

# Safety of Machinery Training Course

## Design and Manufacture of Control System Panels

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(Duration – 1 day)

### Course Purpose

The objective of this course is to provide and reinforce designers of industrial control system panels with the knowledge, tools & competence to design and manufacture control panels compliant with European Union Directives, European Harmonised Standards and good engineering practice and to declare compliance by CE Marking.

### Course Accreditation

This course has been recognized by **TÜV Rheinland** as a “Level 3” program of study and meeting the quality management and quality system elements as defined by EN29004-2 / ISO9004-2.



### Course Units Overview:-

#### 1 - Europe & Directives

Objective:-

To introduce the European Directives that call for CE Marking of machinery and their associated control system panels and to examine the essential requirements of the Machinery, Low Voltage and EMC Directive in relation to such panels.

Key Topics:-

- Single European Market
- European Directives & their adoption into UK Law
- New Approach Directives, Essential Requirements & the CE Mark
- CE Marking Directives
- “New” Machinery Directive, it’s Essential Requirements & the implications of Annex IV
- Associated Directives

## 2 - European Harmonised Standards

Objective:-

To examine the application of European Harmonised Standards and to introduce the principal standards associated with the Low Voltage Directive for machine control panels, MCC's and Power Distribution.

Key Topics:-

- What is a Standard?
- UK, EU & International Standards
- What is a Harmonised Standard?
- Structure of a Harmonised Standard
- Safety of Machinery Standards – A, B & C type standard relationships
- "Functional Safety" – the relevance of EN 61508, EN 62061 & EN ISO 13849

## 4 - Design of Control System Panels

Objective:-

To set out the practical principles for planning, design, manufacture, testing and installation of machine control, LV MCC's and Power Distribution panels.

Key Topics:-

- The Specification
- Planning and Design
  - Risk Assessment
  - Selection of enclosure
  - Environmental Protection
  - Segregation & Separation
  - Layout
  - Power Supply Connections
  - Protective Earthing
  - Component selection
  - Control Functions & Operator interfaces
- Assembly
  - Wiring
  - Dealing with EMI & reducing risk of Common Cause Failures
  - Terminations
  - Markings
- Testing
- Documentation & Compliance
  - Drawings & Manuals
  - Declarations
  - CE Marking
- Installation
  - Location
  - Access
  - Setting to work
  - Training
  - Handover

### 3 - Electrical Equipment of Machines - Harmonised Standard

Objective:-

An "chapter-by-chapter" examination of the requirements of the European Harmonised Standard EN (IEC) 60204-1 "*Safety of Machinery – Electrical Equipment of Machines – General requirements*". The equipment covered commences at the point of connection of the supply to the electrical equipment of the machine.

Key Topics:-

- Clause 1 - Scope
- Clause 4 - General Requirements
- Clause 5 - Incoming Supply
- Clause 6 - Protection against Shock
- Clause 7 - Protection of Equipment
- Clause 8 - Equipotential Bonding
- Clause 9 - Control circuits and functions
- Clause 10 - Operator Interface & Controls
- Clause 11 - Controlgear
- Clause 12 - Conductors & Cables
- Clause 13 - Wiring Practices
- Clause 14 - Electric Motors & Assoc. Equipment
- Clause 15 - Accessories & Lighting
- Clause 16 - Markings, Signs & References
- Clause 17 - Technical Documentation
- Clause 18 - Verification

### Surgery

Objective:-

An opportunity for the attendees to introduce their "real" problems and to discuss, apply and implement the knowledge gained under guidance of the presenter.

**Note:** the supplementary units are subject to the needs of the attendees and the venue. Surgery may require attendees wishing to bring drawings, documentation, photos, etc, and for on-site training, access to the equipment would be an advantage. Preparation is essential.

For more details contact:

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