

Practical

MACHINERY AND AUTOMATION SAFETY

for Industry



YOU WILL LEARN HOW TO:

- Identify hazards that occur with machinery and know how to deal with them
- Perform simple risk assessment and hazard design methods for your projects
- Specify appropriate safety systems for your applications
- Use Safety PLCs and how to effectively apply them
- Apply basic principles of Machinery Safety Management

WHO SHOULD ATTEND:

- Control Engineers & Technicians
- Electrical Engineers
- Instrumentation and Control Engineers & Technicians
- Compliance Engineers
- Machinery Designers & System Integrators
- Safety Professionals, Health & Safety Officers
- Production Managers
- Process Engineers
- Electronic Engineers
- Designers
- Systems Engineers
- Electronic Technicians
- Automation Engineers
- Process Control Engineers
- System Integrators
- Design Engineers
- Test Engineers
- Consulting Engineers



Technology Training that Works

THE WORKSHOP

Perhaps your company is wasting money on inappropriate safety measures that still do not deliver compliance with local safety regulations?

This workshop aims to provide you with the knowledge to tackle machinery safety control problems at a basic and practical level whilst following the best available international standards. The workshop begins with an overview of machinery safety issues, introducing the concepts of hazard identification and risk reduction.

The workshop highlights the major international standards that are used to support compliance with EC regulations and uses these standards as a basis for the design procedures. This approach will assist you to follow best practices for safety system applications wherever your plant is situated.

The workshop looks at the risk assessment processes used to identify hazards and to quantify the risks inherent in a machine. This enables engineers to evaluate the need for risk reduction and hence define the safety functions to be provided by safety related electrical controls. The workshop then introduces the concepts of safety categories as defined by standard EN 954 and illustrates the principles of failsafe design, fault tolerance and self-testing.

With design procedures established the workshop now provides an introduction to machinery protection devices such as guards, enclosures with interlocks and guard monitoring relays, locking systems, safety mats, photo electric and electro sensitive principles and the application of light curtains.

The workshop continues with a study of Safety Control System techniques and introduces the principles of safety-certified PLCs focussing on practical useful information. Application examples such as guard door interlocking applications, two-hand controls, muting, area protection of robot installations and motion detection are then discussed.

PRE-REQUISITES

A basic working knowledge of electrical engineering concepts is useful but not essential as there will be a brief revision at the commencement of the class.

ON-SITE TRAINING

- ✓ **SAVE** over 50% by having an IDC workshop presented at your premises.
- ✓ Customise the training to **YOUR** workplace.
- ✓ Have the training delivered when and where you need it.

Contact us for a **FREE** proposal.

THE PROGRAM

DAY ONE

COURSE OBJECTIVES & INTRODUCTION TO MACHINERY SAFETY PRINCIPLES

- Course outline and objectives
- Definition of a machine and the scope of machinery controls
- Examples of common hazards & typical safety system solutions
- Applicable standards & sources of information

REGULATIONS FOR MACHINERY SUPPLY AND END USE

- Regulations for supply of machinery (Safety), European (CE) and USA examples
- Regulations for the safe use of machinery at work. EC and USA examples
- The European Machinery Directive. Its scope, implications & outline requirements.
- Discussion on end user practices & employer's obligations

Practical 1: Checkout a machine example for compliance.

DESIGN PROCEDURES FOR SAFETY CONTROLS

Background to safety life cycle practices and explanation of the major steps in design of safety systems

- Risk assessment & risk reduction principles
- Measures for risk reduction
- Specification of safety requirements
- Explanation of equipment safety categories
- Introduction to applicable standards: EN 1050 and EN 954

Practical 2: Evaluate an example for category of protection function

RISK ASSESSMENT & HAZARD STUDY METHODS

- Methods for Identifying Hazards, Machinery concept hazard analysis, activity analysis, human error analysis
- Practical example of hazard study
- Risk assessment & the selection of protection measures
- Explanation of safety categories
- Examples of selection of safety categories using EN 954
- Introduction to safety integrity levels

Practical 3: Trial hazard study & selection of safety categories

DAY TWO

MACHINERY PROTECTION DEVICES: INTRODUCTION

- Guards & Enclosures with interlocks
- Fixable & moveable Guards
- Users responsibility
- Emergency Stops & Guard Interlocking
- Guard monitoring relays
- Locking systems
- Safety Mats
- Photo-electric & electro sensitive principles
- Light curtains & proximity sensors
- Instructions, warnings & labels
- Evaluation of approach speeds, safety distances & times

Practical 4: Application examples, selection of devices

SAFETY CONTROL SYSTEM TECHNIQUES

- Principles of Safety Related Control Systems
- Introduction to IEC 61508 general standard for functional safety
- Subsystems: sensor, logic solver, final control element
- Principles of separation & fault tolerance
- Reliability requirements, fail safe principles
- Diagnostics & self testing methods
- Safety relays, Emergency-stop relays
- Circuit application examples for categories 1 to 4

Practical 5: Design task. Application of safety relays

PROGRAMMABLE SYSTEMS

- Why regular PLCs should not be used for safety functions
- Programmable electronic logic solvers.
- Safety Certification
- Certified programming systems
- Application examples
- Growth of networked safety devices & certified networks
- Integrated safety systems

APPLICATION EXAMPLES

- Guard Door Interlocking Applications; Examination of circuits & operating principles
- Power press application with light curtain.
- Area protection of robot installations.
- Motion detection with run down protection system

Practical 6: Maintenance proof testing of a typical application

MACHINERY SAFETY MANAGEMENT

- Maintenance practices & issues on existing plant
- Practical exercise: Checklist for safety compliance
- Ways to deal with existing machinery needing a safety upgrade
- Evaluation of new machinery compliances

REVISION OF KEY POINTS