



COURSE OVERVIEW IE0038

Process Control, Instrumentation, Troubleshooting & Problem Solving

Course Title

Process Control, Instrumentation,
Troubleshooting & Problem Solving

Course Date/Venue

September 06-10, 2026/TBA Meeting Room,
Royal Tulip Hotel, Muscat, Oman

Course Reference

IE0038

Course Duration/Credits

Five days/3.0 CEUs/30 PDHs



Course Description



This practical and highly-interactive course includes various practical sessions and exercises. Theory learnt will be applied using one of our state-of-the-art simulators.



Production processes consist of many complex apparatuses involving both moving and static parts as well as interconnecting pipes, control mechanisms and electronics, mechanical and thermal stages, heat exchangers, waste and side product processing units, power ducts and many others. Bringing such a complicated unit online and ensuring its continued productivity requires substantial skill at anticipating, detecting and solving acute problems. Failure to identify and resolve these problems quickly can lead to lost production, off-spec product, equipment loss, and even catastrophic accidents. Therefore, the ability to troubleshoot process operations is one of the most valuable skills operations personnel can possess.



Troubleshooting is the process used to diagnose the fault safely and efficiently, decide on corrective action and prevent the fault from reoccurring. Process engineering, especially troubleshooting, is different from most other branches of technology in another respect: It is not advancing very quickly.



The principles of distillation, hydraulics, phase separation, and heat transfer, as they apply to process applications, have been well known for quite some time. The challenge in troubleshooting consists of untangling the influence that human error, mechanical failure, and corrosion have on these well-known principles. The aspect of the job that makes it so difficult is that most process problems are initiated by human error – a never-ending source of surprise.

Process control is becoming an increasingly important engineering topic, since the subject plays a crucial role in the design, operation and maintenance in areas such as power plants and chemical and industrial process plants. Control systems have advanced dramatically during the last decade. They become more modular and more sophisticated offering a vast variety of control functions for all the systems that operate within a modern "intelligent" facility. Enhanced functionality of the automation systems also means more complexity, interactive strategies, new technologies and systems management with resulting better control and improved reliability.

This course is designed to provide instruction in process control, instrumentation and the different types of troubleshooting techniques, procedures, and methods used to solve process problems. Participants will use existing knowledge of equipment, systems and the instrumentation to understand the troubleshooting process operations of an entire unit in a facility. Participants study concepts related to troubleshooting commissioning, normal startup, normal operations, normal shutdown, turnarounds, and abnormal situations, as well as the Process team role in performing tasks associated with these concepts within an operating unit.

A major part of the course is devoted to a detailed exposition of currently used control valves, the associated terminology, valve performance, valve and actuator types, control valve accessories as well as to the correct selection and sizing of control valves for a wide range of applications. The course addresses the important issues related to valve installation and maintenance. In addition, this training course also utilizes an extensive collection of state-of-the-art, externally generated process management and video material concerned with all aspects of plant management, including smart wireless solutions to the collection of plant data. In addition, the subjects of digital control systems will be discussed with sections on Distributed Control Systems (DCS), Programmable Logic Controllers (PLC) and SCADA systems.

Course Objectives/Outcomes & Benefits for the Participants

Upon the successful completion of this course, each participant will be able to:-

- Apply and gain an in-depth knowledge on process control, troubleshooting and problem solving
- Discuss process control covering process control benefits, basic measurement definitions, control loops and typical applications
- List down the different technologies currently in use in pressure, temperature, level and flow measurement
- Identify the various types of control valve and use a system approach in actuator selection
- Determine flow characteristics, valve accessories, control valve sizing and leakage rates



- Review and employ the different types of control loop strategies, PID control mode and learn the features and application of Distributed Control System (DCS)
- Discuss the system components and operation of the Programmable Logic Controllers (PLC) and describe the configuration of the SCADA systems
- Employ process troubleshooting, process control maintenance, effective methods for troubleshooting and best practices for maintaining process control equipment
- Discuss the most famous problem with process control equipment and apply preventive maintenance procedures

Exclusive Smart Training Kit - H-STK®



*Participants of this course will receive the exclusive “Haward Smart Training Kit” (H-STK®). The H-STK® consists of a comprehensive set of technical content which includes **electronic version** of the course materials conveniently saved in a **Tablet PC**.*

Who Should Attend

This course provides a complete and up-to-date overview of the process control, instrumentation and various troubleshooting techniques and procedures used to solve process problems. Process control engineers, instrumentation engineers, control system engineers, automation engineers and process engineers will definitely benefit from the engineering problem solving approach of the course. Supervisors, technologists and other technical and operational staff will gain an excellent knowledge from the practical aspects of this course.

Training Methodology

All our Courses are including **Hands-on Practical Sessions** using equipment, State-of-the-Art Simulators, Drawings, Case Studies, Videos and Exercises. The courses include the following training methodologies as a percentage of the total tuition hours:-

- 30% Lectures
- 20% Practical Workshops & Work Presentations
- 30% Hands-on Practical Exercises & Case Studies
- 20% Simulators (Hardware & Software) & Videos

In an unlikely event, the course instructor may modify the above training methodology before or during the course for technical reasons.

Learning Design & Customization

This course can be customized to the exact requirements of clients. Haward Technology is so proud of our huge capabilities in tailoring our courses to the training needs of our valued clients.

Course Certificate(s)

Internationally recognized certificates will be issued to all participants of the course who completed a minimum of 80% of the total tuition hours.

Certificate Accreditations

Haward's certificates are accredited by the following international accreditation organizations:

-  British Accreditation Council (BAC)

Haward Technology is accredited by the **British Accreditation Council** for **Independent Further and Higher Education** as an **International Centre**. Haward's certificates are internationally recognized and accredited by the British Accreditation Council (BAC). BAC is the British accrediting body responsible for setting standards within independent further and higher education sector in the UK and overseas. As a BAC-accredited international centre, Haward Technology meets all of the international higher education criteria and standards set by BAC.

-  The International Accreditors for Continuing Education and Training (IACET - USA)

Haward Technology is an Authorized Training Provider by the International Accreditors for Continuing Education and Training (IACET), 2201 Cooperative Way, Suite 600, Herndon, VA 20171, USA. In obtaining this authority, Haward Technology has demonstrated that it complies with the **ANSI/IACET 2018-1 Standard** which is widely recognized as the standard of good practice internationally. As a result of our Authorized Provider membership status, Haward Technology is authorized to offer IACET CEUs for its programs that qualify under the **ANSI/IACET 2018-1 Standard**.

Haward Technology's courses meet the professional certification and continuing education requirements for participants seeking **Continuing Education Units** (CEUs) in accordance with the rules & regulations of the International Accreditors for Continuing Education & Training (IACET). IACET is an international authority that evaluates programs according to strict, research-based criteria and guidelines. The CEU is an internationally accepted uniform unit of measurement in qualified courses of continuing education.

Haward Technology Middle East will award **3.0 CEUs** (Continuing Education Units) or **30 PDHs** (Professional Development Hours) for participants who completed the total tuition hours of this program. One CEU is equivalent to ten Professional Development Hours (PDHs) or ten contact hours of the participation in and completion of Haward Technology programs. A permanent record of a participant's involvement and awarding of CEU will be maintained by Haward Technology. Haward Technology will provide a copy of the participant's CEU and PDH Transcript of Records upon request.



Course Instructor(s)

This course will be conducted by the following instructor(s). However, we have the right to change the course instructor(s) prior to the course date and inform participants accordingly:



Dr. Ahmed El-Sayed, PhD, MSc, BSc, is a **Senior Electrical & Instrumentation Engineer** with over **30 years** of extensive experience in the **Oil, Gas, Power, Petroleum, Petrochemical** and **Water & Utilities**. He specializes in **Fire Fighting System Instrumentations, Fire Protection System, Fire & Gas Detection & Alarm System, Instrumentation Protection Devices Maintenance & Testing, Protection Devices Troubleshooting, Water Meter Calibration, Liquid & Gas Flowmetering & Meter Calibration, Testing & Calibration of Energy Meters, DCS & ESD System Architecture, Distributed Control System, DCS & SCADA, Distributed Control System (DCS) Selection & Troubleshooting, Advanced DCS Yokogawa, Yokogawa CENTUM VP DCS, Modern Distributed Control System (DCS) & Process Instrumentation, Cyber Security of Industrial System, DCS System (Honeywell), DCS Experion System, DCS Siemens Teleperm XP, Relay Coordination Using ETAP Software, Power System Study on ETAP, ETAP-Power System Analysis, Flow Measurement Foundation, Hydrocarbon Measurement & Sampling, Gas Dosiers Preparation, Gas/Liquid Fuel Measurement, Instrumentation Measurement & Control System, Flow Measurement, Pressure Measurement, Level & Temperature Measurement, Measurement Devices & Control System, Instrumentation & Control Systems, Control System Orientation, Uninterruptible Power Supply (UPS) Battery Charger, Industrial UPS Systems Construction & Operation, Test Lead-Acid & Ni-cad Battery Systems, Hazards & Safe Work Practices, Transformer Operational Principles, Selection & Troubleshooting; HV & LV Transformers, Control Valves & Actuators, Electrical Safety, Protection Relay Application, Maintenance & Testing, NEC (National Electrical Code), NESC (National Electrical Safety Code), Electrical Safety, Electrical Hazards Assessment, Electrical Equipment, Personal Protective Equipment, Lock-Out & Tag-Out (LOTO), Confined Workspaces, Alerting Techniques, Electrical Transient Analysis Program (ETAP), Power Quality, Power Network, Power Distribution, Distribution Systems, Power Systems Control, Power Systems Security, Power Electronics, Electrical Substations, UPS & Battery System, Earthing & Grounding, Load Forecasting, Power Generation, Protective Systems, Electrical Generators, Power & Distribution Transformers, Electrical Motors, Switchgears, Transformers, AC & DC Drives, Variable Speed Drives & Generators, Generator Protection, GE Gas Turbines, PLC, SCADA, DCS, Process Control, Control Systems & Data Communications, Instrumentation, Automation, Valve Tuning, SIS, SIL, ESD, Alarm Management Systems, Energy Management System, Engine Management System, Bearing & Rotating Machine, Fieldbus Systems and Fiber Optics Technology. He is currently the **Systems Control Manager of Siemens** where he is in-charge of Security & Control of Power **Transmission Distribution & High Voltage** Systems and he further takes part in the Load Records Evaluation & Transmission Services Pricing.**

During his career life, Dr. Ahmed has been actively involved in different Power System Activities including Roles in Power System Planning, Analysis, Engineering, **HV Substation Design**, Electrical Service Pricing, Evaluations & Tariffs, Project Management, Teaching and Consulting. His vast industrial experience was honed greatly when he joined many International and National Companies such as **Siemens, Electricity Authority** and **ACETO** industries as the **Instrumentation & Electrical Service Project Manager, Instrumentation & Control Engineer, Fire Protection Engineer, Energy Management Engineer, Department Head, Assistant Professor, Instrumentation & Control Instructor, Project Coordinator, Project Assistant and Managing Board Member** where he focused more on dealing with Technology Transfer, System Integration Process and Improving Localization. He was further greatly involved in manufacturing some of **Power System** and **Control & Instrumentation Components** such as Series of Digital Protection **Relays**, **MV VFD**, **PLC** and **SCADA** System with intelligent features.

Dr. Ahmed is well-versed in different electrical and instrumentation fields like **ETAP**, Load Management Concepts, **PLC** Programming, Installation, Operation and Troubleshooting, **AC Drives** Theory, Application and Troubleshooting, Industrial Power Systems Analysis, **AC & DC Motors**, Electric Motor **Protection**, **DCS SCADA**, **Control** and Maintenance Techniques, Industrial Intelligent Control System, **Power Quality** Standards, Power Generators and Voltage Regulators, Circuit Breaker and Switchgear Application and Testing Techniques, **Transformer** and **Switchgear** Application, Grounding for Industrial and Commercial Assets, Power Quality and **Harmonics**, **Protective Relays** (O/C Protection, Line Differential, Bus Bar Protection and **Breaker Failure Relay**) and Project Management Basics (PMB).

Dr. Ahmed has **PhD, Master's & Bachelor's** degree in **Electrical Engineering** from the **University of Wisconsin Madison, USA** and **Ain Shams University**, respectively. Further, he is a **Certified Instructor/Trainer**, a **Certified Internal Verifier/ Assessor/Trainer** by the **Institute of Leadership and Management (ILM)**, an active member of **IEEE** and **ISA** as well as numerous technical and scientific papers published internationally in the areas of Power Quality, Superconductive Magnetic Energy Storage, SMES role in Power Systems, Power System **Blackout** Analysis, and Intelligent Load Shedding Techniques for preventing Power System Blackouts, **HV Substation Automation** and Power System Stability.



Course Fee

US\$ 5,500 per Delegate + **VAT**. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Accommodation

Accommodation is not included in the course fees. However, any accommodation required can be arranged at the time of booking.

Course Program

The following program is planned for this course. However, the course instructor(s) may modify this program before or during the course for technical reasons with no prior notice to participants. Nevertheless, the course objectives will always be met:

Day 1: Sunday, 06th of September 2026

0730 – 0800	Registration & Coffee
0800 – 0815	Welcome & Introduction
0815 – 0830	PRE-TEST
0815 – 0830	Introduction Course Content • Objectives of Course
0830 – 0930	Introduction to Process Control Process Control Definition • Process Control Benefits • Basic Measurement Definitions • Process Control History • Control Loops • Typical Applications
0930 – 0945	Break
0945 – 1100	Pressure Measurement Basic Principles • Definition of Terminology • Pressure Elements • Pressure Transducers • Installation Considerations • Summary
1100 – 1215	Temperature Measurement Principles • Thermocouples • RTD's • Thermistors Thermometer • Infra-Red Thermometry • Installation Considerations
1215 – 1230	Break
1230 – 1330	Level Measurement Main Types • Sight Glass Method • Buoyancy Tape Systems • Hydrostatic Pressure • Ultrasonic Measurement • Radar Measurement • Electrical Measurement • Installation Considerations
1330 – 1420	Video Presentation Radar Level Measurement
1420 – 1430	Recap Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow
1430	Lunch & End of Day One

Day 2: Monday, 07th of September 2026

0730 – 0830	Flow Measurement Differential Pressure Flowmeters • Oscillatory Flow Measurement • Non-Intrusive Flowmeters • Mass Flow Meters • Positive Displacement Meters • Installation Considerations • Selection Guidelines
0830 – 0930	Video Presentation Coriolis Effect Mass Flowmeter
0930 – 0945	Break



0945 – 1100	Control Valve Types Rotary • Linear • Control Valve Selection
1100 – 1215	Actuator Selection Introduction • Types of Actuators • Linear Actuators • Rotary Actuators • Actuator Forces • Positioners • Fail Safe Actuators
1215 – 1230	Break
1230 – 1330	Control Valves Basic Terminology • Flow Characteristics • Valve Accessories • Control Valve Sizing • Leakage Rates
1330 – 1420	Practical Session Control Valve Sizing
1420 – 1430	Recap Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow
1430	Lunch & End of Day Two

Day 3: Tuesday, 08th of September 2026

0730 – 0830	Control Loop Strategies Introduction • Variables • Basic Elements • Manual Control • Feedback Control • System Responses • ON-OFF Control • PID Control Mode
0830 – 0930	Video Presentation PID Control
0930 – 0945	Break
0945 – 1100	Distributed Control Systems Introduction • Traditional Process Controllers • DCS Definition • Architecture of Controllers • Software • DCS Network • DCS Application • DCS Operator WorkStation • Function Blocks
1100 – 1215	Video Presentation Distributed Control Systems
1215 – 1230	Break
1230 – 1330	Programmable Logic Controllers Introduction • Today's Position • Principles of Operation • System Components • I/O Interfaces • Configuration and Programming Languages
1330 – 1420	SCADA Systems Basic Definitions • Level of Hierarchy • Communication Systems • SCADA Benefits
1420 – 1430	Recap Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow
1430	Lunch & End of Day Three

Day 4: Wednesday, 09th of September 2026

0730 – 0930	Process Troubleshooting Troubleshoot Process Control Issues • Effective Methods of Troubleshooting
0930 – 0945	Break
0945 – 1130	The Process Control Maintenance Maintenance Definition • Types of Maintenance • Preventive Maintenance
1130 – 1215	Effective Methods for Troubleshooting Identify the Problem • Check the Software • Check the Process • Check the Human Factors • Apply the Solutions



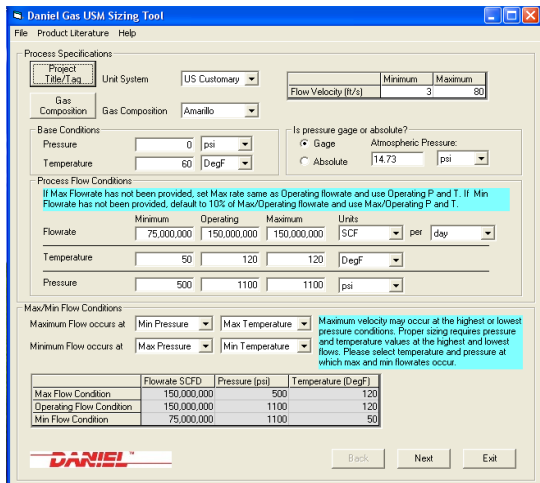
1215 – 1230	Break
1230 – 1420	Best Practices for Maintaining Process Control Equipment Plan and Schedule Maintenance Activities • Train and Equip Maintenance Staff • Monitor and Inspect Process Control Equipment
1420 – 1430	Recap Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow
1430	Lunch & End of Day Four

Day 5: Thursday, 10th of September 2026

0730 – 0930	Most Famous Problems with Process Control Equipment Control Valves Problems and Methods of Solution • Pressure Transmitter Problems with its Solution • Capillary DPT • Calibration
0930 – 0945	Break
0945 – 1145	Preventive Maintenance Procedures PM Procedure for Pressure Transmitter • PM Procedure for Temperature Transmitter
1145 – 1215	Case Studies - Working in Groups
1215 – 1230	Break
1230 – 1345	Case Studies - Working in Groups
1345 – 1400	Course Conclusion Using this Course Overview, the Instructor(s) will Brief Participants about the Course Topics that were Covered During the Course
1400 – 1415	POST-TEST
1415 – 1430	Presentation of Course Certificates
1430	Lunch & End of Course

Simulator (Hands-on Practical Sessions)

Practical sessions will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using one of our state-of-the-art simulators “Gas Ultrasonic Meter Sizing Tool”, “Liquid Turbine Meter and Control Valve Sizing Tool”, “Liquid Ultrasonic Meter Sizing Tool” and “Orifice Flow Calculator” simulators.



Daniel Gas USM Sizing Tool

Process Specifications

Project Title / Tag: [] Unit System: US Customary [] Minimum: [] Maximum: [] Flow Velocity (ft/s): []

Gas Composition: Gas Composition: Amairlo []

Base Conditions: Pressure: [] psi [] Is pressure gage or absolute? [] Gage [] Absolute [] Atmospheric Pressure: []

Temperature: [] DegF []

Process Flow Conditions

If Max Flowrate has not been provided, set Max rate same as Operating flowrate and use Operating P and T. If Min Flowrate has not been provided, default to 10% of Max/Operating flowrate and use Max/Operating P and T.

Flowrate: Minimum: [] Operating: [] Maximum: [] Units: [] per [] day []

Temperature: [] 50 [] 120 [] 120 [] DegF []

Pressure: [] 500 [] 1100 [] 1100 [] psi []

Max/Min Flow Conditions

Maximum Flow occurs at: [] Min Pressure [] Max Temperature [] Maximum velocity may occur at the highest or lowest pressure conditions. Proper sizing requires pressure and temperature values at the highest and lowest flows. Please select temperature and pressure at which max and min flowrates occur.

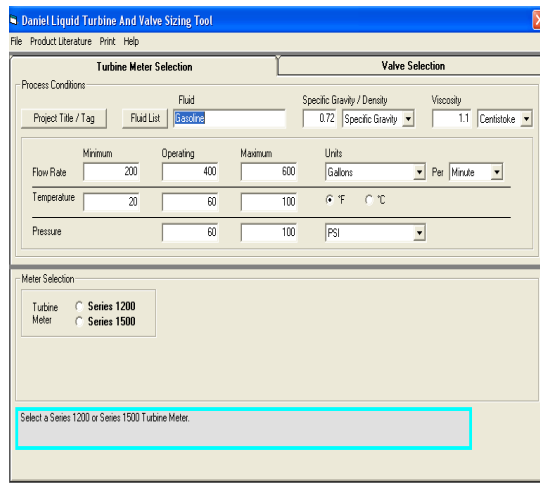
Minimum Flow occurs at: [] Max Pressure [] Min Temperature []

	Flowrate SCFD	Pressure (psi)	Temperature (DegF)
Max Flow Condition	150,000,000	500	120
Operating Flow Condition	150,000,000	1100	120
Min Flow Condition	75,000,000	1100	50

DANIEL

Back Next Exit

Gas Ultrasonic Meter (USM) Sizing Tool Simulator



Daniel Liquid Turbine And Valve Sizing Tool

Process Conditions

Project Title / Tag: [] Fluid List: Gasoline [] Specific Gravity / Density: 0.72 [] Viscosity: 1.1 [] Centistoke []

Flow Rate: Minimum: [] Operating: [] Maximum: [] Units: [] Per [] Minute []

Temperature: [] 20 [] 60 [] 100 [] °F [] °C []

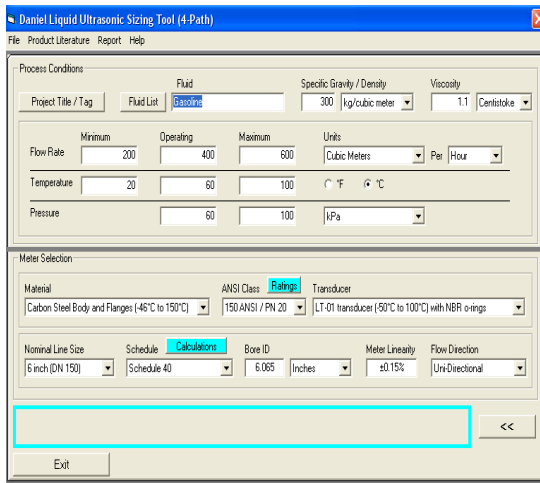
Pressure: [] 60 [] 100 [] PSI []

Meter Selection

Turbine Meter: [] Series 1200 [] Series 1500 []

Select a Series 1200 or Series 1500 Turbine Meter.

Liquid Turbine Meter and Control Valve Sizing Tool Simulator



Daniel Liquid Ultrasonic Sizing Tool (4-Path)

Process Conditions

Project Title / Tag: [] Fluid List: Gasoline [] Specific Gravity / Density: 300 [] kg/cubic meter [] Viscosity: 1.1 [] Centistoke []

Flow Rate: Minimum: [] Operating: [] Maximum: [] Units: [] Cubic Meters [] Per [] Hour []

Temperature: [] 20 [] 60 [] 100 [] °F [] °C []

Pressure: [] 60 [] 100 [] kPa []

Meter Selection

Material: [] ANSI Class: Ratings [] Transducer: []

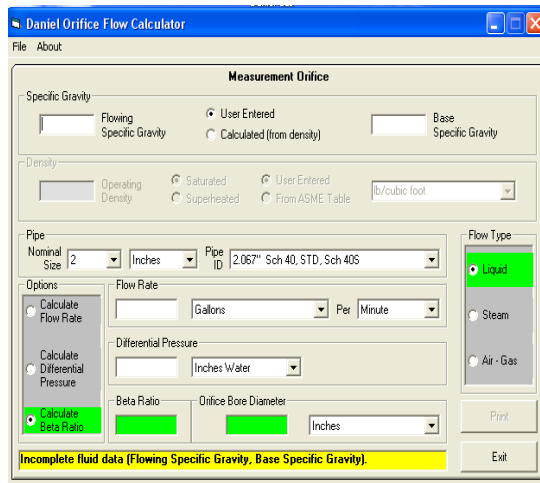
Carbon Steel Body and Flanges (-46°C to 150°C) [] 150 ANSI / PN 20 [] LT-01 transducer (50°C to 100°C) with NBR o-rings []

Nominal Line Size: [] Schedule: Calculations [] Bore ID: [] Meter Linearity: [] Flow Direction: []

6 inch (DN 150) [] Schedule 40 [] 6.065 [] Inches [] ±0.15% [] Uni-Directional []

Exit

Liquid Ultrasonic Meter Sizing Tool Simulator



Daniel Orifice Flow Calculator

Measurement Orifice

Specific Gravity: [] Flowing Specific Gravity [] User Entered [] Base Specific Gravity []

Calculated (from density) []

Density: [] Operating Density [] Saturated [] Superheated [] User Entered [] From ASME Table [] lb/cubic foot []

Pipe: Nominal Size: [] Inches [] Pipe ID: 2.067" Sch 40, STD, Sch 40S []

Options: Calculate Flow Rate [] Flow Rate: [] Gallons [] Per [] Minute []

Calculate Differential Pressure [] Differential Pressure: [] Inches Water []

Calculate Beta Ratio [] Beta Ratio: [] Orifice Bore Diameter: [] Inches []

Flow Type: [] Liquid [] Steam [] Air - Gas []

Incomplete fluid data (Flowing Specific Gravity, Base Specific Gravity).

Print Exit

Orifice Flow Calculator Simulator

Course Coordinator

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