements and Interprets IEC 61131-3 Logic Programming Languages.
-

Networks

- Given a Control System for a Fluid Power Application; Map its Network Components and Protocol.
- Given Control System Requirements for a Fluid Power Application; Identifies the Hardware, Topology and Protocol.
- Given a Specific Open Communication Network for a Fluid Power Application, Identifies Key Network Implementation Variables Influencing System Performance.
- Selecting Wireless Communication Technology for SCADA.
- Selecting HMI Technology for SCADA in Fluid Power Applications.

Electrohydraulic and Electropneumatic Control

- Given Specific Fluid Power Applications; Demonstrates Knowledge of the Operation and Application of Proportional Valves.
- Given Specific Fluid Power Applications; Demonstrates Knowledge of the Operation and Application of Proportional Valves.
- Understands When Pressure Compensation (Hydrostat Function) is Required with Proportional Directional Valves.
- Given the Fluid Power Application; Describes the Operation and Application of Hydraulic and Pneumatic Electric Flow Control Devices.
- Describes the Operation and Application of Hydraulic and Pneumatic Electric Pressure Control Devices.
- Demonstrates Knowledge of the Operation and the Application of Servo Valves.
- Understand the Required Steps to Analyze the Load and Motion for a Given Application.
- Sizing a Proportional or Servo Valve for an Application.
- Demonstrates Knowledge of Application of Proportional or Servo Valves for Different Configurations of Spools and Cylinder applications.
- Given a Bode Diagram for a Closed Loop Control of a Fluid System; Interprets a Bode Diagram to Assist in Selecting the Proper Valve for the Application.

Electronic Controls Specialist

WHAT YOU NEED TO KNOW

Electrohydraulic and Electropneumatic Control (cont)

- Utilizing System Modeling, Describe the Triad of Control Theory.
- Given the Parameters for a Fluid Power Application; Interprets and Uses Block
- Diagrams to Represent the Component Dynamics of the Control System.
- Given Basic System Parameters for a Fluid Power Application; Evaluates the
- Data and Determines Minimum System Response Characteristics.
- Given Operational Fluid Power Applications; Demonstrates an Understanding
- of Friction and Leakage in Fluid Power Components and their Effects on System Performance.
- Given Data on the Dynamics of a Fluid Power Application; Identifies the Causes and Minimizes the Effects of Hydraulic Shock in a System.
- Calculates the Effects of Fluid Compressibility on Actuator Stiffness.

