

The Best Hands-On Training - Designed with U in Mind



**CAROTEK<sup>®</sup>**

Process Training  
**University**

Training Curriculum

## 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
- Level Instruments

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

Register Now at [www.carotek.com](http://www.carotek.com)

# 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:

- 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
- Temperature transmitters
- Conductivity measurement

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

Register Now at [www.carotek.com](http://www.carotek.com)

## 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

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

Register Now at [www.carotek.com](http://www.carotek.com)

# 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.

Register Now at [www.carotek.com](http://www.carotek.com)

## 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.

Register Now at [www.carotek.com](http://www.carotek.com)

## 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.

Register Now at [www.carotek.com](http://www.carotek.com)

# 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<sup>®</sup> 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.

Register Now at [www.carotek.com](http://www.carotek.com)



## 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®
- Diagnose 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.

Register Now at [www.carotek.com](http://www.carotek.com)

## 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.

Register Now at [www.carotek.com](http://www.carotek.com)

# Pressure & Temperature Instrumentation

## Pressure & Temperature School: Course# P101

This introductory course (12 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 • Level
- Diaphragm seals
- Temperature transmitters
- RTD/Thermocouple sensors
- Displays & Relays
- Communication tools & methods

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

Register Now at [www.carotek.com](http://www.carotek.com)

## PD Pump Technology and Application School: Course# PD101

Selecting a Positive Displacement Pump can be a difficult task as compared to centrifugal pumps. There is a wide variety of Positive Displacement Pump products in the marketplace and their typical applications can create confusion about which one to select for each application. This course offers design features of some of the positive displacement pumps available in today's market and the typical applications of each.

A general working principal of these common positive displacement pumps is discussed for: internal gear, external gear, vane, lobe and diaphragm pumps. This course will help clear some of the confusion in selecting positive displacement pumps for your difficult fluid applications.

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

- Recognize different types of Positive Displacement Pumps
- Choose the best pumps suited for specific applications
- Use general operation theory of various Positive Displacement Pump types
- Identify Wear patterns and PM maintenance for various styles of PD pumps
- Tear down, inspect and rebuild various styles of PD pumps
- Analyze failures of PD pumps

The course will specifically cover:

- Internal Gear Pumps
- External Gear Pumps
- Rotary Vane Pumps
- Rotary Lobe Pumps
- Air Diaphragm Pumps
- Diaphragm metering pumps

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

Register Now at [www.carotek.com](http://www.carotek.com)

## **ON/OFF and Control Valve Technology School: Course# CV101**

This introductory course (8 hours) will provide maintenance, production, and operation personnel with a basic understanding of control valves. This course will focus on applications, technologies and characteristics of different control valves. The definitions/terminologies are applicable for any manufacturer's equipment. The class will be a combination of classroom and "hands-on" training.

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

- Properly select, size and apply control valves
- Select and size the best type actuator for the application
- Properly select the positioner and any accessories
- Assemble and calibrate control valves

The course will specifically cover:

- Valve and actuator sizing
- Cavitation, flashing, hysteresis
- Valve characteristics and applications • Gas and Liquid Sizing
- Positioner technologies

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

Register Now at [www.carotek.com](http://www.carotek.com)



The Power of Solutions

## Training Registration

Company Information					
Company:		Supervisor:			
Address:					
City:		State:		Zip:	
Phone:			Fax:		
Contact Email:					
Class Information					
Class:		Date:			
Names of Attendees					
1		2			
3		4			
5		6			
7		8			
9		10			
11		12			
Special Needs or Request:					
Payment Options: Purchase Order payable to: Endress+Hauser c/o Carotek or Credit Card (All Major Cards Accepted).					
Fax or email completed form to 704-847-4400; email <a href="mailto:Evette.Austin@carotek.com">Evette.Austin@carotek.com</a> Need Help? Contact Evette Austin by email or call 704-844-1100.					