INTERNATIONAL STANDARD

IEC 61025

Second edition
2006-12

Fault tree analysis (FTA)

*This **English-language** version is derived from the original **bilingual** publication by leaving out all French-language pages. Missing page numbers correspond to the French-language pages.*

Reference number
IEC 61025:2006(E)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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FOREWORD

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International Standard IEC 61025 has been prepared by IEC technical committee 56: Dependability.

The text of this standard is based on the following documents:

FDIS	Report on voting
56/1142/FDIS	56/1162/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This second edition cancels and replaces the first edition, published in 1990, and constitutes a technical revision.

The main changes with respect to the previous edition are as follows:

– added detailed explanations of fault tree methodologies
– added quantitative and reliability aspects of Fault Tree Analysis (FTA)
– expanded relationship with other dependability techniques
– added examples of analyses and methods explained in this standard
– updated symbols currently in use

Clause 7, dealing with analysis, has been revised to address traditional logic fault tree analysis separately from the quantitative analysis that has been used for many years already, for reliability improvement of products in their development stage.

Some material included previously in the body of this standard has been transferred to Annexes A and B.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

INTRODUCTION

Fault tree analysis (FTA) is concerned with the identification and analysis of conditions and factors that cause or may potentially cause or contribute to the occurrence of a defined top event. With FTA this event is usually seizure or degradation of system perfomance, safety or other important operational attributes, while with STA (success tree analysis) this event is the attribute describing the success.

FTA is often applied to the safety analysis of systems (such as transportation systems, power plants, or any other systems that might require evaluation of safety of their operation). Fault tree analysis can be also used for availability and maintainability analysis. However, for simplicity, in the rest of this standard the term “reliability” will be used to represent these aspects of system performance.

This standard addresses two approaches to FTA. One is a qualitative approach, where the probability of events and their contributing factors, – input events – or their frequency of occurrence is not addressed. This approach is a detailed analysis of events/faults and is known as a qualitative or traditional FTA. It is largely used in nuclear industry applications and many other instances where the potential causes or faults are sought out, without interest in their likelihood of occurrence. At times, some events in the traditional FTA are investigated quantitatively, but these calculations are disassociated with any overall reliability concepts, in which case, no attempt to calculate overall reliability using FTA is made. The second approach, adopted by many industries, is largely quantitative, where a detailed FTA models an entire product, process or system, and the vast majority of the basic events, whether faults or events, has a probability of occurrence determined by analysis or test. In this case, the final result is the probability of occurrence of a top event representing reliability or probability of fault or a failure.

FAULT TREE ANALYSIS (FTA)

1 Scope

This International Standard describes fault tree analysis and provides guidance on its application as follows:

– definition of basic principles;
  - describing and explaining the associated mathematical modelling;
  - explaining the relationships of FTA to other reliability modelling techniques;
– description of the steps involved in performing the FTA;
– identification of appropriate assumptions, events and failure modes;
– identification and description of commonly used symbols.

2 Normative references

The following referenced documents are indispensable for the application of this document. For the references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60050(191), *International Electrotechnical Vocabulary (IEV) – Chapter 191: Dependability and quality of service*

IEC 61165, *Application of Markov techniques*