



Process Instrumentation Schools

Training combined with hands-on experience, to learn how to reduce costs and achieve process optimization

Training is the key



Technology and the marketplace are changing rapidly. Are you and your maintenance staff keeping up with the changes? Did the economic market force maintenance and engineering cuts, and the recovery now puts you in a position to hire and train new technical personnel?

We can help with schools designed to teach fundamental, theoretical, and practical knowledge about instrumentation and application technology, with an emphasis on service and maintenance of the instrumentation. Training combined with hands-on experience, is a powerful combination that will help you better manage your life cycle costs.

Endress+Hauser Instrumentation Schools are designed to introduce technicians to process instrumentations from reading P&IDs, to wiring, installing, commissioning and troubleshooting the basic sensing instruments and final control elements associated with today's process control loops.

While Endress+Hauser process instruments are the hardware supporting these schools, the training is designed to address instrumentation in a generic fashion with emphasis on theory and technology rather than product specifics.

All course attendees will receive clear training materials and text, where applicable. Each course consists of approximately 50%-60% lectures, presentations, oral and written exams and 40%-50% opportunity to take a hands-on approach to learning.

Hands-on learning is facilitated by working instruments as demonstration units on the bench, and in actual working conditions installed in our Process Training Units (PTU) or in portable training stands designed to simulate actual operating conditions.

At the end of the course, there will be a written and lab exam to evaluate how well each student grasps the concepts presented. Results from the exam can be shared with the students as well as returned to company management personnel for evaluation of student progress and our training program. Professional Development Hours (PDH) are available and noted on all certificates of completion.

All instructors are seasoned professionals with years of real-world measurement application and troubleshooting experience, and will be available to spend additional time with students at the end of each day to go over any concepts on which they are unclear or want to understand in greater depth. The hands-on or lab portions of the class will be conducted by breaking the overall class into manageable groups of three to four students.

View current schedules/pricing or register for schools at www.us.endress.com/training

Call 800-642-8737 (Option 5) to register by phone

... to keeping up with today's challenges

The Endress+Hauser sponsored Instrumentation Schools are currently conducted at:

- Greenwood (Indianapolis), IN
Endress+Hauser Inc.
2350 Endress Place
Greenwood, IN 46143
- La Porte (Houston), TX
School in Spanish available to large groups.
Endress+Hauser Calibration and Service Center ¹
10057 Porter Road, Suite 100
La Porte, TX 77571
- Memphis, Tennessee
TriNova partnership facility ¹
4771 S. Mendenhall Road
Memphis, TN 38141
- Mobile, Alabama
TriNova partnership facility ¹
4485 Laughlin Drive South
Mobile, AL 36693
- Matthews (Charlotte), North Carolina
Carotek partnership facility ¹
700 Sam Newell Road
Matthews, NC 28106
- Vega Alta, Puerto Rico
NOTE: Schools at EPS are conducted in Spanish.
English schools available to large groups.
Engineered Parts & Services partnership facility ¹
Highway #2, Km 30.8, Espinosa Industrial Park
Vega Alta, PR 00692
- Customized On-Site Training
If you would like to consider having this type of maintenance training conducted for a group at your facility, please call 800-642-8737. We'll be happy to discuss your individual requirements and provide an estimate of the cost.

* Courses require a minimum enrollment of 4 students and a maximum enrollment of 12 students

¹ Indicates facility equipped with a Process Training Unit for hands-on instrumentation labs.



Gulf Coast Calibration and Service Center



TriNova (Memphis) partnership facility



TriNova (Mobile) partnership facility



Carotek partnership facility



EPS partnership facility

Register now! Call 800-642-8737 (Option 5)

Basic Instrumentation School: Course# I101

This introductory course (16 hours) on basic instrumentation will start by providing maintenance and engineering personnel with a review of instrumentation technologies, terminology, symbols needed to work in the field. Understanding P&ID's and basic wiring techniques will be covered along with how instruments communicate. Students will be exposed to a variety of instrument disciplines including Level, Flow, Pressure, Temperature, and Control Valves.

Students will participate in a troubleshooting workshop and conduct loop checkouts. The class will be a combination of classroom and hands-on training on either the Process Training Unit (PTU), a full-scale, working process skid with on-line instrumentation and controls, or live instruments in training stands designed to simulate operating conditions

At the conclusion of the course, attendees should be able to:

- Read and understand P&IDs
- Work with instrumentation specialists to specify the best type of level technology for a variety of applications
- Set up and commission current instrument technologies including Flow, Level, Pressure, Temperature
- Use on-board and pc-based tools/instruments to set up and verify the health of the instrument and its signals
- Diagnose and correct problems with instrumentation

This course is an excellent primer for those who plan to attend specialized schools such as Flow, Level and other schools offered.

The course will specifically cover:

- Coriolis flowmeters
- Vortex Shedding flowmeters
- Electromagnetic flowmeters
- Radar level transmitters
- Pressure transmitters
- Differential pressure transmitters
- Level switches
- Temperature transmitters

16 PDH (Professional Development Hours) available upon completion of entire course.

Instrumentation Technology School: Course# I102

This extended course (32 hours) in process instrumentation will provide maintenance and engineering personnel with a deeper understanding of the principles explored in our Basic Instrumentation School (course I101: 16 hours consisting of wiring, signals, instrumentation technologies, applications and installations for instruments listed below). Fundamental and detailed operation of the common instruments and applications found in today's process industries will be examined from a view applicable to virtually any manufacturer's equipment. Typical troubleshooting procedures for instrumentation will be covered and practiced. The class will be a combination of classroom and additional hands-on training on either the Process Training Unit (PTU), a full-scale, working process skid with on-line instrumentation and controls, or live instruments in training stands designed to simulate operating conditions. **Attending Basic Instrumentation School I101 is not a prerequisite.**

At the conclusion of the course, attendees should be able to:

- Recognize the various type of process instrumentation found in processes of all types of industry
- Understand basic Piping & Instrument Drawings (P&ID), how instruments are installed and wired
- Properly install and commission common process instruments
- Troubleshoot instrumentation loops to determine malfunctioning elements within the loop and determine best how to repair the loop to operating condition

The course will specifically cover:

- Flow Instrumentation – dP, magnetic, vortex, Coriolis
- Recording and display instruments
- Level Instrumentation – point level and continuous level
- Liquid Analysis Instrumentation – pH/ORP, conductivity, analyzers
- Pressure Instrumentation – gauge, absolute, differential, hydrostatic
- Temperature sensors and transmitters
- Control Valves & final elements

32 PDH (Professional Development Hours) available upon completion of entire course.

**View current schedules/pricing or register for schools
at www.us.endress.com/training**

Operator Instrumentation School: Course# I107

This introduction to instrumentation course (16 hours) is focused on providing operators of process systems with a basic understanding of instrumentation technologies, applications and installations. Fundamental operation of the common instruments found in today's process industries will be examined from a view applicable to virtually any manufacturer's equipment. We will examine the types of instruments used in a number of applications and why they are used in specific locations and applications to better understand how they affect the process.

The class will be a combination of classroom and hands-on training on either the Process Training Unit (PTU), a full-scale, working process skid with on-line instrumentation and controls, or live instruments in training stands designed to simulate operating conditions.

At the conclusion of the course, attendees should be able to:

- Recognize the various type of process instrumentation found in processes of all types of industry
- Understand basic Piping & Instrument Drawings (P&ID), how instruments are installed and wired
- Identify how processes react to changes in the measurements of various instruments in order to help maintenance personnel troubleshoot malfunctioning loops

The course will generally cover:

- Flow instrumentation
- Recording and display instruments
- Level instrumentation
- Liquid Analysis instrumentation
- Pressure instrumentation
- Temperature sensors and transmitters
- Control Valves & final elements

16 PDH (Professional Development Hours) available upon completion of entire course.



Analytical Instrumentation

pH and Conductivity Measurement School: Course# A101

This one day (8 hour) course will start by providing maintenance and engineering personnel with a basic understanding of pH and conductivity analytical technologies. This basic portion will focus on concepts applicable to virtually any manufacturer's equipment. Following this introduction, we will proceed with in-depth training on pH and conductivity. The class will be a combination of classroom and hands-on training on either the Process Training Unit (PTU), a full-scale, working process skid with on-line instrumentation and controls, or live instruments in training stands designed to simulate operating conditions. At the conclusion of the course, attendees should be able to:

At the conclusion of the course, attendees should be able to:

- Recognize a broad variety of analytical technologies and understand the strengths and limitations of each
- Work with instrumentation specialists to specify the best type of analytical technology for a variety of applications
- Set up and commission pH and conductivity meters
- Use on-board and PC-based tools within Endress+Hauser instruments to verify the health of the instrument and its signals
- Diagnose and correct problems with pH and conductivity meters

The course will specifically cover:

- pH measurement
- Conductivity measurement

8 PDH (Professional Development Hours) available upon completion of entire course.

Register now at www.us.endress.com/training

Liquid Analytical Measurement School: Course# A102

This day and a half (12 hour) introductory course will start by providing maintenance and engineering personnel with a basic understanding of numerous analytical technologies. This basic portion will focus on concepts applicable to virtually any manufacturer's equipment. Following this introduction, we will proceed with in-depth training on pH, conductivity and chlorine monitors. The class will be a combination of classroom and hands-on training on either the Process Training Unit (PTU), a full-scale, working process skid with on-line instrumentation and controls or live instruments in training stands designed to simulate operating conditions.

At the conclusion of the course, attendees should be able to:

- Recognize a broad variety of analytical technologies and understand the strengths and limitations of each
- Work with instrumentation specialists to specify the best type of analytical technology for a variety of applications
- Set up and commission analytical instruments from pH to conductivity meters
- Use on-board and PC-based tools within Endress+Hauser instruments to verify the health of the instrument and its signals
- Diagnose and correct problems with pH, conductivity and chlorine

The course will specifically cover:

- pH measurement
- Chlorine measurement
- Conductivity measurement

12 PDH (Professional Development Hours) available upon completion of entire course.



Flow Instrumentation

Flow School 1 (Introductory): Course# F101

This introductory course (16 hours) to flow will start by providing maintenance and engineering personnel with a basic understanding of numerous flow technologies. The basic portion will focus on the physics of flow and concepts applicable to virtually any manufacturer's equipment. Following this introduction, we will proceed with in-depth training on magnetic and Coriolis flowmeters. The class will be a combination of classroom and hands-on training on either the Process Training Unit (PTU), a full-scale, working process skid with on-line instrumentation and controls, or live instruments in training stands designed to simulate operating conditions.

At the conclusion of the course, attendees should be able to:

- Recognize a broad variety of flow technologies and understand the strengths and limitations of each
- Work with instrumentation specialists to specify the best type of flow technology for a variety of applications
- Set up and commission flow instruments from differential pressure transmitters to Coriolis flowmeters
- Use on-board and PC-based tools within instruments to verify the health of the instrument and its signals
- Diagnose and correct problems with vortex, magnetic, differential pressure, Coriolis, and ultrasonic flowmeters

The course will specifically cover:

- DP Transmitters/Primary dp devices
- Vortex Shedding flowmeters
- Electromagnetic flowmeters
- Coriolis flowmeters
- Ultrasonic flowmeters
- Thermal Dispersion flowmeters
- Volumetric vs. Mass Flow
- Field Tooling

16 PDH (Professional Development Hours) available upon completion of entire course.

For details of additional Flow Schools, visit www.us.endress.com/training

**View current schedules/pricing or register for schools
at www.us.endress.com/training**

Flow School 2 (Advanced): Course# F102

This advanced course (16 hours) is designed for those students having successfully completed the basic Flow School, Course One (F101). Additionally, users with demonstrable competence in the programming, operation, and troubleshooting of flowmeters are encouraged to attend. Students should be proficient with PC-based and HART® communication. Class will start by providing instrument techs and engineers with a brief section on the basic understanding of numerous flow technologies. Following this introduction, we will proceed with in-depth training on vortex, magnetic, ultrasonic, and Coriolis flowmeters. This class will primarily be hands-on training on either the Process Training Unit (PTU), a full-scale, working process skid with on-line instrumentation and controls, or live instruments in training stands designed to simulate operating conditions.

At the conclusion of the course, attendees should be able to:

- Perform configuration of flow device (Coriolis, electromagnetic, vortex and ultrasonic)
- Use on-board and PC-based tools to troubleshoot process and instrument problems
- Diagnose and correct problems with vortex, magnetic, Coriolis, and ultrasonic flowmeters
- Produce proper documentation and trending of flow measuring devices
- Work with instrumentation specialists to specify the best type of flow technology for a variety of applications

The course will specifically cover:

- Coriolis flowmeters
- Ultrasonic flowmeters
- Electromagnetic flowmeters
- Vortex Shedding flowmeters
- Endress+Hauser FieldCare®
- Density and Viscosity measurements

16 PDH (Professional Development Hours) available upon completion of entire course.

Coriolis Flow School 3: Course# F103

This Coriolis flow course (8 hours) will start by providing maintenance and engineering personnel with a basic understanding of the Coriolis principle. This basic portion will focus on concepts applicable to virtually any manufacturer's equipment. Following this introduction, we will proceed with in-depth training on density and concentration measurements. This class will be a combination of classroom and hands-on training on either the Process Training Unit (PTU), a full-scale, working process skid with on-line instrumentation and controls, or live instruments in training stands designed to simulate operating conditions.

At the conclusion of the course, attendees should be able to:

- Proper mass flow installation
- Set up and commission Coriolis flowmeters
- Use on-board and pc-based tools to verify the health of the instrument and its signals
- Diagnose and correct problems with Coriolis flowmeters

The course will specifically cover:

- Flow overview
- Field Tooling
- Coriolis basics
- Applications
- Entrained air
- Density measurements
- Zero points

8 PDH (Professional Development Hours) available upon completion of entire course.

HART is a registered trademark of HART Communication Foundation, Austin, USA
FieldCare is a registered trademark of Endress+Hauser Flowtec AG, Reinach, CH
ToF is a registered trademark of Endress+Hauser GmbH+Co. KG, Maulburg, Germany

Call 800-642-8737 (Option 5) for current schedule and to register

Level Instrumentation

Level School 1 (Introductory): Course# L101

This introductory course (16 hours) for level will start by providing maintenance and engineering personnel with a basic understanding of numerous level technologies. This basic portion will focus on concepts applicable to virtually any manufacturer's equipment. Following this introduction, we will proceed with in-depth training on Time of Flight, or ToF[®] technologies that include a variety of radar types as well as ultrasonic level transmitters. The class will be a combination of classroom and hands-on training on either the Process Training Unit (PTU), a full-scale, working process skid with on-line instrumentation and controls, or live instruments in training stands designed to simulate operating conditions.

At the conclusion of the course, attendees should be able to:

- Recognize a broad variety of level technologies and understand the strengths and limitations of each
- Work with instrumentation specialists to specify the best type of level technology for a variety of applications
- Set up and commission Endress+Hauser level instruments from point level switches to radar gauges
- Use on-board and PC-based tools within Endress+Hauser instruments to verify the health of the instrument and its signals
- Diagnose and correct problems with capacitance, ultrasonic and radar level systems

The course will specifically cover:

- Differential Pressure transmitters
- Capacitance probes
- Vibratory level switches (liquid)
- Guided radar
- High & low frequency radar
- Solids application radar
- Ultrasonic continuous level
- Conductivity level switches
- Vibratory level switches (solids)
- Endress+Hauser ToF Tool

16 PDH (Professional Development Hours) available upon completion of entire course.

Level School 2 (Advanced): Course# L102

This advanced course (16 hours) is designed for those students having successfully completed the basic Level School Course One (L101). Additionally, users with competence on "Time of Flight" level instrumentation and PC-based ToF software are encouraged to attend. The Advanced Level School begins with a brief review of current level technologies. Following the technology refresher, we will proceed to look deeper at each level measuring technology discussing, then implementing proper techniques of configuration and calibration and troubleshooting. There will be an emphasis on an in depth understanding of Time of Flight, ToF technologies and envelope curves. This class will primarily be focused on hands-on training utilizing either the Process Training Unit (PTU), a full-scale, working process operation with on-line instrumentation and controls, or live instruments in training stands designed to simulate operating conditions.

At the conclusion of the course, attendees should be able to:

- Install instrument properly (wiring and sensor location)
- Perform configuration of level devices via local interface, PC, and HART[®]
- Diagnosis of envelope curves using ToF software
- Make practical changes to level measuring device filters for process problems
- Work with instrumentation specialists to specify the best type of level technology for a variety of applications

The course will specifically cover:

- Radar programming and troubleshooting
- Capacitance programming and calculations
- Ultrasonic programming and troubleshooting
- Pressure and Differential Pressure linearization
- Guided Radar programming and troubleshooting
- Envelope curve diagnosis
- Endress+Hauser ToF and FieldCare[®]

16 PDH (Professional Development Hours) available upon completion of entire course.

**View current schedules/pricing or register for schools
at www.us.endress.com/training**

Time of Flight School (ToF): Course# L103

This Time of Flight course (8 hours) for level will start by providing maintenance and engineering personnel with a basic understanding of numerous ToF® technologies. This basic portion will focus on concepts applicable to virtually any manufacturer's equipment. Following this introduction, we will proceed with in-depth training on Time of Flight, or ToF technologies that include a variety of radar types as well as ultrasonic level transmitters. The class will be a combination of classroom and hands-on training on either the Process Training Unit (PTU), a full-scale, working process skid with on-line instrumentation and controls, or live instruments in training stands designed to simulate operating conditions.

At the conclusion of the course, attendees should be able to:

- Recognize a broad variety of ToF technologies and understand the strengths and limitations of each
- Work with instrumentation specialists to specify the best type of level technology for a variety of applications
- Set up and commissioning of ToF level instruments
- Use on-board and PC-based tools within instruments to verify the health of the instrument and its signals
- Diagnose and correct problems with guided radar, ultrasonic and radar level systems

The course will specifically cover:

- Radar transmitters
- Envelope curve evaluation
- Guided radar transmitters
- Ultrasonic transmitters
- ToF Tooling
- ToF applications

8 PDH (Professional Development Hours) available upon completion of entire course.



Pressure & Temperature Instrumentation

Pressure & Temperature School: Course# P101

This introductory course (16 hours) will provide maintenance and engineering personnel with a basic understanding of numerous pressure and temperature technologies. This basic portion will focus on concepts applicable to virtually any manufacturer's equipment as well as the skills needed to set up and maintain such equipment. Introductions and lectures on the technologies will be followed with in-depth demonstrations and "hands on" training exercises. The class will be a combination of classroom and "hands-on training" featuring either the Process Training Unit (PTU), a full-scale, working process operation with on-line instrumentation and controls, or live instruments in training stands designed to simulate operating conditions.

At the conclusion of the course, attendees should be able to:

- Recognize a broad variety of pressure technologies and understand the strengths and limitations of each
- Recognize a broad variety of temperature technologies and understand the strengths and limitations of each
- Work with instrumentation specialists to specify the best type of pressure and temperature technologies for a variety of applications
- Set up and commission pressure and temperature devices
- Use commonly accepted communications tools to set up and verify the health of the instrument and its signals
- Diagnose and correct problems with pressure and temperature products

The course will specifically cover:

- Pressure transmitters
- Differential Pressure transmitters - Flow
- Differential Pressure transmitters - Level
- Diaphragm seals
- Temperature transmitters
- RTD/Thermocouple sensors
- Displays & Relays
- Communication tools & methods

Register today at www.us.endress.com/training or call 800-642-8737 (Option 5)

ToF is a registered trademark of Endress+Hauser GmbH+Co.
KG, Maulburg, Germany

Communications

Certified PROFIBUS® PA Engineer Training: Course# C201



**This is 3 days of theoretical and practical work and examinations on the 4th day (28 hours)
Course number C201 (24 PDH hours upon completion of entire course)**

The “Certified PROFIBUS PA Engineer” course is a world wide recognized training program. It is standardized by PROFIBUS International to create a quality platform for PROFIBUS qualified persons who are acknowledged by an official exam. The Standard Certified PROFIBUS PA Engineer course is an intensive hands-on and theoretical 4-day training program. On the last day there will be an exam. After passing the exam, the attendee receives the title “Certified Engineer” and will be officially registered.

The advantages of fieldbus products are recognized by most industries and the technology has been adopted in many applications. The use of fieldbus technology asks for a different approach with respect to defining, designing and realizing a PROFIBUS installation. The success of an implementation depends on an integral approach, based on knowledge and experience. Cost savings throughout a plant life cycle from planning, commissioning to maintenance. The training is designed to let the participant gain more knowledge of the PROFIBUS technology with all its features, to be able to select the correct components for application and installations, to be familiar with implementing instruments in a correct way as well as commissioning and troubleshooting.

Target audience: System programmers, control and instrumentation engineers, engineers who plan in PROFIBUS plants as well as service engineers/installers

Prerequisites: Basic computer, electronics and mathematics knowledge

Course elements: Theory I

- PROFIBUS organization structure
- From 4-20 mA to Fieldbus
- PROFIBUS Physical Layer
- DP/PA PROFIBUS basics
- DP/PA Link, Coupler
- Components
- Installation
- Commissioning
- PA segment calculation
- System integration
- Diagnosis, status

Course elements: Theory II

- Termination
- FISCO
- Network components
- Device management
- GSD, DD, DFT.DTM
- PA profiles
- Cycle time
- Important bus parameters
- PROFIBUS protocol

***This course requires a minimum enrollment of 4 students and a maximum enrollment of 10 students.**

PROFIBUS is a registered trademark of the PROFIBUS user organization.

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Select the training location convenient for you:

- Greenwood (Indianapolis), IN - Endress+Hauser Inc. - 2350 Endress Place - Greenwood, IN 46143
- La Porte (Houston), TX - Endress+Hauser Calibration and Service Center - 10057 Porter Road, Suite 100 - La Porte, TX 77571
School in Spanish available to large groups.
- Memphis, Tennessee - TriNova partnership facility - 4771 S. Mendenhall Road - Memphis, TN 38141
- Mobile, Alabama - TriNova partnership facility - 4485 Laughlin Drive South - Mobile, AL 36693
- Matthews (Charlotte), North Carolina - Carotek partnership facility - 700 Sam Newell Road - Matthews, NC 28106
- Vega Alta, Puerto Rico - Engineered Parts & Services partnership facility - Highway #2, Km 30.8, Espinosa Industrial Park - Vega Alta, PR 00692
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- Customized On-Site Training - If you would like to consider having this type of maintenance training conducted for a group at your facility, please call 800-642-8737. We'll be happy to discuss your individual requirements and provide an estimate of the cost.

Endress+Hauser 
People for Process Automation



CAROTEK

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* Courses require a minimum enrollment of 4 students and a maximum enrollment of 12 students.

ISO 9001:2000 Certified

01.11/SCUSA

USA

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Visit www.us.endress.com/training for current schedule, courses, and pricing

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