



COURSE OVERVIEW IE0038 Process Control, Instrumentation, Troubleshooting & Problem Solving

Course Title

Process Control, Instrumentation, Troubleshooting & Problem Solving

Course Date/Venue

July 19-23, 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 hermal 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.

Accommodation

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

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:

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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.

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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:



Mr. Barry Pretorius is a **Senior Instrumentation Engineer** with almost **30** years of extensive experience within the **Oil, Gas, Petrochemical, Refinery & Power** industries. His expertise widely covers in the areas of **Flowmetering & Custody Measurement, Multiphase Flowmetering, Measurement & Control, Distributed Control System (DCS), DCS Operations & Techniques, Plant Control and Protection Systems, Process Control & Instrumentation, Cascade Control Loops, Split-Range Control Loops, Capacity Control & Other Advanced Control Schemes, Safety Instrumented Systems, Plant**

Automation Operations & Maintenance, Programmable Logic Controller (PLC), Siemens PLC Simatic S7-400/S7-300/S7-200, PLC & SCADA for Automation & Process Control, Artificial Intelligence, Allen Bradley PLC Programming and Hardware Trouble Shooting, Schneider SCADA System, Wonder Ware, Emerson, Honeywell, Honeywell Safety Manager PLC, Yokogawa, Advanced DCS Yokogawa, Endress & Hauser, Field Commissioning and Start up Testing Pre Operations, System Factory Acceptance Test (FAT), FactoryLink ECS, Modicon 484, Rockwell Automation, System Site Acceptance Test (SAT), SCADA HMI & PLC Control Logic, Cyber Security Practitioner, Cyber Security of Industrial Control System, IT Cyber Security Best Practices, Cybersecurity Fundamentals, Ethical Hacking & Penetration Testing, Cybersecurity Risk Management, Cybersecurity Threat Intelligence, OT Whitelisting for Better Industrial Control System Defense, NESA Standard and Compliance Workshop, OT, Cyber Attacks Awareness - Malware/Ransom Ware / Virus /Trojan/ Phishing, Information Security Manager, Security System Installation and Maintenance, Implementation, Systems Testing, Commissioning and Startup, Foxboro DCS & Triconics, SIS Systems, Advanced DC Drives, Motion Control, Hydraulics, Pneumatics and Control Systems Engineering, Electrical & Automation Control Systems, HV/MV Switchgear, LV & MV Switchgears & Circuit Breakers, High Voltage Electrical Safety, LV & HV Electrical System, HV Equipment Inspection & Maintenance, LV Distribution Switchgear & Equipment, Electrical Safety, Electrical Maintenance, Transformers, Medium & High Voltage Equipment, Circuit Breakers, Cable & Overhead Line Troubleshooting & Maintenance, Electrical Drawing & Schematics, Voltage Distribution, Power Distribution, Filters, Automation System, Electrical Variable Speed Drives, Power Systems, Power Generation, Diesel Generators, Power Stations, Uninterruptible Power Systems (UPS), Battery Chargers, AC & DC Transmission, CCTV Installation, Data & Fire Alarm System, Evacuation Systems and Electrical Motors & Variable Speed Drives, & Control of Electrical and Electronic devices.

During Mr. Pretorius's career life, he has gained his practical experience through several significant positions and dedication as the **Senior Technical Analyst, Team Leader, Pre-operations Startup Engineer, Automation System's Software Manager, Automation System's Senior Project Engineer, PLC Specialist, Site Manager, Senior Project & Commissioning Engineer, Technical Director, Project Engineer, Radio Technician, A T E Technician** and **Senior Instructor/Trainer** from various companies like the ADNOC Sour Gas, Ras Al Khair Aluminum Smelter, Johnson Matthey Pty. Ltd, Craigcor Engineering, Unitronics South Africa Pty (Ltd), Bridgestone/Firestone South Africa Pty (Ltd) and South African Defense Force.

Mr. Pretorius's has a Higher Diploma in **Electrical Engineering Heavy Current**. Further, he is a **Certified Instructor/Trainer** and delivered numerous trainings, courses, workshops, seminars and conferences internationally.





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, 19th of July 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, 20th of July 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
230 – 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, 21st of July 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, 22nd of July 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, 23rd of July 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

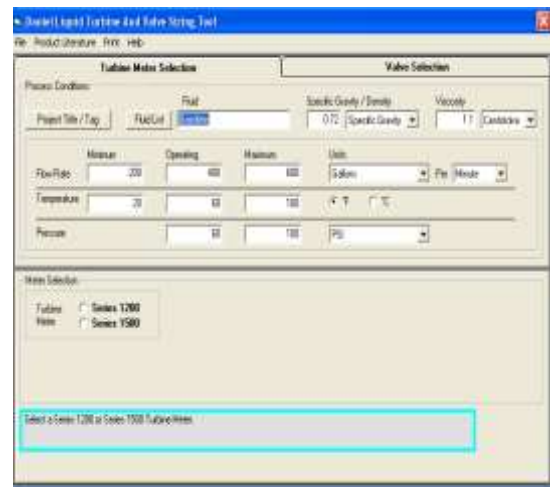


Simulator (Hands-on Practical Sessions)

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”, “PID Simulator”, “Rockwell Automation Builder” and “Fisher™ Valve Specification Manager” simulators



Gas Ultrasonic Meter (USM) Sizing Tool Simulator



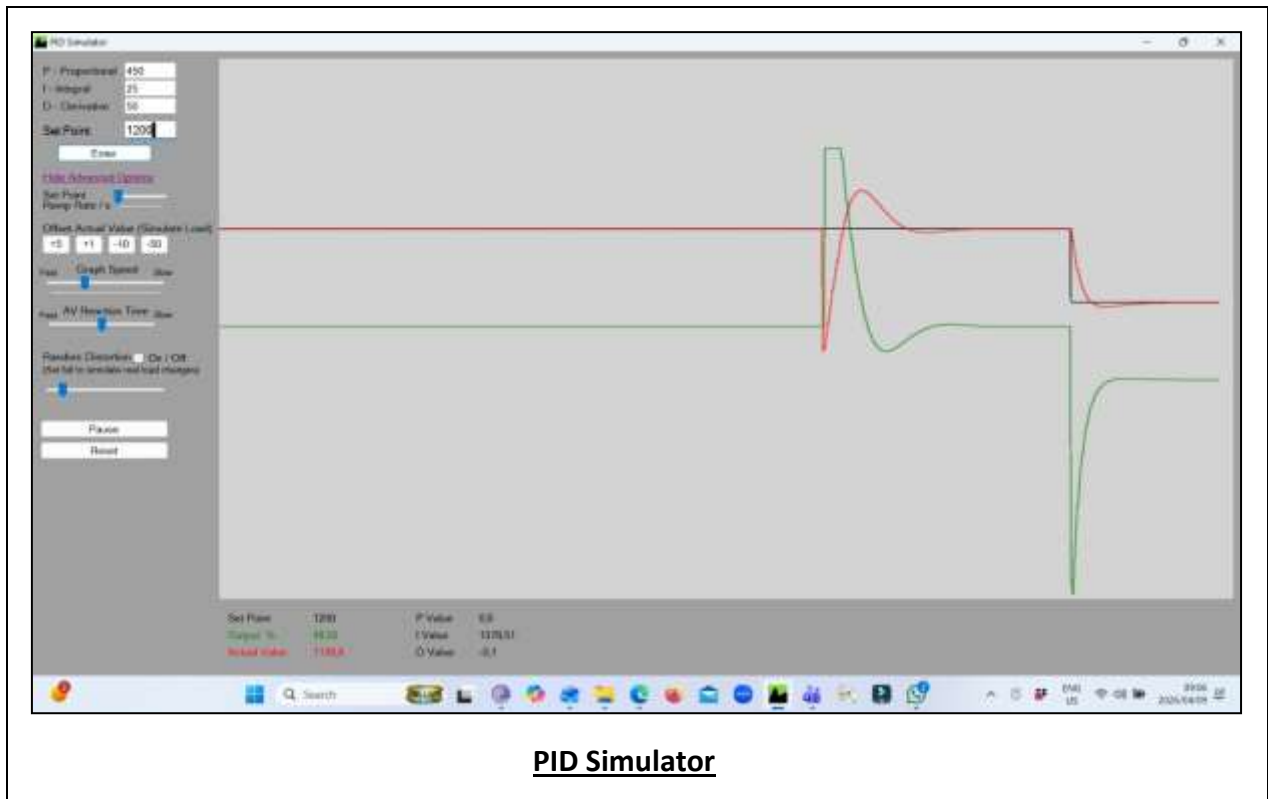
Liquid Turbine Meter and Control Valve Sizing Tool Simulator



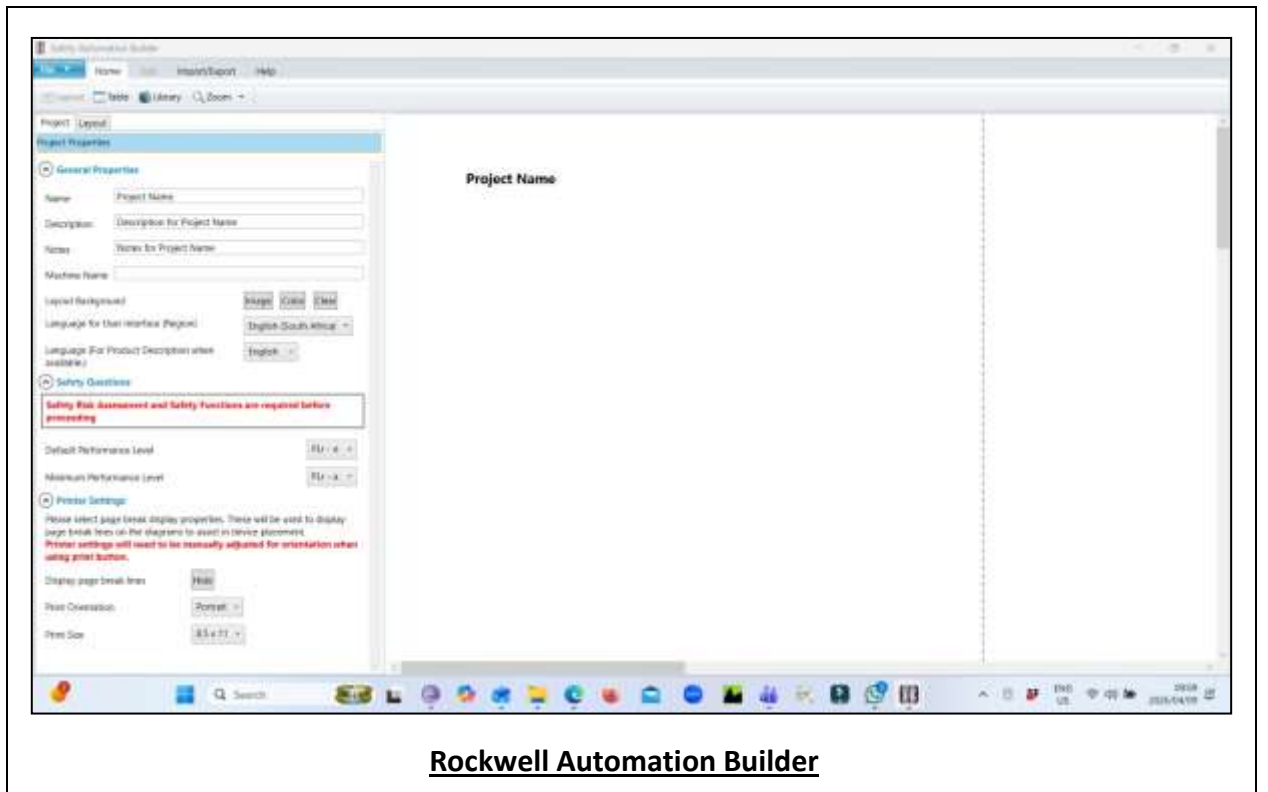
Liquid Ultrasonic Meter Sizing Tool Simulator



Orifice Flow Calculator Simulator



PID Simulator



Rockwell Automation Builder



Fisher™ Valve Specification Manager 3.2.0.0

File Edit Profile Contacts View Help

ISA Sheet | 1 Installation Data | 2 Valve Sizing | 3 Valve Selection | 4 Valve Construction | 5 Actuator Selection | 6 Options | 7 Additional Accessories

Control Valve Specification Sheet

Customer: _____ Phone: _____
 Fax: _____ Contact: _____
 Item: 1 Qty: 1 P.O. Number: _____
 Tags: 100-XX-0001 Project: _____ Day: _____
 Description: _____ P&ID Number: _____
 Service Description: **harbor fuel supply valve** Line Number: _____

1 Fluid: TSDZENG Out Press FC: 100.000 psia

Service Conditions	Units	Minimum	Normal	Maximum	Others
2 Volumetric Flow Rate Liquid (Q)	gpm(G)	15.000	50.000	14.000	
3 Inlet Pressure (PI)	psig	200.000	250.000	275.000	
4 Pressure Differential (dP)	psi	8.000	8.500	11.000	
5 Inlet Temperature (TI)	deg C	75.0000	80.0000	85.0000	
6 Liquid Specific Gravity (G)		5.000	6.000	7.000	
7 Kinematic Viscosity (Mu)	cSt	1.000	1.000	1.200	1.800
8 Vapor Pressure (Pv)	psia	1.000	1.200	1.500	
9 Spring Coefficient (Cv)		11.700	13.340	11.110	
10					
11 Allowed I (Calculated w/ Insulation Credit)	dB(A)	70<50	70<50	70<50	70<50
12					
13					

PIPE LINE

13 Size Schedule in: **1.5 inches, 40**
 14 Size Schedule out: **3 inches**
 15 Insulation: _____
 16 VALVE BODY/BOHMET Type: **Butterfly**
 17 Size: **AA03** **CL300**
 18 Max Press Temp: **350kPa(g)/100kg C**
 19 Hg Model: **Fisher**
 20 Body Bonnet Mat: _____
 21 Liner Mat ID: _____
 22 End Flange ID: _____

23 Actuator Type: _____
 24 Hg Model: _____
 25 Size: _____
 26 On/Off: _____
 27 Spring Action: _____
 28 Max Allow Press: _____
 29 Min. Peak Press: _____
 30 Available Air Supply Pressure: _____
 31 Max: _____ (Short) _____ (Long)
 32 Batch Flange: _____
 33 End Flange: _____

Spring & Diaphragm: **Fisher**
 34 Area: _____
 35 Modulating: _____
 36 Open: _____

Fisher™ Valve Specification Manager

Course Coordinator

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