



# Begin Implementing UL 991/UL 1998 and IEC/UL 60730-1 Annex H

## Functional safety training for cross-industry technologies

### Course overview

This three-day technical training course will give you in-depth exposure to industrial functional safety standards UL 991: Standard for Tests for Safety-Related Controls Employing Solid-State Devices, UL 1998: Standard for Software in Programmable Components, and IEC/UL 60730-1 Annex H: Standard for Automatic and Electrical Controls for Household and Similar Use. This course teaches how to effectively use the standards in a product's design phase, which is critical to its certification and acceptance. During the course, the concepts covered by the Standards will be applied to a cross-industry technology topic, highlighting the fact that different standards used in different industries use different metrics for assessing and testing functional safety. Day 1 consists of a general overview of the Standards and will cover Failure Mode and Effects Analysis (FMEA) techniques, the environmental stress test program and other topics of UL 991. Day 2 focuses on the embedded software requirements of UL 1998. Day 3 covers commonalities between IEC/UL 60730-1 Annex H and UL 991, UL 1998 and this international standard.

### Training topics

- Overview of functional safety
- UL 991:
  - FMEA
  - Environmental stress tests, including EMC immunity
  - Computational investigation and demonstrated method
  - Follow-up program
- UL 1998:
  - Risk analysis and microelectronic hardware considerations
  - Process definition
  - Qualification of development tools and off-the-shelf (OTS) software
  - Software design and partitioning
  - Product and user interfaces
  - Software verification, validation and testing
  - Configuration management and maintenance
  - Documentation
- IEC/UL 60730-1 Annex H:
  - Overview of IEC/UL 60730 standard series
  - Similarities between UL 991 and UL 1998
  - Hardware requirements
  - Software requirements
  - Testing requirements
- Review the UL process steps for functional safety certification



## Optional UL Certified Functional Safety Professional Exam

Participants who complete all three days of training are eligible to take a two-hour certification exam on the morning of the fourth day. Those who pass the exam are individually certified as a *UL Certified Functional Safety Professional (UL-CFSP)* in UL 991/UL 1998 and IEC/UL 60730-1 Annex H.

Upon the successful completion of the *UL-CFSP* exam, participants will receive a certificate and badges that they can use to demonstrate their competence in UL 991/UL 1998 and IEC/UL 60730-1 Annex H industrial functional safety. The certification is effective for three years, after which individuals may recertify.



## Objectives

Upon completion of this workshop, you will be able to:

- Analyze the relationship of end-product standard requirements to UL 991, UL 1998 and IEC/UL 60730-1 Annex H requirements
- Recognize the applicability of UL 991, UL 1998 and IEC/UL 60730-1 Annex H requirements to the end-product design
- Apply FMEA techniques to safety-related circuits to identify critical components
- Learn how to evaluate critical components through computational investigation and demonstrated method
- Walk through an example UL 991, UL 1998 and IEC/UL 60730-1 Annex H test program
- Trace risk identification and analysis through programmable component and software design, implementation and validation processes
- Assess project management practices against UL 991, UL 1998 and IEC/UL 60730-1 Annex H requirements
- Develop submittal documentation for UL 991, UL 1998 and IEC/UL 60730-1 Annex H compliance
- Learn more about how these requirements may apply to your own product(s) during the interactive Q&A throughout the workshop
- Identify commonalities between UL 991, UL 1998, and other international standards like IEC/UL 60730-1 Annex H

## Target audience

- Hardware/firmware designers
- Embedded software designers and development managers
- Project and product leaders
- Compliance engineers
- Design and manufacturing engineers

## Why choose UL?

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For more information, call 1.864.630.5373, email: [kvasales@UL.com](mailto:kvasales@UL.com) or visit [kvausa.com](http://kvausa.com).



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