
ABLE Instruments & Controls Limited

Instrumentation in Hazardous Areas

Course Code: GS003B, 1 day; Instructor-Led

Venue: ABLE Training Centre, Dyce, Aberdeen

ABLE Training - Education and Certification

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Introduction

Elements of this syllabus are subject to change.

This training course covers all aspects of instrumentation and automation systems used in hazardous (classified) locations.

Facilities in oil & gas, refining, petrochemical and chemical processing all typically have areas that contain explosive or hazardous atmospheres. The instrumentation and automation systems used in these areas must be designed to ensure that they work safely at all times. Engineers working on these systems need to know about hazardous area classification, temperature and material classification, methods of explosion protection, certification, testing and maintenance.

Audience

This course is suitable for those who would like an in depth understanding of working with instrumentation in hazardous locations.

It is particularly suitable for:

- Graduates
- Managers
- Process Engineers
- Instrument Engineers
- Design Engineers
- Buyers

Course Objectives

To provide delegates with the following:

- knowledge of hazardous area zones and classifications
- attain a good understanding of using instrumentation in hazardous environments
- Product markings and approvals
- an understanding of hazardous area certification
- methods of protection
- international approval system
- knowledge of maintaining instruments in hazardous areas



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Prerequisites

This course requires that students meet the following prerequisites:

- There are no prerequisites for this course.

Course Materials

The student kit includes a comprehensive workbook for this class.

Course Outline

Module 1 : Basic Concepts

1. Learning Objectives
2. Introduction to Hazardous Areas
3. History Related to Mines
4. Flammable Materials
5. Fire Triangle
6. Explosive Limits
7. Concept of LEL & UEL
8. Hazardous Atmosphere
9. Effects of Temperature and Pressure
10. Ignition Energy
11. Flashpoint
12. AIT
13. Dust Hazards
14. Explosion Pentagon

Module 2 : Classification

1. Learning Objectives
2. Classification
3. Area Classification of Gas
4. Area Classification Dust
5. Group Classification
6. MESH
7. MIC



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8. MIC Ratio
 9. Temperature Classification
 10. Classification (Europe)
 11. Classification of Hazardous Locations
 12. Group Classification (Europe)
 13. MESG and MIC ratios
 14. Area Classification of Dusts
 15. Dust Groups
 16. Temperature Classification
 17. Steps to Area Classification for Gases & vapours
 18. Pitfalls in the Classification Process
 19. Area Classification of Dusts
 20. Example (area classification of a chemical facility)
 21. Example (area classification of a chemical facility)
 22. Example (area classification of a chemical facility)

Module 3: Methods of Protection

1. Learning Objectives
2. Overview of protection philosophy
3. Explosion proof Fundamentals
4. Explosion proof method-working
5. Explosion proof method-flanged joint
6. Explosion proof method-threaded joint
7. Explosion proof method-pressure developed
8. Explosion proof Pressure Piling
9. Explosion proof MESG
10. Explosion proof Standards & practices
11. Explosion proof seals
12. Explosion proof-Direct & Indirect entry
13. Dust Ignition Proof
14. Explosion proof Advantages
15. Explosion proof Disadvantages
16. Intrinsic Safety - Fundamentals
17. Intrinsic Safety - History
18. Intrinsic Safety - Simple Apparatus
19. Intrinsic Safety - Safe area & associated apparatus
20. Intrinsic Safety - How barriers work
21. Intrinsic Safety - How Zener barriers work
22. Intrinsic Safety - What are Isolators
23. Intrinsic Safety - How isolators work



Official Curriculum

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24. Intrinsic Safety - Cable Parameters
 25. Intrinsic Safety - Faults- Ex-ia and Ex-ib
 26. Intrinsic Safety - Safety description of barriers
 27. Intrinsic Safety - Typical IS Loop
 28. Intrinsic Safety - Conditions to be met
 29. Intrinsic Safety - How to design a practical IS temperature loop
 30. Intrinsic Safety Example
 31. Intrinsic Safety Advantages/Disadvantages
 32. Pressurization & Purging concept
 33. Pressurization Interlocks
 34. Types of Pressurisation
 35. Pressurization - Type Z, X and Y
 36. Pressurisation - Static & leakage compensation
 37. Pressurisation with dilution
 38. Purged panels - advantages & disadvantages
 39. Increased Safety Basics
 40. Increased Safety - Enclosures & terminals
 41. Increased Safety - Construction
 42. Increased Safety - creepage & clearances
 43. Increased Safety - Advantages & disadvantages
 44. Nonincendive - Basic concept
 45. Nonincendive - How non incendive circuits work
 46. Nonincendive - Advantages & disadvantages
 47. Encapsulation
 48. Powder filling & oil immersion
 49. Weather Protection Basics
 50. Weather Protection - NEMA codes
 51. Ingress Protection codes (IP codes)
 52. IP charts

Module 4 : Fieldbus

1. Learning Objectives
2. Fieldbus in Hazardous Areas
3. Fieldbus with traditional Explosion proof methods
4. Non-Incendive protection
5. FNICO
6. Non-Incendive Diagram
7. Fieldbus using Intrinsic Safety (traditional)
8. Bus Powered Devices
9. Separately powered devices



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10. IS barrier
 11. With Earth Barriers
 12. Galvanic Isolator-1
 13. Galvanic Isolator-2
 14. Cabling
 15. FISCO
 16. Cable Circuit
 17. Topology of a typical FISCO solution
 18. Topologies FNICO

Module 5 : Certification

1. Learning Objectives
2. Introduction
3. Certification Bodies - North America
4. Certification Bodies - Europe
5. Marking & labeling
6. How to decode marks and labels - North American
7. How to decode marks & labels - European & IEC
8. Testing
9. ATEX Directives
10. ATEX Directive - Objectives
11. ATEX Directive - Employers obligations
12. ATEX 100a
13. CE mark & Hexagon Ex mark

Module 6 : Maintenance

1. Learning Objectives
2. Maintenance - Introduction
3. Maintenance - General guidelines
4. Inspection
5. Maintenance of explosion proof instruments/equipment - 1
6. Maintenance of explosion proof instruments/equipment - 2
7. Inspection of explosion proof equipment
8. Maintenance of Increased Safety equipment