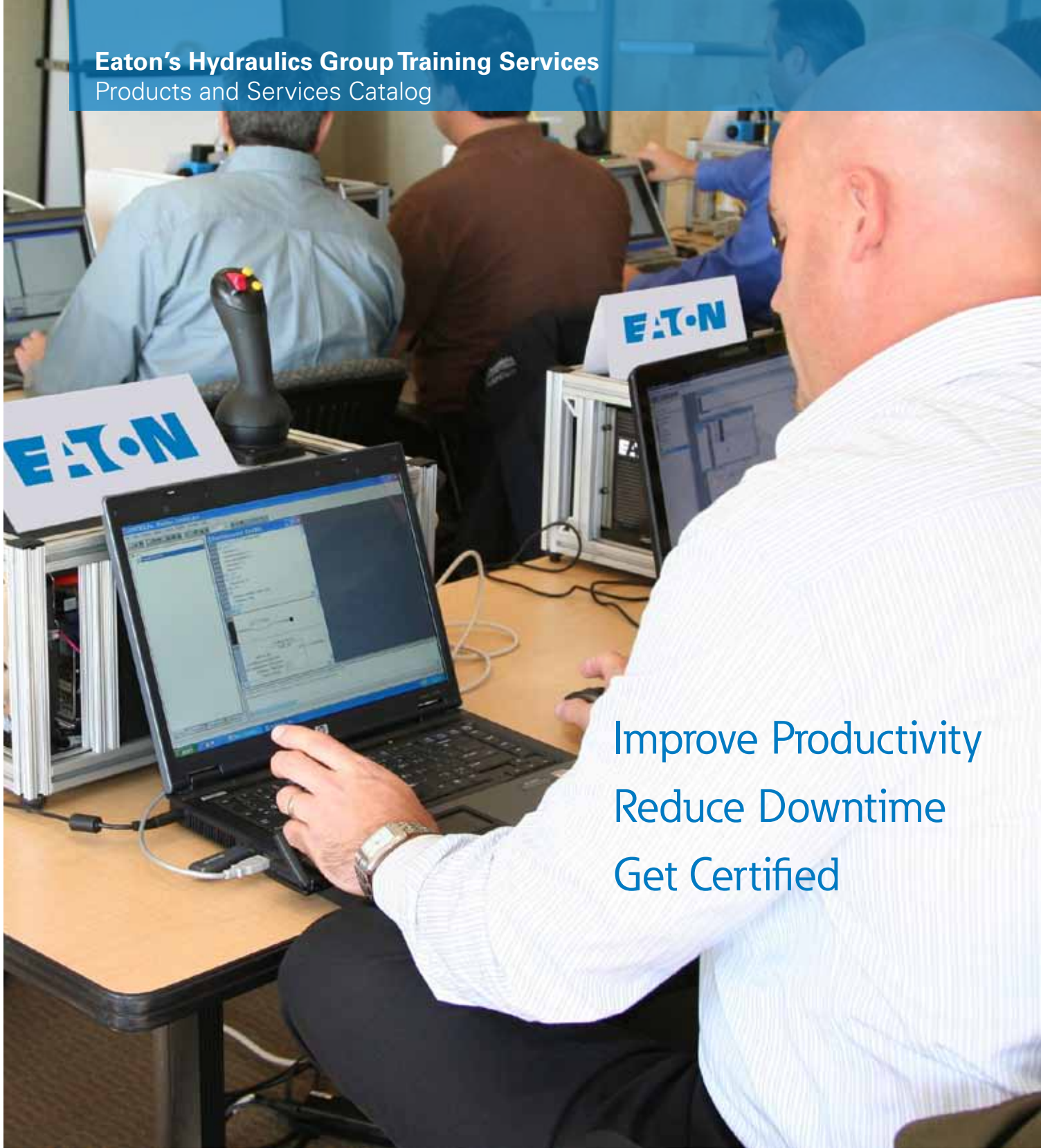


**Eaton's Hydraulics Group Training Services**  
Products and Services Catalog



Improve Productivity  
Reduce Downtime  
Get Certified



*Powering Business Worldwide*

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# Make Your Choice

## Eaton's Hydraulics Group Training Services

# Overview

## Eaton's Hydraulics Group Training Services

### Our Commitment to Excellence

Eaton's (formerly Vickers®) Hydraulics Group training center was established in 1945. Since then, our world-class instructors and state-of-the-art facilities have made Eaton the educational standard for the industry. We are the first choice of many customers for their fluid power training needs.

It is a bold statement, but we here at Eaton's Hydraulics Training live for the world of hydraulics education. Our organization was created to bring you the absolute latest in hydraulic technology, and we are confident that we can do it in the most efficient, cost-effective way possible. Each class is constructed to convey the knowledge you desire, and each instructor is outfitted with years of industry field experience to back it up. Our entire curriculum is focused completely around hydraulics, and we take pride in our ability to offer industry-specific courses and products.

Training Services is able to ensure quality in its courses by maintaining a limited class size, utilizing state-of-the-art equipment that includes simulators, cut-aways and take-aparts, and by providing materials that directly coincide with the course presentation.

Training Services offers both product and technology courses that cover a wide array of fluid power related topics. Our courses suit the needs of anyone involved in the industry, from newcomers to application specialists.

This brochure contains complete descriptions of training courses as well as our full line of training products.



### Facilities

Headquartered in Maumee, Ohio (Toledo area), our 23,000ft<sup>2</sup> state-of-the-art training facility can accommodate all training offerings. In addition, we have a satellite training facility in Eden Prairie, MN also fully equipped to offer technical and product training courses.

### Improve Productivity

Whether for hydraulic repair personnel, supervisors, engineers, sales or purchasing, our courses will solidify hydraulic knowledge and aid increased job performance. Our technical training instructors are International Fluid Power Society Certified Fluid Power Specialists and Certified Fluid Power Accredited Instructors, ensuring a consistent and high quality experience for our students.

### Reduce Downtime

Training in Hydraulics from Eaton is an investment in the future, both your career and company. Properly trained personnel save their employers significant dollars by reducing unplanned downtime and maximizing the effectiveness of planned downtime. Our program is based on decades of experience in the hydraulics field, as well as the feedback we receive from companies and their employees who are committed to offering the highest quality services available.

### Get Certified

Courses offered in this brochure are led by the finest instructors available. Students attending training at our facilities are provided with all the necessary training materials needed to be successful. We provide Continuing Education Units (CEUs) for all students who attend and successfully pass a comprehensive exam. Getting a certification from Eaton's Hydraulics Training Services will be recognized by the entire Fluid Power industry as a significant achievement. Continuing your professional development with Eaton will help you continue to build and enhance your ability to operate, maintain and design any hydraulic system. Count on Eaton's Hydraulics Training Services to get you prepared for any of the IFPS Certifications to enhance your qualifications for your next opportunity.

### Capabilities

Eaton's Hydraulics Group Training Services is continually taking great strides in progressive hydraulics education. In addition to our centralized facilities, our versatile instructors are capable of taking their classes on the road to you. At Eaton, we don't just talk about training, we deliver. With over 30 technical and product courses, and numerous training materials that include manuals, multi-media, and hands-on equipment, the investment made in training today can pay off with significant results for the future.



## Registration and Payment Policies

Registrations are processed on a first-come, first-served basis and must be accompanied by payment. Accepted payment methods include purchase order or credit card. A seat in class can be reserved only upon receipt of a form of payment for tuition; purchase order or credit card.

Registrations made with Credit Card (Visa, Mastercard, AMEX, Discover) will be billed upon registration to the class. Registrations made with Purchase Order (for customers with established lines of credit through Eaton Hydraulics, LLC) will be billed on the first day of class. Form of payment must be received at Eaton's Hydraulics Training Services at least four weeks prior to the first day of class.

All training materials are included in the tuition payment. Lunch and drinks will be provided throughout the class, except classes where last day of class ends at noon.

Students are responsible for transportation and lodging expenses / arrangements. Confirmation letters with detailed travel, lodging and class information will be sent via email to registered students approximately 30 days before the start date of the class.

## Cancellation Policy

An enrollment can be cancelled up to THREE weeks prior to the first day of class without penalty. Cancellations occurring within three weeks of the first day of class are subject to a 100% cancellation fee. No tuition refunds will be processed for "no-show" student that registered with a credit card. In addition, students that registered with a purchase order will be charged the full tuition the first day of class for "no show".

Students have the ability to cancel their own registrations in the Eaton University system. However, if you are not able to access Eaton University to cancel your registration it is recommended that all enrollment cancellations be communicated via telephone or email. Dated cancellation statements will be sent to the student upon request.

## Class Cancellations

Eaton reserves the right to cancel classes for any reason. If a class cancellation occurs, each registered student will be notified at approximately four weeks prior to the first day of class and receive alternative class date(s). If credit card was used for payment during registration a full refund will be issued back to the credit card used at the time of registration. If purchase order was used for payment during registration no refund will be required as no billing will have taken place.

Do **NOT** book any travel arrangements for a class unless you have received the 30 day confirmation letter stating you are register in the class and expected to attend. Eaton assumes no responsibility for transportation charges incurred relative to cancelled or changed classes.

## Prerequisites

Eaton's Hydraulics Training Services offers courses from basic to advance. Our basic programs will set a foundation for students build upon as they continue developing their skills in the Fluid Power industry. We believe it is crucial for students to develop the basic understanding of theory and principles in order to be successful in our more advanced classes. As a result, some courses in this brochure will have prerequisites that are strongly recommended or possibly required in order for a student to be allowed to register. Courses prerequisites will be noted at the bottom of a course description. If a course does not have a prerequisite noted none are required. If you have taken formal hydraulics training at another institute and believe you have met the prerequisite of an advanced class please contact the training department to approve your registration, before trying to register.

## Completion Requirements

Unless otherwise stated, successful completion in all courses include: passing written exercises and exams, attendance in entire class and participation in all sessions. Certificates will be awarded to all students who have met all of the above course completion requirements. Those students who are unable to meet the completion requirements will be provided a certificate of attendance and no CEU's will be awarded.

Upon successful completion of a training course, students are issued a certificate to validate and recognize their learning and competency (except for the FPS Certification review courses). The Fluid Power Society (FPS) conducts the exam for their respective certifications the day after Eaton's review session is completed. To register for a FPS certification exam call the FPS at 800-303-8520 or [www.ifps.org](http://www.ifps.org).

## More Information

Classes offered through Eaton's Hydraulics Training Services are very popular and fill quickly. To check availability, cost, locations and dates of our training classes please visit <http://www.eaton.com/EatonCom/Markets/Hydraulics/Training/index.htm>



[www.eaton.com/EatonCom/Markets/Hydraulics/Training/index.htm](http://www.eaton.com/EatonCom/Markets/Hydraulics/Training/index.htm)

# The Training You Need to Succeed

	Inside Sales	Outside Sales	Field Service / Maintenance or Technical Service Personnel	Engineers
	Distributor & Eaton Personnel		OEM & End-Customers	
Aeroquip Fluid Conveying Product School Level 200	✓	✓		
Aeroquip Advanced Product Specialist School Level 300		✓		
Aeroquip Product Application Specialist School Level 400		✓		
Aeroquip Navy Flex Hose School		✓		
Weatherhead Fluid Conveying Product School Level 200	✓	✓		
Weatherhead Advanced Product Specialist School Level 300		✓		
Weatherhead Product Application Specialist School Level 400		✓		
Char-Lynn Service School		✓		
Closed Circuit Piston Product Service School		✓		
Open Circuit Piston Products Service School		✓		
Eaton CONTROL F(x) <sup>TM</sup> and / or IEC 61131-3 Certifications		✓	✓	✓
Warranty Center Failure Analysis	✓	✓		
Basic Hose Technology	✓	✓	✓	✓
Wind Turbine Fundamental Hydraulics	✓	✓	✓	✓
Industrial Basics	✓	✓	✓	✓
Industrial Hydraulics	✓	✓	✓	✓
Mobile Hydraulics	✓	✓	✓	✓
Circuit Design		✓	✓	✓
Troubleshooting		✓	✓	✓
Filtration, Fluids & Lubricants	✓	✓	✓	✓
Cartridge Valves	✓	✓	✓	✓
CANbus Fundamentals	✓	✓	✓	✓
Electrohydraulics Maintenance, and Troubleshooting	✓	✓	✓	✓
Advanced Mobile Hydraulics (Level 400)		✓	✓	✓
IFPS Certified Mechanic Review		✓	✓	✓
IFPS Certified Technician Review		✓	✓	✓
IFPS Electronic Controls Specialist Review		✓	✓	✓
IFPS Connector & Conductor Review & Job Performance		✓	✓	✓
IFPS Hydraulic Specialist Certification Review		✓	✓	✓
INVEST - Independent Vickers Electrohydraulic Systems Training		✓	✓	✓

# Recommended Course Progressions for Industry Certifications

Overview

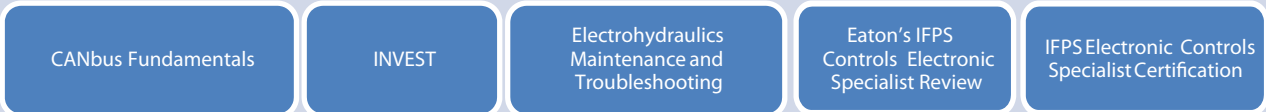
## Professional Development: Eaton's Technical Training Course Progressions

Courses Listed in Recommended Sequence

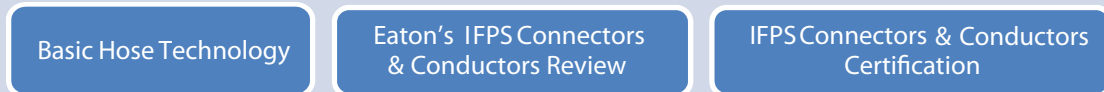
### IFPS Hydraulic Specialist



### IFPS Electronic Controls Specialist



### IFPS Connectors & Conductors Specialist



# How to Register for Training Courses

## 1. Where to find training courses online:



<http://www.eaton.com/EatonCom/Markets/Hydraulics/Training/Courses/index.htm>

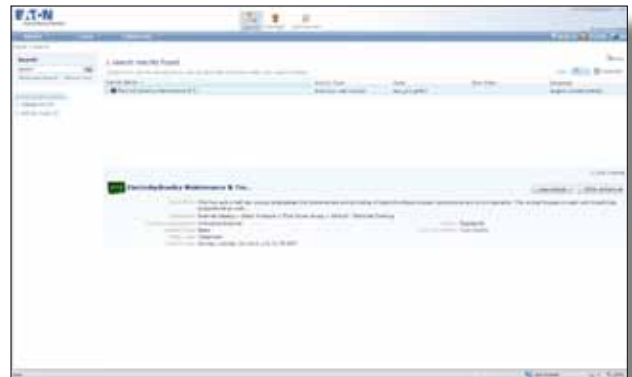
## 3. Create an Account or Log into your Existing Account.



## 2. Select "Enroll" on the class you want to attend.



## 4. Select the course and click 'Register' or search the course registration code.



# Make Your Choice

## Eaton's Hydraulics Group Training Services

## History

Eaton's Training Services has a long and distinguished history in the fluid power education arena, ever since the original Vickers' Training Center was founded in 1945. Through various technology and product related classes, as well as the variety of training materials that we offer, Eaton strives to lead the industry in fluid power education. We applaud and salute the



efforts of personnel involved with educating students in the fluid power industry. To all of us, maintaining high educational standards is important to ensure students are well prepared when they enter the working environment. To show our appreciation in maintaining these high quality educational programs, we invite you to participate in an Instructor Symposium held annually at our facility in Maumee, OH.

We will present a number of varied topics that we hope you will find of interest.

## Prerequisites

Professionals who are actively teaching fluid power concepts at an educational institute or fluid power company that have a desire to make their programs better. This course is by invitation only and is typically held in the middle of June every year.

## Who Should Attend

This symposium is appropriate for instructors and educators involved with educating students in the fluid power industry. Instructors with vocational, technical colleges and universities are encouraged to attend. Topics covered during this symposium vary from year to year. Below are some example previous topic offerings.



## Topics vary annually, previously covered topics include:

- Closed Circuit Transmission Sizing
- Open Circuit Pump – Torque Limiting Control
- Leaks, Causes, and Cures
- Hose Routing and Failure Analysis
- Hose Assembly (Lab)
- CAN - Basic Primer
- CBT (computer based training) Demo
- Counterbalance Valves
- Proportional Amplifier Tuning and Troubleshooting (Lab)
- Cavitation and Aeration (Lab)
- New fluid Power Trainer Demo
- Gerotor/Geroler – Application Considerations
- Steering Controls Primer (Lab)
- PID Control Concepts
- "Rules of Thumb" = Thumbs Down

There is no cost to attend this session but space is limited. Early registration is important to ensure your seat is reserved.

We provide lunch on all three days and a continental breakfast on Wednesday and Thursday. A group dinner is also included Wednesday night. While transportation and lodging will be the participant's responsibility, we have negotiated special rates with a number of local lodging providers. Directions and lodging information will be provided upon confirmation of your registration. Business casual is recommended for the entire event.

Registration in the Instructor Symposium is by invitation only. If you are interested in attending our annual training seminar please feel free to contact Eaton's Hydraulics Training Services by emailing us at [hydraulicstraining@eaton.com](mailto:hydraulicstraining@eaton.com) or by phone at 800-413-8809.





## Advanced Mobile Hydraulics (Level 400)

Course Registration Code: Hyx\_ILT\_AMH

Duration: 4.5 Days

This four-and-a-half-day course will cover how to select and properly size components used in mobile hydraulic circuits. It will not cover industrial applications. Students will learn the correct methods for properly sizing components selected and not relying on “rules of thumb” to optimize the energy use within a system. The course is math intensive as basic math and physics are used to calculate required performance requirements for applications.

### Prerequisites:

**Eaton’s Distributor’s personnel** must complete all authorized brand Certifications (either on-line or by instructor led courses) through level 300, as well as Industrial Hydraulics/Industrial Basics, Electrohydraulics Maintenance & Troubleshooting and Troubleshooting.

**Non-Distributor personnel** must have completed Industrial Hydraulics or Industrial Basics or Mobile Hydraulics, Electrohydraulics Maintenance & Troubleshooting and Troubleshooting.

### Who Should Attend

This course is appropriate for personnel involved with the application and design of hydraulic systems and for product application specialists.

**NOTE:** This course will meet the requirements for the Eaton 400 level certification for distributors and employees as part of the Channel Compensation Resource Program. Certification is valid for 3 years.

### Topics Covered

- Pump Energy Utilization
- Pressure Controls
- Hydraulic Pumps
- Light Duty Transmissions
- Relief Valves
- Medium Duty Transmissions
- Directional Control Valves
- Heavy Duty Transmissions
- Flow controls
- Cylinders
- Steering Control Units
- Hydraulic Motors

### Completion Requirements

Students will be required to attend and participate in all sessions, exercises, and assignments. In addition, successful completion of this course will require successfully passing a written exam with a score of 70% or higher.

## Basic Hose Technology

Course Registration Code: Hyx\_ILT\_BHT

Duration: 2 Days

This 2-day course is designed for individuals interested in learning in the technology selection, application of hose and fittings in hydraulic systems.

*Prerequisites:* None

### Who Should Attend

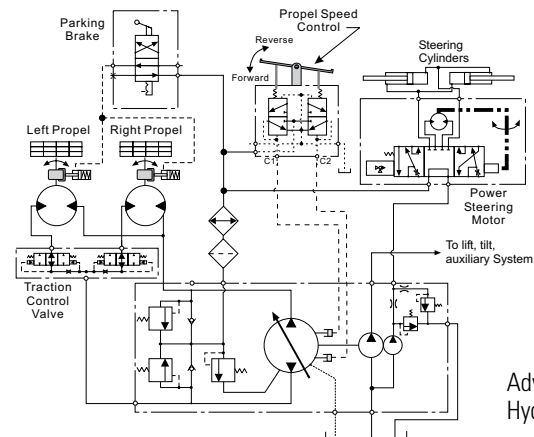
This course is appropriate for hydraulic mechanics, technicians and installers working with hydraulic hose and fittings or tube assemblies.

### Topics Covered

- Hose Construction
  - Terminology
  - Tube, Reinforcement and Cover Materials
- Hose Specifications Overview
  - SAE, CEN & ISO
- Fitting Design
  - Review of Hose End Designs
  - Attachment Methods and Assembly Machine Options
- Port & Line Connections, STC & Metrics
  - Definition of Port and Lines
  - Identification Tools and Use
  - NPT/NPTF Pipe Threads
  - BSP Pipe Threads
  - SAE O-Ring Boss
  - SAE Split Flange
  - SAE 45 and 37 Degree Flare
  - JIS 30 Degree Flare
  - SAE Flat Face O-Ring Seal
  - Threadless Connectors
  - DIN connections
  - ISO connections
- Hose Routing and Safety
  - Hose Routing and Safety
  - Leaks, Causes and Cures
  - Hose Failure Analysis
  - Proper Hose Selection using S-T-A-M-P-E-D

### Completion Requirements

Students will be required to attend and participate in all sessions, exercises, and assignments. In addition, successful completion of this course will require successfully passing a written exam with a score of 70% or higher.



Advanced Mobile Hydraulics (Level 400)

## Cartridge Valves

Course Registration Code: Hyx\_ILT\_CV  
Duration: 3 Days

This three-day course covers both the theory and operations of DIN (Slip-in) and screw-in cartridge valves. Operating principles of the most commonly used cartridge valves will be described and students will perform lab exercises to reinforce the concepts of how these components are used in both mobile and industrial hydraulic circuits.

*Prerequisites:* Students must have completed either the Industrial Hydraulics, Industrial Basics, Mobile Hydraulics or equivalent training programs.

### Who Should Attend

This course is appropriate for personnel involved with the maintenance and application of hydraulic systems and for product application specialists. It is not intended to be an engineering design level course.

### Topics Covered

- Cartridge Valve Basics
- Pressure Control Concepts
- Systemic Contamination Control
- Flow Control Concepts
- Directional Valve Concepts
- Proportional Valves

### Completion Requirements

Students will be required to attend and participate in all sessions, exercises, and assignments. In addition, successful completion of this course will require successfully passing a written exam with a score of 70% or higher.

## Circuit Design

Course Registration Code: Hyx\_ILT\_CD  
Duration: 4.5 Days

This four-and-a-half-day course will cover how to select and properly size components used in industrial hydraulic circuits. It will not cover mobile applications. Students will learn the correct methods for properly sizing components selected and not relying on “rules of thumb” to optimize the energy use within a system. The course is math intensive as basic math and physics are used to calculate required performance requirements for applications.

*Prerequisites:*

**Eaton’s Distributor’s personnel** must complete all authorized brand Certifications (either on-line or by instructor led courses) through level 300, as well as Industrial Hydraulics/Industrial Basics, Electrohydraulics Maintenance & Troubleshooting and Troubleshooting.

**Non-Distributor personnel** must have completed Industrial Hydraulics or Industrial Basics or Mobile Hydraulics, Electrohydraulics Maintenance & Troubleshooting and Troubleshooting.

### Who Should Attend

This course is appropriate for personnel involved with the application and design of hydraulic systems and for product application specialists.

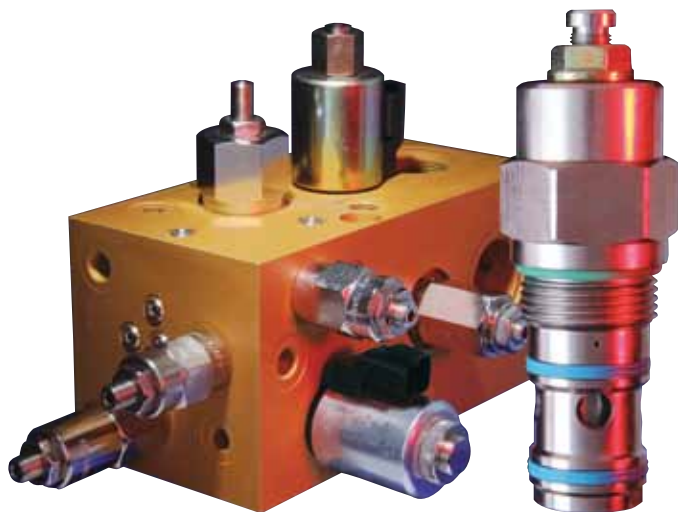
**NOTE:** This course is open for registration however all registrations will require approval of Eaton’s Hydraulics Training Services. This course will meet the requirements for the Eaton Industrial 400 level certification for distributors and Eaton employees.

### Topics Covered

- Reservoir selection and sizing
- Pump selection
- Pump sizing and control analysis (pressure comp and torque limiting)
- Pressure controls (reducing, unloading, counterbalance, sequence, back-pressure) - selection and sizing
- Directional controls - selection and sizing
- Flow controls - selection and sizing
- Cylinders - selection, sizing, and mounting styles
- Motors - selection and sizing
- Heat load calculations
- Heat exchanger sizing
- Filtration selection and sizing
- Fluid conductor sizing

### Completion Requirements

Students will be required to attend and participate in all sessions, exercises, and assignments. In addition, successful completion of this course will require successfully passing a written exam with a score of 70% or higher.



## Electrohydraulics Maintenance and Troubleshooting

Course Registration Code: Hyx\_ILT\_EHMT  
Duration: 4.5 Days

This four-and-a-half-day course emphasizes the fundamentals and principles of electrohydraulic system components and circuit operation. The course focuses on open and closed loop proportional as well as servo control systems. Attendees will work hands-on with a wide series of control products in a laboratory environment to setup, tune and troubleshoot flow, direction, and pressure control circuits. In addition, students will learn how to properly maintain their hydraulic system for to maximize efficiency and reduce system downtime by learning various troubleshooting techniques.

*Prerequisites:* Students need to have attended either the Industrial Hydraulics, Mobile Hydraulics, Industrial Basics or equivalent training.

### Who Should Attend

This course is appropriate for application engineers, maintenance and repair personnel. Attendees are encouraged to have a background in hydraulics, but electronics knowledge is not a requirement.

### Topics Covered

- Hydraulic and electronic principles and equivalents
- Operational Amplifiers
- Proportional Solenoids
- Proportional Flow, Directional and Pressure Controls
- Servo Valves and Amplifiers
- Proportional Power Plugs
- Proportional Amplifiers: Types A, B, C and D
- On-Board Electronic Proportional Valves
- DIN-Rail Mounted Electronic Controls
- Slip-In and Screw-In Proportional Cartridge Valves

### Completion Requirements

Students will be required to attend and participate in all sessions, exercises, and assignments. In addition, successful completion of this course will require successfully passing a written exam with a score of 70% or higher.



## Filtration, Fluids & Lubricants

Course Registration Code: Hyx\_ILT\_FFL  
Duration: 3 Days

This three-day seminar teaches students how to determine the contamination control requirements of hydraulic systems so they may properly design, maintain, and purchase hydraulic systems. The course examines the concepts behind effective contamination control and the proper ways to select and size a filtration solution for hydraulic systems. In addition, a fluids expert will spend one day covering the lubricants commonly used in hydraulic systems and what properties and characteristics are important when selecting a fluid for a hydraulic system.

*Prerequisites:* Students will need to have a basic understanding of mobile or industrial hydraulic systems and component functions.



### Who Should Attend

This course is appropriate for maintenance, sales and design personnel.

### Topics Covered

- System Contamination Control Theory
- Contaminants(other than particulate)
- Effective Control of Contaminants
- Filtration Sizing and Selection
- Types of Lubricants, Classifications, Properties and Applications
- Anti-Wear Hydraulic Fluids
- Specialty Lubricants
- Fire Resistant Fluids

### Completion Requirements

Students will be required to attend and participate in all sessions, exercises, and assignments. In addition, successful completion of this course will require successfully passing a written exam with a score of 70% or higher.

## IFPS Certified Mechanic Review & Job Performance

Course Registration Code: Hyx\_ILT\_FPS-MC  
Duration: 2.5 Days

This two-and-a-half day course is appropriate for individuals who have been trained in the field of fluid power and need to sharpen their skills by achieving Fluid Power Certified Mechanic. Four different mechanic certifications exist: Industrial, Mobile, Pneumatic & Master Level. Eaton Hydraulics Training Services will provide reviews for the Industrial and Mobile Certified Mechanic. Fabricates, assembles, services, maintains, and tests hydraulic equipment. The mechanic understands hydraulic symbols, reads system schematics, understands electrical principles, and is skilled in using hand tools, power tools, micrometers, and testing equipment.

*Prerequisites:* IFPS has created a study manual for candidates who wish to prepare for the Job Performance and written exam. This course is a review session and students should prepare themselves by reviewing this manual prior to attending.

### Who Should Attend

Any fluid power professional involved in the selection, application, installation or sales of hydraulic equipment.

### Topics Covered

- Read hydraulic symbols and circuit diagrams
- Use dial calipers and micrometers
- Know various tube fittings and select the proper replacement
- Make up tube assemblies
- Know how to prevent and repair system leaks
- Perform contamination control
  - Add fluid to system with filter cart
  - Aid in system flushing and commissioning
  - Know how, when, and where to take fluid samples
  - Use "Target Cleanliness Chart" for each system
  - Check condition of hydraulic filters
  - Check systems for water
- Make up a crimped hose assembly
  - Replace a hose assembly
  - Inspect hose applications for twist and minimum bend radius
- Service and charge accumulators
- Assist technicians in start-up and commissioning
- Promote safe working conditions with pressurized systems

### IFPS Exam(s)

All Mechanic certifications require a three (3)-hour written and a three (3)-hour job performance (hands-on) test done during the afternoon of the 3rd day of the review.

Test registrations must be made through the International Fluid Power Society at [www.ifps.org](http://www.ifps.org) for both the Job Performance and Written test.

## IFPS Certified Technician Review & Job Performance

Course Registration Code: Hyx\_ILT\_FPS-TC  
Duration: 2.5 Days

This two-and-a-half day course is appropriate for individuals who have been trained in the field of fluid power and need to sharpen their skills by achieving Fluid Power Certified Technician. Four different mechanic certifications exist: Industrial, Mobile, Pneumatic & Master Level. Eaton Hydraulics Training Services will provide reviews for the Industrial and Mobile Certified Technician. Applies fluid power theory and related knowledge to test and troubleshoot operational hydraulic systems and applications. A Hydraulic Technician reads schematics, performs basic cylinder & hydraulic motor calculations and is able to supervise system installations and commissioning.

*Prerequisites:* IFPS has created a study manual for candidates who wish to prepare for the Job Performance and written exam. This course is a review session and students should prepare themselves by reviewing this manual prior to attending.

### Who Should Attend

Any fluid power professional involved in the selection, application, installation or sales of hydraulic equipment.

### Topics Covered

- Sets-up and tests systems and components under direction of engineering and scientific staff.
- Recommends modifications to circuit & components to improve performance.
- Supervises system installation, flushing & commissioning.
- Provides leak-free piping.
- Knows how, where and when to take fluid samples and read lab reports.
- Can establish ISO cleanliness level for a system.
- Can devise the Target Cleanliness Chart.
- Understands accumulator use & operation.
- Understands hydrostatic drives.
- Sets pump load sensing and compensator controls.
- Understands basic electrical controls and their application.
- Calculates decompression volume.
- Understands regenerative circuits and their use.
- Understands sequence & counterbalance circuits and associated valving.
- Does trouble shooting and supervises required replacements, repair or adjustment.

### IFPS Exam(s)

All Technician certifications require a three (3) hour written and a three (3) hour Job Performance (hands on) test taken in the afternoon of the 3rd day.

Test registrations must be made through the International Fluid Power Society at [www.ifps.org](http://www.ifps.org) for both the Job Performance and Written test.

## IFPS Connector & Conductor Review & Job Performance

Course Registration Code: Hyx\_ILT\_FPS-CC  
Duration: 1.5 Days

This one-and-a-half day course is appropriate for individuals who have been trained in the field of fluid power and need to sharpen their skills by achieving Fluid Power Connector & Conductor Certification. The Connector & Conductor certifications require a three (3)-hour job performance (hands-on) test and a three (3)-hour written test.

*Prerequisites:* IFPS has created a study manual for candidates who wish to prepare for the Connector & Conductor Certification exam. This course is a review session and students should prepare themselves by reviewing this manual prior to attending.

### Who Should Attend

Any fluid power professional involved in the selection, application, installation or sales of connector and components.

### Topics Covered

- Product Identification:
  - Hose and coupling Identification
  - Identifying threads and selecting the proper O-ring
- Assembly Component Selection:
  - S-T-A-M-P-E-D method for selecting proper tubing and fittings
  - Selecting abrasion protection
  - Converting English and metric units - pressure conversions
- Assembly Procedure and Operation
  - Measuring hose assemblies
  - Cutting and skiving hose
  - How to measure using a dial caliper or micrometer
  - Determining displacement angles
  - Cleaning of hose assemblies and cleanliness levels
  - Flaring tubing and brazing assemblies
  - Nomographic chart
- Related Topics:
  - Leakage safety
  - Fastener standards, specifications and markings
  - Basic fastener types, terminology, measurements and strength classes
  - Hose assembly routing tips

### IFPS Exam(s)

The corresponding three (3)-hour job performance (hands-on) test will follow the conclusion of the 1½-day review session on the afternoon of the 2nd day. The three (3)-hour written test will be offered at the same location on the following day after the job performance (hands-on) test.

Test registrations must be made through the International Fluid Power Society at [www.ifps.org](http://www.ifps.org) for both the Job Performance and Written test.

## IFPS Electronic Controls Specialists Review

Course Registration Code: Hyx\_ILT\_FPS-EC  
Duration: 4.5 Days

This four-and-a-half day course is appropriate for individuals who have been trained in the field of fluid power and electronics that need to sharpen their skills by achieving IFPS Electronic Controls Specialist Certification. Eaton's review is will help prepare students for the IFPS certification that is designed to review and test understanding, specification, and application of the full breadth of electronics used in the fluid power industry 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 of the electronics for both mobile and industrial fluid power equipment.

*Prerequisites:* IFPS has created a study manual for candidates who wish to prepare for the Electronic Controls Specialist exam. This course is a review session and students should prepare themselves by reviewing this manual prior to attending.

### Who Should Attend

Any fluid power professional involved in application, design or sales of hydraulic & Electrohydraulic systems.

### Topics Covered

- Fluid Power Systems
- Electronic and Electrical Solutions
- Input / Output Devices
- Applying Control Theory
- Interacting with Controllers
- Utilize Industrial Networks

### IFPS Exam

The three (3) hour written test will NOT be offered at the same location due to this review ending on a Friday. Students attending the review will should register for the exam at a time and location that best fits their schedule.

Test registrations must be made through the International Fluid Power Society at [www.ifps.org](http://www.ifps.org) for both the Job Performance and Written test.

## IFPS Hydraulic Specialists Review

Course Registration Code: Hyx\_ILT\_FPS-SP

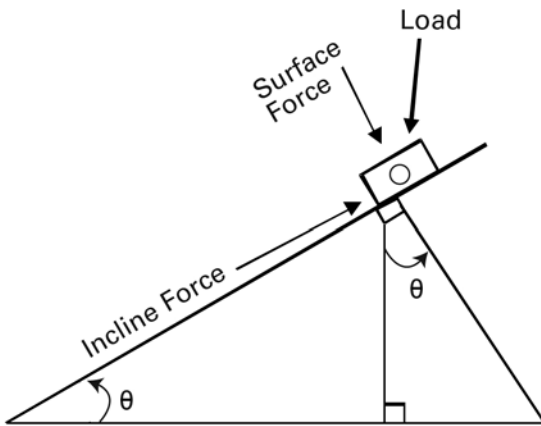
Duration: 3 Days

This three-day review course is appropriate for individuals who have been trained and work in the field of fluid power and need to sharpen their skills in various areas to become certified as an International Fluid Power Society Hydraulic Specialist. This course is a review; students should prepare themselves for the exam prior to attending.

*Prerequisites:* IFPS has created a study manual for candidates who wish to prepare for the Hydraulic Specialist exam. This course is a review session and students should prepare themselves by reviewing this manual prior to attending.

### Who Should Attend

Any fluid power professional involved in application, design or sales of hydraulic systems.



### Topics Covered

- Hydraulic Symbols
- Circuit Diagrams, Size Components, Recognizing Functions
- System Parameters
- Force, Distance, Work, Torque, Speed, Velocity and Power
- Load Calculations
- Motor Characteristics
- Hydraulic Pump and Motor Applications
- Valve Sizing for Hydraulic Circuits
- Electrohydraulics: Prop Valves & Amplifier Cards
- Accumulators, Intensifiers & Boosters
- Heat Exchangers & Fluid Conductors
- Filtration, Fluids and Lubricants
- Troubleshooting

### IFPS Exam

The three (3)-hour written test will be offered at the same location on the following day after the review.

Test registrations must be made through the International Fluid Power Society at [www.ifps.org](http://www.ifps.org) for both the Job Performance and Written test.

## Industrial Basics

Course Registration Code: Hyx\_ILT\_IB

Duration: 4.5 Days

This four-and-a-half-day course is a condensed version of the Industrial Hydraulics course that includes hands-on exercises that focuses on industrial component construction and operation, as well as on the role of the individual components in an operating industrial hydraulic system.

### Customized In-Plant Training

Eaton Hydraulics Training Services also has the ability and equipment to perform this training at a customer location. In addition, we can tailor the curriculum to specific applications and concepts of the customers choosing and incorporate a customer's schematics to enhance the employees understanding of their specific systems. For more information on customized in-plant training please see our Customized In-Plant Training section.

*Prerequisites:* None

### Who Should Attend

This course is appropriate for sales, design, maintenance, and repair personnel who work with industrial machinery.

### Topics Covered

- Hydraulic principles and fundamentals
- Reservoirs and fluids
- Gear, vane, and piston pumps
- Pressure controls
- Directional controls
- Flow controls
- Cylinders
- Vane and piston motors
- Contamination control
- Proportional and servo valves
- Cartridge valves
- Accumulators

### Completion Requirements

Students will be required to attend and participate in all sessions, exercises, and assignments. In addition, successful completion of this course will require successfully passing a written exam with a score of 70% or higher.

## Industrial Hydraulics

Course Registration Code: Hyx\_ILT\_IH  
Duration: 9.5 Days

This two-week course covers the fundamentals and principles of industrial hydraulics with the additional emphasis on hands-on exercises. The construction, operation, and uses of individual hydraulic components are a major focus of this program.

### Customized In-Plant Training

Eaton Hydraulics Training Services also has the ability and equipment to perform this training at a customer location. In addition, we can tailor the curriculum to specific applications and concepts of the customers choosing and incorporate a customer's schematics to enhance the employees understanding of their specific systems. For more information on customized in-plant training please see our Customized In-Plant Training section.

*Prerequisites:* None

### Who Should Attend

This course is appropriate for operations, sales, maintenance, and repair personnel.

### Topics Covered

- Hydraulic Principles and Fundamentals
- Basic System Troubleshooting
- Fluids
- Reservoirs
- Pumps and Pumping Principles
- Pressure Controls
- Directional Controls
- Flow Controls
- Cartridge Valves
- Contamination Control
- Filters
- Accumulators
- Gear, Vane, and Piston Motors
- Electrohydraulic Systems
- Hydraulic Circuits

### Completion Requirements

Students will be required to attend and participate in all sessions, exercises, and assignments. In addition, successful completion of this course will require successfully passing a written exam with a score of 70% or higher.



## Mobile Hydraulics

Course Registration Code: Hyx\_ILT\_MH  
Duration: 4.5 Days

This four-and-a-half-day course is a condensed version of the Industrial Hydraulics course but focuses solely on mobile hydraulic components and applications. In addition, this course will include hands-on exercises teaching students how to make hydraulic circuits, component tear-down exercises and the individual role of each component in a circuit.

### Customized In-Plant Training

Eaton Hydraulics Training Services also has the ability and equipment to perform this training at a customer location. In addition, we can tailor the curriculum to specific applications and concepts of the customers choosing and incorporate a customer's schematics to enhance the employees understanding of their specific systems. For more information on customized in-plant training please see our Customized In-Plant Training section.

*Prerequisites:* None

### Who Should Attend

This course is appropriate for operations, sales, maintenance, and repair personnel.

### Topics Covered

- Hydraulic Principles and Fundamentals
- Reservoirs and Fluids
- Actuators
- Fixed-Pump Principles
- Variable-Pump Principles
- Hydrostatic Transmissions
- Pressure Controls
- Directional Valves
- Flow Controls
- Contamination Controls
- Cartridge Valves
- Accumulators
- Mobile Hydraulic Circuits

### Completion Requirements

Students will be required to attend and participate in all sessions, exercises, and assignments. In addition, successful completion of this course will require successfully passing a written exam with a score of 70% or higher.



## Troubleshooting

Course Registration Code: Hyx\_ILT\_TS  
Duration: 4.5 Days

This Four-and-a-half-day course is designed for those individuals involved with troubleshooting hydraulic systems in the industrial environment. The objective of this course is to familiarize students with the proper techniques to perform systematic troubleshooting from symptom identification to fault isolation. Hands-on training is utilized to provide students the opportunity to perform troubleshooting techniques.

*Prerequisites:* Students should have completed either the Industrial Hydraulics, Industrial Basics, or equivalent training.

### Who Should Attend

This course is appropriate for application engineers, maintenance and repair personnel.

### Topics Covered

- Hydraulic Fundamentals
- Component Functions and Failures
- Graphic Symbology Review
- Circuit and Control Analysis
- Clamp and Work Circuits
- Contamination Control
- Diagnostic Instruments
- Systematic Troubleshooting Procedures

### Completion Requirements

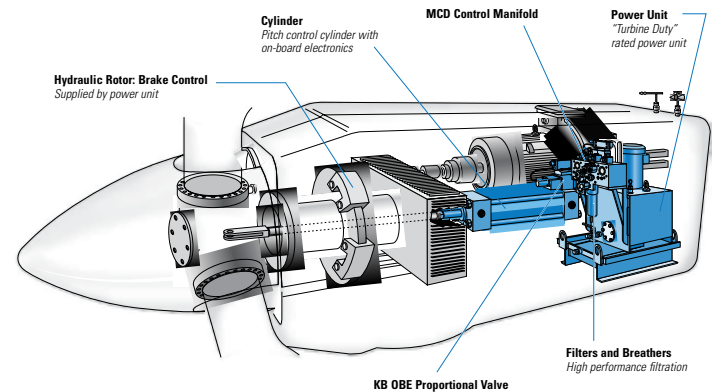
Students will be required to attend and participate in all sessions, exercises, and assignments. In addition, successful completion of this course will require successfully passing a written exam with a score of 70% or higher.



## Wind Turbine Fundamental Hydraulics

Course Registration Code: Hyx\_ILT\_WTFH  
Duration: 4.5 Days

This four and a half-day course emphasizes the fundamentals and principles of hydraulic systems used for wind turbine operation such as pitch control, yaw control, braking, and cooling/filtration systems. Focusing on component construction and operation, as well as on the role of the individual components in an operating hydraulic system, the student will come away with a solid foundation for future studies within the hydraulics industry.



*Prerequisites:* None

### Who Should Attend

This course is appropriate for sales and maintenance personnel who need to have a solid understanding of the operation of the hydraulics used in utility grade wind turbine operation. Almost half of all utility grade wind turbines installed today utilizes hydraulics as a central element of control.

### Topics Covered

- Hydraulic Principles and Fundamentals
- Graphic Symbology
- Hydraulic Fluids and Reservoirs
- Gear, Vane and Piston Pumps
- Pressure Controls
- Directional Controls
- Flow Controls
- Cylinders
- Hydraulic Motors
- Contamination Control
- Electrohydraulic Valves
- Screw-In Cartridge Valves
- Accumulators

### Completion Requirements

Students will be required to attend and participate in all sessions, exercises, and assignments. In addition, successful completion of this course will require successfully passing a written exam with a score of 70% or higher.



## CANbus Fundamentals

Course Registration Code: Hyx\_ADBPS\_CAN  
Duration: Self Paced

This on-line course emphasizes the fundamentals and principles of Controller Area Network communication protocol known as CANbus. The course, delivered in four separate modules, focuses on computer number systems, hardware connections, message formats, the CANbus Protocols and error handling methods along with associated messages. It is a good primer to familiarize learners with the CANbus Communication Standard in preparation for setting up a CANbus controlled system.

*Prerequisites:* None

### Who Should Attend

This course is appropriate for application designers and engineers, electronic technicians and system maintenance staff with appropriate electrical background.

### Topics Covered

- Electronic signal transmission
- Voltage vs. current signals
- Analog vs. digital signals
- Common number systems
- Signal transmission methods
- Transmission industry standards
- Communication buses and types of networks
- Message types
- CANbus transmission rates and cabling
- Message frame types
- Error handling and associated messages
- Higher level protocols

### Completion Requirements

Students will be required to study all modules, complete review questions and successfully complete a comprehensive final knowledge check to successfully complete this course. Certification will be awarded to students who have met all course completion requirements.

## INVEST: Interactive Vickers Electrohydraulic Systems Training

Course Registration Code: Hyx\_CURR\_INVEST  
Duration: Approximately 18 Months

INVEST is a home-study, web-based training program in Electrohydraulic Technology. This course was developed for sales personnel who needed to learn the basics of Power and Motion Control Technologies. INVEST is an 18-month program and is composed of seven major modules, each taking 2-3 months.

*Prerequisites:* None

### Who Should Attend

Sales personnel seeking to comprehend and troubleshoot basic electrical / electronic control circuits used in electrohydraulics. This course requires a considerable time commitment. See details below.

### Topics Covered

- Basic Electronics
- Electrical Machine Controls
- Proportional Valves & Amplifiers
- Servo Valves & Feedback Transducers
- Closed Loop Control Systems
- Motion Controllers
- Programmable Controllers

### Completion Requirements

INVEST is not a self-paced program. Students are required to study the materials and on average should anticipate spending 8-10 hours per week on INVEST studies. During the INVEST program, an instructor is available via phone, fax or e-mail during regular business hours to assist the student when necessary. Exams must be submitted by students on schedule. Students who fall behind schedule and cannot catch up are eliminated from the program.

# Make Your Choice

## Eaton's Hydraulics Group Training Services

## Aeroquip Fluid Conveying Product School Inside Sales – Level 200

Course Registration Code: Hyx\_ILT\_AFCPS  
Duration: 3 Days(Regional) 3.5 Days (Eaton Facility)

This course is offered in either a three-day or three-and-a-half day session in Maumee, OH, Eden Prairie, MN or remote locations. Sessions differ only with respect to location and hands-on equipment training opportunities. The three-and-a-half day session is conducted at Eaton’s Training Services facility in both Maumee, Ohio and Eden Prairie, MN and includes an emphasis on hands-on equipment training. The three-day session is conducted at regional locations and does not include any hands-on equipment training.

*Prerequisites:* None

### Who Should Attend

For authorized Aeroquip product distributors and Eaton employees only. This school is appropriate for all employees and principals of Eaton’s authorized Aeroquip product distributors. End customers may attend with prior approval from their Eaton Area Sales Manager.

### Topics Covered

- Hose construction and fitting design analysis
- Air-conditioning products for the truck and bus markets
- Authorized Synflex® products
- Hose and fitting selection
- Aeroquip brand technical and promotional literature
- Identification and sizing of threads, ports, adapters and fittings (SAE, BSP and metric)
- Product selection to meet customer needs
- Downtime reduction with Lifesaver™ fittings
- Selection of Quick Disconnect™ couplings and swivel joints
- Introduction to STC® connections
- MatchMate Plus™ crimp hose assembly system / Triple Crown
- FLOCS™ fast lube oil change system
- Flexmaster® joints
- Eaton’s line of brass fittings and valves
- Ermeto tube connection products
- Everflex® PTFE hose products
- Construction of hose assemblies with hand tools and assembly equipment
- Proper operation and maintenance of reusable and crimp assembly equipment
- Brazing of Lifesaver™ fittings
- Brass product assembly techniques

### Completion Requirements

Students will be required to attend and participate in all sessions, exercises, and assignments. In addition, successful completion of this course will require successfully passing a written exam with a score of 70% or higher.

## Aeroquip Advanced Product Specialist School Outside Sales – Level 300

Course Registration Code: Hyx\_ILT\_AAPSS  
Duration: 2 Days

This two-day school now includes expanded training on Aeroquip brand’s most popular products. New sessions include: Filtration, Boston® Air and Multipurpose Hoses, Synflex®, Everflex®, and Air Conditioning hose and fittings. Additional emphasis is placed on identifying foreign end connections, including how to locate parts using Eaton’s literature. This course meets the criteria stated in the Channel Compensation Resources (CCR) Program Manual, for Eaton Product Specialist.

*Prerequisites:* Prior to enrollment the student must have a current Aeroquip 200 Level Certification.

### Who Should Attend

For authorized Aeroquip distributors and Eaton employees only. Aeroquip Advanced Product Specialist School is recommended for experienced Aeroquip distributor inside and outside sales personnel.

### Topics Covered

- Role of the product specialist
- Synflex and Everflex hose and fittings
- Tour of Eaton’s fluid power hose test facility
- Boston air and multipurpose hoses
- In-depth discussion on Aeroquip’s air-conditioning products
- Overview of Eaton’s filtration products
- Extensive assembly equipment review with hands-on assembly practice
- New and upcoming products overview
- Extensive hands-on identification of metric, british, french and japanese thread systems
- Walterscheid™ tube fittings and adapters
- Product identification techniques

### Completion Requirements

Certification as an “Aeroquip Certified Sales Specialist” requires the student to attend and participate in all sessions, demonstrate proficiency in the course topics, successfully complete a written exam with a score of 70% or higher.



## Aeroquip Product Application Specialist School Application Specialist – Level 400

Course Registration Code: Hyx\_ILT\_APASS  
Duration: 2 Days

This new two-day school is designed to illustrate the markets and applications into which Aeroquip products are installed. Included in the training will be product hands-on identification techniques, procedures for troubleshooting leaks, hose routing techniques, methods to analyze hose failures and how to identify, assemble and install Eaton's Aeroquip products in real life applications.

*Prerequisites:* Prior to enrollment the student must have a current Aeroquip 300 Level Certification.

### Who Should Attend

For authorized Aeroquip distributors and Eaton employees only. Eaton's Aeroquip Product Application School is recommended for experienced Aeroquip distributor inside and outside sales personnel and is required for individuals who are applying for Eaton's Application Specialist Certification.

### Topics Covered

- Markets and applications for Aeroquip products
- Leaks, causes and cures for hose and fittings
- Hose routing techniques
- Analyzing hose failures
- Parts identification exercises
- Product identification techniques
- Determine Eaton's Aeroquip product offerings based on application criteria

### Completion Requirements

Certification as an "Eaton Aeroquip Product Application Specialist" requires the student to attend and participate in all sessions, demonstrate proficiency in the course topics and successfully complete a written exam with a score of 70% or higher.



## Weatherhead Fluid Conveying Product School Inside Sales – Level 200

Course Registration Code: Hyx\_ILT\_WFCPS  
Duration: 3 Days(Regional) 3.5 Days(Eaton Facility)

This course is offered in either a three-day or three-and-a-half day session in Maumee, OH, Eden Prairie, MN or remote locations. Sessions differ only with respect to location and hands-on equipment training opportunities. The three-and-a-half day session has a special emphasis on assembly equipment training. The three-day session is conducted at regional locations and does not include any hands-on equipment training.

*Prerequisites:* None

### Who Should Attend

For authorized Weatherhead product distributors and Eaton employees only. This school is appropriate for all employees and principals of Eaton's authorized Weatherhead product distributors. End customers may attend with prior approval from their Eaton Area Sales Manager.



### Topics Covered

- Hose construction
- Hose identification basics
- Proper hose and hose end selection
- Weatherhead technical and promotional literature
- Weatherhead numbering systems
- Coll-O-Crimp® system features
- Sealing method identification basics
- Imperial and metric thread specifications
- Proper tube fitting selection
- Introduction to STC® connectors
- Quick Disconnect™ couplings and swivel joints
- Flexmaster® joints
- FLOCS™ fast lube oil change system

### Completion Requirements

Students will be required to attend and participate in all sessions, exercises, and assignments. In addition, successful completion of this course will require successfully passing a written exam with a score of 70% or higher.

## Weatherhead Advanced Product Specialist School Outside Sales – Level 300

Course Registration Code: Hyx\_ILT\_WAPSS  
Duration: 2 Days

Eaton's Weatherhead Advanced Product Specialist School has been redesigned to add more in-depth product coverage. This two-day school now includes expanded training on Eaton's most popular Weatherhead products. New sessions include: Filtration, Boston Air and Multipurpose Hoses, Synflex, Everflex, and Air Conditioning hose and fittings. Additional emphasis is placed on identifying foreign end connections, including how to locate parts using Eaton's literature.

*Prerequisites:* Prior to enrollment the student must have a current Weatherhead 200 Level Certification.

### Who Should Attend

For Eaton's authorized Weatherhead brand distributors and Eaton employees only. Eaton's Weatherhead Advanced Product Specialist School is recommended for experienced inside and outside sales personnel of Weatherhead product distributors.

### Topics Covered

- Role of the product specialist
- Synflex and everflex hose and fittings
- Tour of the Eaton's hose test facility
- Boston air and multipurpose hoses
- In-depth discussion on Eaton's Weatherhead air-conditioning products
- Overview of Eaton's filtration products
- Extensive assembly equipment review with hands-on assembly practice
- Overview of new and upcoming products
- Extensive identification of metrics, british and japanese thread systems
- Walterscheid™ tube fittings and adapters
- Website tools review
- Product identification techniques

### Completion Requirements

Certification as an Eaton Weatherhead Product Specialist requires the student to attend and participate in all sessions, demonstrate proficiency in the course topics, successfully complete a written exam with a score of 70% or higher.



## Weatherhead Product Application Specialist School Application Specialist – Level 400

Course Registration Code: Hyx\_ILT\_WPASS  
Duration: 2 Days

This two-day school is designed to illustrate the markets and applications into which Eaton's Weatherhead products are installed. Included in the training will be hands-on product identification techniques, procedures for troubleshooting leaks, hose routing techniques, methods to analyze hose failures and how to identify, assemble and install Eaton's Weatherhead products in real life applications.

*Prerequisites:* Prior to enrollment the student must have a current Weatherhead 300 Level Certification.

### Who Should Attend

For Eaton's authorized Weatherhead brand distributors and Eaton's employees only. Eaton's Weatherhead Product Application Specialist School is recommended for experienced inside and outside sales personnel of Weatherhead product distributors.



### Topics Covered

- Markets and applications for Weatherhead products
- Leaks, causes and cures for hoses and fittings
- Product identification techniques
- Hose routing techniques
- Determine Eaton's Weatherhead product offerings based on application data
- Analyzing hose failure
- Parts identification exercises

### Completion Requirements

Certification as an Eaton Weatherhead Product Application Specialist requires the student to attend and participate in all sessions, demonstrate proficiency in the course topics, successfully complete a written exam with a score of 70% or higher.

## Aeroquip Navy Flex Hose School

Course Registration Code: Hyx\_ILT\_NFHS

Duration: 2 Days

For over 50 years Aeroquip has been providing marine flexible hose products for U.S. Navy ships and submarines. In this two-day course, Eaton continues the tradition of providing the highest quality flex hose training available for Eaton customers.

*Prerequisites:* None

### Who Should Attend

This school is designed for personnel whose major responsibility is to know how to specify, recommend and work with flexible hose for shipboard application.

### Topics Covered

- Shipboard piping applications
- Terminology
- Technical literature and catalogs
- Fitting assembly
- Construction & styles
- Assembly techniques and tips
- Component identification for
- In-depth review of hose safety and integrity and fitting MIL-Specs
- Piping port and connector identification
- U.S. navy technical directive S6430-AE-TED-010

### Completion Requirements

Students will be required to attend and participate in all sessions, exercises, and assignments. In addition, successful completion of this course will require successfully passing a written exam with a score of 70% or higher.



## Char-Lynn Service School

Course Registration Code: Hyx\_ILT\_CLSS  
Duration: 3 Days

This three-day service and repair school covers all of Eaton's Char-Lynn low-speed, high-torque motors and steering control units. Eaton's gear pumps and motors are also reviewed. This school combines both classroom and hands-on lab time. First, students will review the principle of operation, product catalog information, parts and service bulletins in a classroom setting. They will then learn first-hand how to tear down, repair and reassemble each of the different products.

*Prerequisites:* None

### Who Should Attend

This class is for Eaton Char-Lynn brand authorized distributors and Eaton employees only. This class is recommended for sales & service personnel who are sale and/or repair Char-Lynn products.

### Topics Covered

- Product Function and Identification
- Model Coding
- Disassembly and Reassembly
- Repair Kits
- Performance data
- Total servicing
- Troubleshooting

### Completion Requirements

Students will be required to attend and participate in all sessions, exercises, and assignments. In addition, successful completion of this course will require successfully passing a written exam with a score of 70% or higher.



## Warranty Center Failure Analysis

Course Registration Code: Hyx\_ILT\_FA  
Duration: 3 Days

This three-day failure and warranty analysis class focuses on typical causes of component failures, warranty analysis, product testing requirements and a review of how to process warranty claims. This course incorporates both hands-on and lecture to ensure students get a good understanding of how to analyze component failures. In addition to understanding product construction, students will learn to determine the root cause of failure and identify the failure modes caused by contamination, improper machining, bad material, and much more. Students will also learn how to identify the root cause of smearing, seizing, sticking and galling. The products covered in class include, piston, vane, and gear pumps, directional control valves, low-speed high torque motors, light duty hydrostatic transmissions and steering valves.

*Prerequisites:* Industrial Hydraulics, Industrial Basics, Mobile Hydraulics or equivalent. Complete all level 200 Eaton certifications for Vickers, Eaton, Char-Lynn product school. We also recommend students attend the available Eaton and Char-Lynn service schools.

### Who Should Attend

For Eaton's Authorized Warranty Center personnel only. This course is intended for technical service and repair personnel who work for Eaton's Authorized Warranty Centers.

### Topics Covered

- Failures covered by warranty
- Failures caused by contamination
- Failures caused by bad material
- Failures that cause leakage
- Failures caused by improper assembly
- Failures that cause parts to break
- Root cause of failures that show signs of smearing, seizing, sticking or gulling.
- Failure diagnoses
- Product test procedures
- Warranty analysis program
- Identify product manufacturing locations
- Best practices for populating a warranty reimbursement form

### Completion Requirements

Students will be required to attend and participate in all sessions, exercises, and assignments. In addition, successful completion of this course will require successfully passing a written exam with a score of 70% or higher.



## Closed Circuit Piston Products Service School

Course Registration Code: Hyx\_ILT\_CCPPSS  
Duration: 2.5 Days

This two-and-a-half day service and repair school covers all of Eaton's light, medium and heavy-duty closed circuit hydrostatic pumps, motors, transmission, and transaxle products. This school combines both classroom and hands-on lab time. First, students will review the principle of operation, product catalog information, parts and service bulletins in a classroom setting. They will then learn first-hand how to tear down, repair and re-assemble each of the different products.

*Prerequisites:* None

### Who Should Attend

This class is for Eaton customers, authorized distributors and Eaton employees only. This class is recommended for sales & service personnel who are selling and/or repair Eaton's Hydrostatic products.

### Topics Covered

- Basic hydrostatic closed circuit
- Product function and identification
- Model & Assembly Coding
- Disassembly & Reassembly
- Troubleshooting
- Total servicing
- Controls



### Completion Requirements

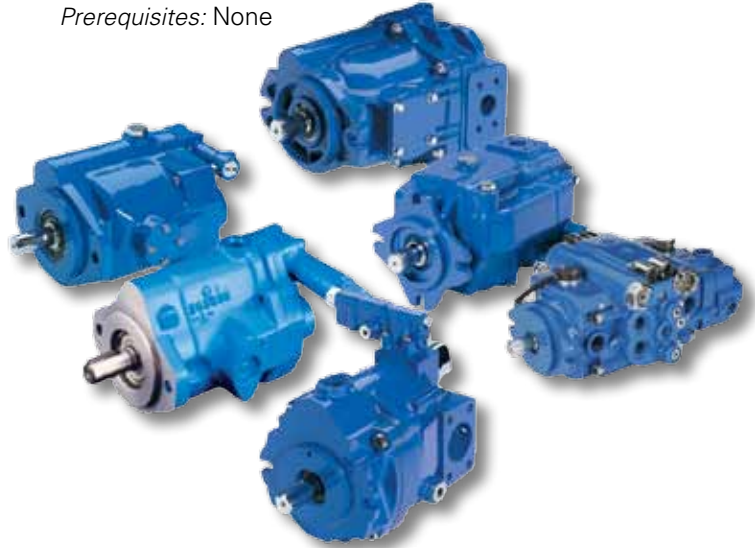
Students will be required to attend and participate in all sessions, exercises, and assignments. In addition, successful completion of this course will require successfully passing a written exam with a score of 70% or higher.

## Open Circuit Piston Products Service School

Course Registration Code: Hyx\_ILT\_OCPPSS  
Duration: 2 Days

This two-day service and repair school covers all of Eaton's open circuit piston pump products. This school combines both classroom and hands-on lab time. Students will review the principle of operation, product catalog information, parts and service bulletins in a classroom setting. Learn first-hand how to tear down, repair and reassemble each of the different products.

*Prerequisites:* None



### Who Should Attend

This class is for Eaton customers, authorized distributors and Eaton employees only. This class is recommended for sales & service personnel who are selling and/or repair Eaton's Open Circuit Piston products.

### Topics Covered

- Open circuit piston pump & motor principle of operation
- Product function and identification
- Model and Assembly Coding
- Disassembly & Reassembly
- Open circuit controls
- Performance data
- Total servicing
- Troubleshooting

### Completion Requirements

Students will be required to attend and participate in all sessions, exercises, and assignments. In addition, successful completion of this course will require successfully passing a written exam with a score of 70% or higher.

## Eaton's F(x) Certification

Course Registration Code: Hyx\_ILT\_CFX  
Duration: 3 Days

Eaton offers this three-day course for students looking to certify for the Eaton CONTROL F(x) software, EFX controllers, and the VFX / SFX panel mounted display units. Functions and features of both the programming software and target hardware are covered. The IEC 61131-3 standard is introduced and many of the language capabilities are demonstrated. Attendees will create, download, and test hands-on programs with real hardware. Debugging and visualization capabilities within CONTROL F(x) are addressed as well. Each attendee will receive a license for CONTROL F(x), an EFX 1612J controller, and a first-year paid support contract with this course. A comprehensive exam will be given at the end of the course and those that successfully complete the exam will be awarded Eaton's F(X) certification.

*Prerequisites:* None

### Who Should Attend

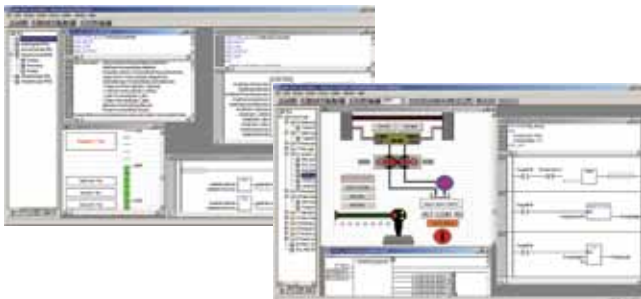
This course is appropriate for personnel involved in design and/or creation of electrohydraulic systems. A basic understanding of plc's or microprocessors as well as basic familiarity with programming languages is necessary as a prerequisite to attending.

### Topics Covered

- CONTROL F(x) user interface
- IEC 61131-3 standard
- EFX controller configuration
- Ladder diagram programming
- Using functions and function blocks
- Function block library overview
- Creating user defined function blocks
- Sequential function chart programming
- Structured text programming
- Continuous function chart programming
- Compiling / downloading / debugging programs
- Logic simulation and creating visualizations
- Introduction to VFX and SFX controllers
- Demonstration of VFX using the panel mounted displays

### Completion Requirements

Students will be required to attend and participate in all sessions, exercises, and assignments. In addition, successful completion of this course will require successfully passing a written exam with a score of 70% or higher.



## IEC 61131-3 Certification

Course Registration Code: Hyx\_ILT\_IEC  
Duration: 1 Day

As an authorized training center by PLCopen, Eaton offers this one-day add on course after the completion of Eaton F(X) certification which covers the remainder of the information that is required for certification for the IEC61131-3 Standard. Each attendee will earn certification in the IEC61131-3 programming standard upon the successful completion of a comprehensive exam at the end of the course.

*Prerequisites:* Eaton's F(x) Certification.

### Who Should Attend

This course is appropriate for personnel involved in design and/or creation of electrohydraulic systems who are required to be IEC 61131-3 certified.

### Topics Covered

- Review IEC 61131-3 standard
- Target configurations, data types, and structures
- Variables, functions, and function block development
- Instruction list and structured text
- Compiling / downloading/ dunning drograms
- Logic simulation and debugging
- Creating visualizations and tasks

### Completion Requirements

Students will be required to attend and participate in all sessions, exercises, and assignments. In addition, successful completion of this course will require successfully passing a written exam with a score of 70% or higher.



Eaton's F(x) Certification



# Eaton's Power & Motion Control Product Certifications

Each course in this category is an e-Learning activity available in Eaton University via Customer Connect and requires a brand authorization for an Eaton distributor to be able to register.

## 200 Level Certifications

All personnel working towards a 200 level certification for a specific Eaton Brand should expect to be able to perform and/or explain the following:

- Product offerings and features
- Where to locate catalog information
- Model coding based on given criteria
- Interpreting catalog tables

Below is a list of all Eaton 200 Level Brand Course Curriculums: Designed to help students study for the actual certification assessment, and the respective Certification Assessment Course Registration Code in Eaton University.

### Eaton's Char-Lynn Brand

#### Char-Lynn Inside Sales Level 200 Study Courses Hyx\_CURR\_CL200C

Char-Lynn G/G Motor Products Course  
Char-Lynn Steering Control Units Course

#### Char-Lynn Inside Sales Certification Assessment Level 200 Hyx\_ADBPS\_CL200AC

### Eaton's Brand

#### Eaton Inside Sales Level 200 Study Courses Hyx\_CURR\_ET200C

Eaton Gear Pump & Motor Products Course  
Eaton Light Duty Hydrostatic Products Course  
Eaton Medium Duty Hydrostatic Products Course  
Eaton Heavy Duty Hydrostatic Products Course  
Eaton Mobile Valve Products Course

#### Eaton Inside Sales Certification Assessment Level 200 Hyx\_ADBPS\_ET200AC

### Eaton's Hydro-Line Brand

#### Hydro-Line Inside Sales Level 200 Study Course Hyx\_CSAV\_HL201C

#### Hydro-Line Inside Sales Certification Assessment Level 200 Hyx\_ADBPS\_HL200AC

### Eaton's Vickers Brand

#### Vickers Inside Sales Level 200 Study Courses Hyx\_CURR\_VK200C

Vickers Piston Pump Products Course  
Vickers Vane Pump Products Course  
Vickers Industrial Valve Products Course  
Vickers Screw-in Cartridge Valve Products Course  
Vickers Pro-Active Maintenance Products Course

#### Vickers Inside Sales Certification Assessment Level 200 Hyx\_ADBPS\_VK200AC

### Eaton's Vickers Cylinder Brand

#### Vickers Cylinder Products Level 200 Study Course Hyx\_CSAV\_VKC206C

#### Vickers Cylinder Inside Sales Certification Assessment Level 200 Hyx\_ADBPS\_VKC200AC

## 300 Level Certifications

All Personnel working towards a 300 level certification for a specific Eaton Brand should expect to be able to do all the 200 Level objectives in addition to:

- Features and benefits of specific Eaton product offerings
- Key application selection criteria
- Major competitor names
- Key selling differentiators
- Appropriate product selection based on application criteria

Below is a list of all the Eaton 300 level Course Curriculums: Designed to help students study for the actual certification assessments, and the respective Certification Assessment Course Registration Code in Eaton University.

### Eaton's Char-Lynn Brand

#### Char-Lynn Outside Sales Level 300 Study Courses Hyx\_CURR\_CL300C

Char-Lynn G/G Motor Products Course  
Char-Lynn Steering Control Units Course

#### Char-Lynn Outside Sales Certification Assessment Level 300 Hyx\_ADBPS\_CL300AC

### Eaton's Brand

#### Eaton Outside Sales Level 300 Study Courses Hyx\_CURR\_ET300C

Eaton Light Duty Hydrostatic Products Course  
Eaton Medium Duty Hydrostatic Products Course  
Eaton Heavy Duty Hydrostatic Products Course  
Eaton 420 Pumps Course

#### Eaton Outside Sales Certification Assessment Level 300 Hyx\_ADBPS\_ET300AC

### Eaton's Hydro-Line Brand

#### Hydro-Line Cylinders Products Level 300 Study Course Hyx\_CSAV\_HL300C

#### Hydro-Line Outside Sales Certification Assessment Level 300 Hyx\_ADBPS\_HL300AC

### Eaton's Vickers Brand

#### Vickers Outside Sales Level 300 Study Courses Hyx\_CURR\_VK300C

Vickers Piston Pump & Motor Products Course  
Vickers Vane Pump Products Course  
Vickers Industrial Valve Products Course  
Vickers Screw-in Cartridge Valve Products Course  
Vickers Pro-Active Maintenance Products Course

#### Vickers Outside Sales Certification Assessment Level 300 Hyx\_ADBPS\_VK300AC

### Eaton's Vickers Cylinder Brand

#### Vickers Cylinder Products Level 300 Study Course Hyx\_CSAV\_VKC306C

#### Vickers Cylinder Outside Sales Certification Assessment Level 300 Hyx\_ADBPS\_VKC300AC

## 400 Level Certifications

All personnel working towards a 400 Level Certification for either the mobile or industrial markets Eaton services should expect to be able to do all the 200 level, 300 level objectives in addition to:

- Understand correct methods for properly sizing components
- How to optimize energy use within a system
- Component selection, sizing and mounting for hydraulic circuits
- Strong Analytical and mathematic skills

Below is a list of the Eaton 400 level certification assessments available online via Eaton University.

#### Eaton's Mobile Hydraulics 400 Level Certification Mobile Application Knowledge Hyx\_CSAV\_MH401A

#### Eaton's Industrial Hydraulics 400 Level Certification Industrial Application Knowledge Hyx\_CSAV\_IA402A

Eaton is a manufacturer of fluid power components, and has, for over 65 years, served as a market leader in fluid power education beginning as the Vickers and Aeroquip Training Centers and then continuing as Eaton. We are able to adapt our programs and teaching style to best suit the needs of our customer. This is not a "commercial" program used to promote our Eaton products. These training programs are designed to teach the technology utilizing the latest in presentation technology, projection systems, and animation.

### Eaton Hydraulics Training Center

We would like to extend an invitation to visit our training facilities in Eden Prairie, Minnesota and in Maumee, Ohio. Eaton Corporation's training facilities feature: state of the art, audio-visual technology and the best "hands on" training lab in the country. The student has a chance to learn the theory in the classroom and apply what they learned in the lab. We use a variety of fluid power components for the student to disassemble, inspect and reassemble to help reinforce our classroom training. We also maintain a laboratory of Electro-Hydraulic trainers that are used in teaching the application of servo and proportional valves.

### Eaton Hydraulics Training Services Staff

A training facility is only part of what is needed for the student to enjoy a great training experience. Eaton's Hydraulic Training Services is comprised of dedicated professionals who have the knowledge that comes from years of experience in design, application and repair of fluid power components and systems. The teaching staff averages over twenty years of fluid power experience. They are dedicated to providing the best program available and continually update the reference and teaching materials as they discover new methods of illustrating these important control concepts. The staff of Eaton's Hydraulic Training Services, past and present, wrote many of the textbooks currently used in fluid power education throughout the world.

*"If I have seen further, it is because I was standing on the shoulders of giants."*

- Isaac Newton, circa 1675

### Value

Your students receive the best value in training. Quality training is delivered by one of the world's largest and respected manufacturer of hydraulic components. Many professionals in our industry have displayed their Vickers/Eaton Certificates of Completion, from the training center, on their wall, with pride.

### Pricing

The pricing subject to the materials needed / requested, location and class size of (12) students. This class size has proven to be the most effective. Keeping the student to teacher ratio low results in a better learning experience as the instructor can more closely interact with the students.

## Electrohydraulic Maintenance & Troubleshooting

Duration: Typically 3 Days

This three-day course emphasizes basic electrical principles, theory and applications of electrohydraulic components including amplifiers and valves in a closed loop system. Students will learn operations and applications of proportional and servo valves as well as how to tune various amplifier cards. Typically done as a three-day program this course can be modified to fit specific customer applications and designs to include basic troubleshooting of electrohydraulic systems.

### Type of Personnel to Benefit

Sales and maintenance personnel are encouraged to attend this training to become more familiar with the operations and applications of closed loop systems. Maintenance personnel will receive extra benefits from the hands on exercises that accompany this training.

### Topics Covered

- Pascal's Law, Bernoulli's Principle, Ohm's Law, Kirchhoff's Law
- Voltage, Current, Resistance Concepts and Measurements
- Amplifier Theory, Types, Operations
- Types of Control Systems: Open & Closed Loop
- Proportional Valves Theory
- Proportional controls and valves
- Proportional Solenoids
- Feedback / Non-Feedback Valves
- PID Theory, Control, Operations & Characteristics
- Servo Valves: Types and Operations
- Servo Amplifiers: Operations, Adjustments & Effects
- Closed Loop Systems: Concepts, Types & Operations
- Alignment, Tuning & Troubleshooting Closed Loop Systems

### Completion Requirements

Students will be required to attend and participate in all sessions, exercises, and assignments. In addition, successful completion of this course will require successfully passing a written exam with a score of 70% or higher.





## Fundamental Hydraulics

Duration: 3 Days

This three-day course emphasizes the fundamentals and principles of hydraulic system operation. Students will learn how power is transmitted in a hydraulic system from a reservoir to the actuator. The course focuses on component construction and operation, as well as the role of the individual components used in a hydraulic system. Fundamental Hydraulics is deployed as an in-plant or regional training only. Contact Training Services for details or refer to our website: <http://web.fluidpower.eaton.com>

### Type of Personnel to Benefit

This course is appropriate for sales and customer service personnel. Maintenance and repair personnel are encouraged to take the Mobile Hydraulics course, the Industrial Basics course, or the Industrial Hydraulics course (these courses include hands-on exercises).

### Topics Covered

- Hydraulic principles and fundamentals
- Graphic Symbology
- Reservoirs and fluids
- Fluid Conductors
- Gear, vane, and piston pumps
- Pressure controls
- Directional controls
- Flow controls
- Cylinders
- Vane and piston motors
- Contamination control
- Cartridge valves
- Accumulators

### Completion Requirements

Students will be required to attend and participate in all sessions, exercises, and assignments. In addition, successful completion of this course will require successfully passing a written exam with a score of 70% or higher.



## Hydraulic Troubleshooting

Duration: Typically 3 Days

This three-day course is designed for those individuals involved with troubleshooting hydraulic systems in the industrial environment. The objective of this course is to familiarize students with the proper techniques to perform systematic troubleshooting from symptom identification to fault isolation. Hands-on training is utilized to provide students the opportunity to perform troubleshooting techniques. Typically done as a three-day program this course can be modified to fit specific customer applications and designs to include basic troubleshooting of electrohydraulic systems.

*Prerequisites:* Fundamental Hydraulics, Industrial Basics, Industrial Hydraulics or equivalent training.

### Type of Personnel to Benefit

This course is appropriate for application engineers, maintenance and repair personnel. Maintenance and repair personnel are also encouraged to take the Mobile Hydraulics course, the Industrial Basics course, or the Industrial Hydraulics course (these courses include hands-on exercises).



### Topics Covered

- Review of Hydraulic Fundamental Principles
- Review of Graphic Symbology used in Hydraulic Schematics
- Contamination Control
- Component Functionality and Failure Analysis of:
  - Pressure Controls
  - Flow Controls
  - Directional Controls
  - Pumps
  - Actuators
- Basic Electrical Ladder Logic
- Circuit and Control Analysis
- Troubleshooting Problems Systemically
- Bar Trim & Injection Molding Troubleshooting

### Completion Requirements

Students will be required to attend and participate in all sessions, exercises, and assignments. In addition, successful completion of this course will require successfully passing a written exam with a score of 70% or higher.

# Training Products - Overview

Eaton Hydraulics Training Services has long been a leader in the Hydraulics Training market for textbooks, cutaways and simulators. Our full line of textbooks, multimedia and other materials give instructors a turn-key solution to developing an entire curriculum from scratch or updating their existing content.



www.hydraulicsliteraturestore.com

## Order & Shipping Policy

Orders placed online at [www.hydraulicsliteraturestore.com](http://www.hydraulicsliteraturestore.com) must be by MasterCard, VISA or Purchase Order. In addition to being able to place orders online via our ecommerce store, Eaton Hydraulics Training Services will also accept orders via fax. Faxed orders must be by Purchase Order only and your company must have an established line of credit with Eaton Hydraulics, LLC.

To avoid delays in order processing, Purchase Orders need to have:

- Bill To / Ship To Address
- Phone Number
- Name of Billing & Shipping Contact
- Item Number and Quantity
- Eaton Customer Account Number

Eaton Hydraulics typically has all products (except simulators and cutaways) in stock at all times. Most orders received prior to 1:00pm EST typically will ship the same day, depending on quantity. However, shipments can be delayed around certain holidays (i.e. Memorial Day, Independence Day, Labor Day, Thanksgiving and Christmas)

Shipping and handling will be charged and added to all invoices as estimated by the ecommerce store. If a purchase order is faxed Eaton will estimate the shipping charges via FedEx and add the estimated shipping charges to a customer's invoice.

If a customer prefers to use their preferred carrier for shipping, the carriers name and valid customer account number must be provided on the order. If a customer does not provide their preferred carrier and account number Eaton will use the ecommerce store estimate or FedEx estimate and add the cost to the invoice.

International shipments will follow the same procedures as noted above. In addition, the customer will be responsible for paying the duties and taxes on their shipments. Eaton will not attempt to estimate these charges.

## Discount Policy

Eaton Hydraulics Training Services offers a discount on specific items based on quantity orders. A 25% discount will automatically be applied to the following items if a quantity of 6 or more are ordered per item:

- Industrial Hydraulics Manual 5th Edition 2nd Printing
- Mobile Hydraulics Manual 2nd Edition
- Closed Loop Electrohydraulics Systems Manual 2nd Edition
- Bird Bones & Sludge: Comprehensive Guide to Filtration

## Return Policy

Only the following items qualify for return:

- Industrial Hydraulics Manual 5th Edition 2nd Printing
- Mobile Hydraulics Manual 2nd Edition
- Closed Loop Electrohydraulics Systems Manual 2nd Edition
- Bird Bones & Sludge: Comprehensive Guide to Filtration

Shipments of manual returns must include written authorization from Eaton Hydraulics Training Services to be accepted for credit.

*Return Request must be made within 181 days of invoice date.*

To receive written authorization to return manuals:

- Manual return request must be from a paid invoice.
- Manuals must be in "like new" condition to be accepted and credited.
- Return requests for damaged manuals must be made within 15 days of the shipment date.
- Return Request must be submitted in writing (via mail, fax or email) and include:

- Number of books to be returned.
- Eaton invoice number.
- Customer PO number or method of payment
- Reason for return
- Complete customer and contact information
- Fax, Phone, Address

All items must be returned to the address noted on the "Authorization to Return" form. Failure to return materials to this address will delay issuance of credit. If P.O.D. is unable to be provided, the credit will NOT be authorized.

All authorized manual returns must include a copy of the "Authorization to Return" form.

Customer is responsible for return shipping charges.

Books **MUST** be bubble wrapped, lying cover/back down in the box in a tight fitting box. Books received in "like new" condition will receive full credit less the Restocking fee. Please note your credit amount if these instructions are followed. No credit issued for books received damaged.

All manual returns meeting these requirements will result in a Credit Memo being issued to the customer account, less a 25% re-stocking fee (Based on list price, not discount price). Refund checks will only be issued on request.

## HTS-2 Hydraulics Training System

Eaton's Training Services newly redesigned Hydraulic Training System (HTS-2) hydraulic trainer is based on many years of instructional experience and our previous, highly acclaimed designs. This fluid power training simulator is designed to ensure that those involved with the study of hydraulics have the most cost effective, hands-on method of presenting a practical demonstration of the principles taught within the classroom. The HTS-2 unit has been designed, built and is exclusively available through the Eaton Hydraulics Group Training Services department with a 1 year limited warranty.

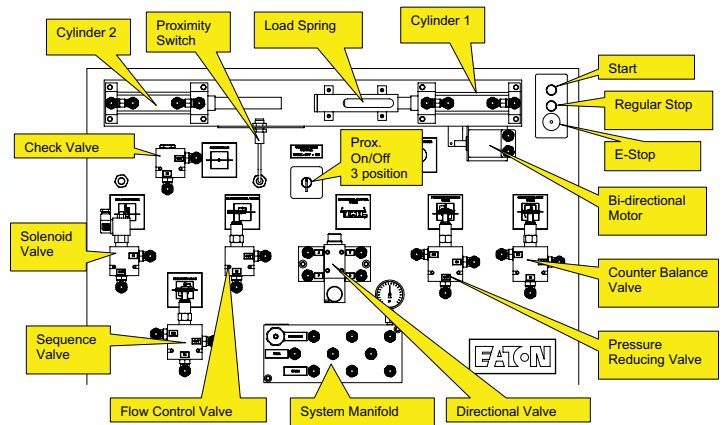
The HTS-2 is a dual operator station simulator with a central power unit that supplies one or both sides to accommodate up to 4 students at a time. The power unit is capable of supplying a total flow of 3 gpm at 500 psi and will operate on a standard 120VAC 15 amp lighting circuit.

The components mounted on each panel are representative of those found in today's hydraulic applications and allow the students to visually reinforce the learning concepts. Each HTS-2 comes with a detailed instructor guide that explains the exercises, provides a pictorial guide to ensure proper assembly and a video demonstrating the proper performance of each exercise.

Components can be easily connected together through flexible hoses and leak-free quick disconnects to configure many variations of basic hydraulic circuits which reinforce the theory and principles of operation taught in class. Each operator station panel is equipped with the following hydraulic components:

- Directional control valve – lever operated, 4-way, three position, tandem center
- Sequence valve
- Pressure reducing/relieving valve
- Check valve
- Pressure compensated flow control valve
- Counterbalance valve
- Normally open 2-position solenoid valve
- Two cylinders - one equipped with adjustable proximity switch and another equipped with resistive spring load
- Fixed Volume Vickers V10 Vane Pump
- Pressure gages
- 2 Plumbing tees

Using the HTS-2, students will become familiar with the principles of aeration and cavitation, sequencing circuits, operation of components in series and parallel, flow control characteristics and types of applications, hydraulically counterbalancing an actuator and many other fundamental concepts.



**Contact Eaton's Hydraulics Training Services to Order:**

Phone: 800-413-8809

Fax: 952-294-2080

Email: [hydraulicstraining@eaton.com](mailto:hydraulicstraining@eaton.com)

Web: [www.hydraulicsliteraturestore.com](http://www.hydraulicsliteraturestore.com)

## PETS-II: Portable Electrohydraulic Training Simulator

Eaton's Training Services newly redesigned Portable Electrohydraulic Training Simulator (PETS-II) is based on many years of instructional experience and our previous, highly acclaimed designs. This fluid power training simulator is designed to ensure that those involved with the study of electrohydraulics have the most cost effective, hands-on method of presenting a practical demonstration of the principles taught within the classroom. The PETS-II unit has been designed, built and is exclusively available through the Eaton Hydraulics Training Services department with a 1 year limited warranty.

The PETS-II is a portable desktop simulator with a compact power unit that supplies flow to the directional control valve in order to accommodate up to 2-3 students at a time. The power unit is capable of supplying a total flow of 0.25 gpm at 200 psi and will operate on a standard 120VAC 15 amp lighting circuit.

The components mounted on each panel are representative of those found in today's hydraulic applications and allow the students to visually reinforce the learning concepts. Each PETS-II unit comes with a detailed instructor guide that explains the exercises and provides a pictorial guide to ensure proper assembly.

The PETS-II unit comes complete with the following components:

- Motor/Pump with 1 Liter Tank, 0.25GPM pump at 300 psi
- Extruded Aluminum Enclosure with carrying handles
- Non-feedback Proportional Directional Control Valve
- 7" Hydraulic Cylinder
- 5K Ohm Linear Potentiometer (Cylinder Position Feedback)
- 5K Ohm 10 Turn Command Potentiometer on the front Panel
- 3 Push Button Switches on the front panel for enable, and step command signals
- DIN-Rail mounted Eaton ELC programmable Controller with Digital and Analog I/O
- DIN-Rail Mounted PID Amplifier
- Patch Cord Set to connect proportional lab experiments

Using the PETS-II unit, students will become familiar with the principles of Electrohydraulic control of position, velocity and the electrical wiring, tuning, and troubleshooting of the proportional amplifier. The lab experiments include both open and closed loop control of the cylinder position or velocity. Students will wire the proportional amplifier and adjust the Gain, Deadband Compensation, and acceleration and deceleration of the cylinder using on board Ramps. The PID amplifier will demonstrate the adjustment of Proportional, Integral, and Derivative Gains for proper closed loop control of the cylinder.



### Contact Eaton's Hydraulics Training Services to Order:

Phone: 800-413-8809

Fax: 952-294-2080

Email: [hydraulicstraining@eaton.com](mailto:hydraulicstraining@eaton.com)

Web: [www.hydraulicsliteraturestore.com](http://www.hydraulicsliteraturestore.com)



## Component Cutaways

A full line of the most commonly used hydraulic components; designed to help students better understand internal operations; without the mess! The best way to supplement your hydraulics presentations and curriculum.

### Contact Eaton's Hydraulics Training Services to Order:

Phone: 800-413-8809

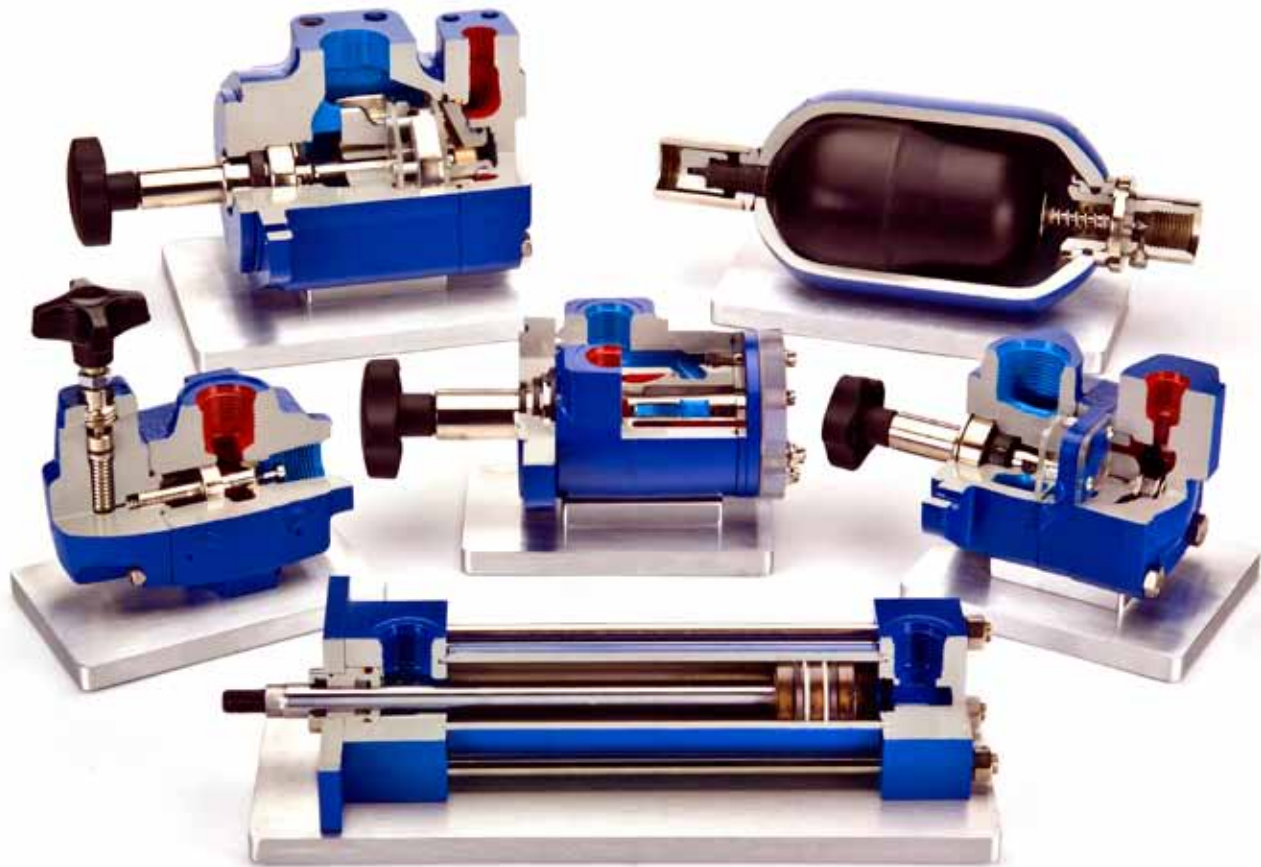
Fax: 952-294-2080

Email: [hydraulicstraining@eaton.com](mailto:hydraulicstraining@eaton.com)

Web: [www.hydraulicsliteraturestore.com](http://www.hydraulicsliteraturestore.com)

Available as separate components or as a complete set of 20:

- Spool Valve Motor
- Hydrostatic Steering Unit
- Bladder Accumulator
- 25M Vane Motor
- V10 Vane Pump
- 20V Vane Pump
- 26000 Series Pump
- 1 1/2" X 5/8" X 6" Cylinder
- Pressure & Flow Compensated Piston Pump
- Aluminum Sandwich Crossover Relief Valve Block
- Manually Operated Variable Piston Pump
- Fixed Displacement Piston Motor
- Balanced Piston Relief Valve
- Pressure Control (Multi-Function Valve)
- Pressure Reducing Valve
- CML60 Sectional Valve
- Directional Control Valve, Solenoid Controlled Pilot Operated
- Directional Proportional Valve w/ Feedback & OBE
- Disc Valve Motor
- Model 1100 Transmission





### Industrial Hydraulics Manual

Edition: 5th, Published 2010  
 ISBN-13: 978-0-9788022-0-2  
 ISBN-10: 0-9788022-0-9

Our color-illustrated, 600+ pages, hardbound textbook covers everything you need to know about hydraulics. Learn about the principles of basic hydraulics, electronics, amplifiers, pumps, cartridge valves and circuits. A systems chapter focuses on the operation of industrial hydraulics circuits and injection molding systems. Included in the appendices are commonly used formulas, conversion charts, tables that can be used as on-the-job reference materials and much more. This manual is perfect for individuals who are just starting in the hydraulics industry and for individuals with years of experience. The end of each chapter contains review questions to test your comprehension of the material as you progress.



### Mobile Hydraulics Manual

Edition: 2nd, Published 2010  
 ISBN-10: 0-9634162-5-1

The latest addition to our textbook collection is the Mobile Hydraulics Manual. Our 2nd Edition, reprinted in 2010 is hardbound with over 500 pages and 475 colored-illustrations. This edition has improved graphics and new end of chapter test questions. Every major aspect of mobile hydraulics theory and application is covered, including: basic hydraulic theory, basic electrical theory, hydrostatic transmissions, and fixed and variable displacement pumps. If you work on mobile applications or are teaching a fluid power course with mobile concepts this manual is the perfect companion to support your professional development and curriculum.



### Closed Loop Electrohydraulics Systems Manual

Edition: 2nd, Published 1998  
 ISBN: 0-9634162-1-9

This text was designed to help people involved with closed loop electrohydraulic control systems. Because the discussion of the fundamental principles of amplifiers, ramp generators and comparators requires a working knowledge of electronics, the student will learn about voltage, current, resistance and capacitance in DC circuits. The manual covers the operation of open and closed loop servo valve and proportional valve systems, and design considerations such as valve sizing, actuator selection and feedback transducers. It was prepared assuming the reader has a solid understanding of fluid power concepts.

### Electrohydraulics Applications Manual - Coming Soon!

Edition: 1st, Available 2012

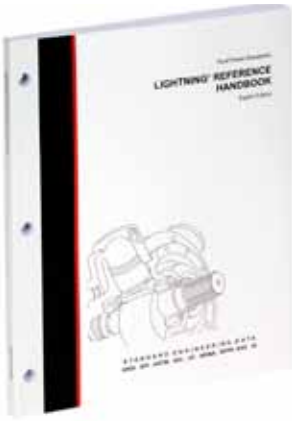


### Bird Bones & Sludge: Comprehensive Guide to Filtration

Edition: 1st, Published 1996  
 ISBN: 0-9634162-4-3

You'd be surprised what you'll find in a hydraulic system. Bird bones, feathers, sandwiches and shop rags are just a few of the items routinely found. In fact, just about anything that's used on a typical shop floor can end up in a hydraulics system as contamination. Bird Bones and Sludge is a book published by Eaton's Hydraulics Training Services that provides a comprehensive reference on contamination control of hydraulic systems. Written for individuals with a basic knowledge of hydraulics, the book's purpose is to help people find ways to identify and eliminate particles as small as a few microns in order to prolong hydraulic machine and component life.





### Lightning Reference Handbook

Edition: 8th, Published  
ISBN:

The Fluid Power Designers Standard Engineering Data, quite simply the best fluid power engineering reference book in existence. Complete with full conversion tables, formulas, shortcut component size tables. Complete with current graphic Symbology for several different applications. It covers standards and practices, fluid power data, fluids, actuators, conductors, valves, connectors, seals...etc. If you are in the fluid power industry you should have this manual, no excuses.



### Answer Book – Industrial Hydraulics Manual 5th Ed.

This book contains the answers to all of the questions shown in the fifth edition of the Industrial Hydraulics Manual. It was written for instructors who are currently using our textbook as a training aid.



### Answer Book – Mobile Hydraulics Manual 2nd Edition

This book contains the answers to all of the questions shown in the fifth edition of the Industrial Hydraulics Manual. It was written for instructors who are currently using our textbook as a training aid.



### Intro to Hydraulics Technology – Student Workbook

Designed to complement our Industrial Hydraulics Manual. This workbook is a perfect guide for students to get extra practice in graphic symbols, circuits, reinforce principles and fundamental concepts. Complete with test questions for each section and answers in back to validate comprehension. New students to the fluid power industry will be able to reduce the amount of time required to learn and master basic fluid power concepts when this workbook is added to their library.



**Graphics CD – Industrial Hydraulics Manual 5th Ed.**

The Industrial Hydraulics textbook is a great resource for instructors and students. Available for purchase, this graphics CDs contains all of the images from these valuable visual aids for instructors. We have converted the images to convenient to use PowerPoint® slides. The Industrial Hydraulics Manual graphics set consists of 600 images from the Industrial Hydraulics Manual. These slides are in order and divided by chapter as they exist in the Industrial Hydraulics Manual. It is the perfect companion for anyone who wishes to teach from the best textbook in the fluid power training industry.



**Graphics CD – Mobile Hydraulics Manual 2nd Edition**

The Mobile Hydraulics textbook is a great resource for instructors and students. Available for purchase, this graphics CDs contains all of the images from these valuable visual aids for instructors. We have converted the images to convenient to use PowerPoint® slides. The Mobile Hydraulics Manual graphics set consists of over 400 images from the Mobile Hydraulics Manual. These slides are in order and divided by chapter as they exist in the Mobile Hydraulics Manual. It is the perfect companion for anyone who wishes to teach from the best textbook in the fluid power training industry.



**Aeration & Cavitation DVD Demonstration**

This DVD demonstrates the effects of an aerated system using the Eaton Hydraulics Training Service’s aeration simulator. This simulator permits air to be introduced into a hydraulic system under controlled circumstances. Cavitation is a similar problem created when a vacuum arises upstream of the pump producing bubbles from air coming out of the fluid. This DVD is approximately six (6) minutes long.

Eaton  
Training Services  
Hydraulics Group  
1785 Indian Wood Circle  
Maumee, OH 43537  
Phone: 800-413-8809  
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