

**Functional safety of  
electrical/electronic/programmable  
electronic safety-related systems - Part  
6: Guidelines on the application of IEC  
61508-2 and IEC 61508-3**

Functional safety of  
electrical/electronic/programmable electronic safety-  
related systems - Part 6: Guidelines on the  
application of IEC 61508-2 and IEC 61508-3

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

<p>Käesolev Eesti standard EVS-EN 61508-6:2003 sisaldab Euroopa standardi EN 61508-6:2001 ingliskeelset teksti.</p> <p>Käesolev dokument on jõustatud 15.01.2003 ja selle kohta on avaldatud teade Eesti standardiorganisatsiooni ametlikus väljaandes.</p> <p>Standard on kättesaadav Eesti standardiorganisatsioonist.</p>	<p>This Estonian standard EVS-EN 61508-6:2003 consists of the English text of the European standard EN 61508-6:2001.</p> <p>This document is endorsed on 15.01.2003 with the notification being published in the official publication of the Estonian national standardisation organisation.</p> <p>The standard is available from Estonian standardisation organisation.</p>
--	---

<p><b>Käsitlusala:</b></p> <p>This part of standard series contains information and guidelines on parts 2 and 3, and gives a brief overview of the requirements and sets out the functional steps in their application. It gives an example technique for calculating the probabilities of failure, gives a worked example of calculating diagnostic coverage, gives a methodology for quantifying the effect of hardware-related common cause failures on the probability of failure, and gives worked examples of the application of the software safety integrity.</p>	<p><b>Scope:</b></p> <p>This part of standard series contains information and guidelines on parts 2 and 3, and gives a brief overview of the requirements and sets out the functional steps in their application. It gives an example technique for calculating the probabilities of failure, gives a worked example of calculating diagnostic coverage, gives a methodology for quantifying the effect of hardware-related common cause failures on the probability of failure, and gives worked examples of the application of the software safety integrity.</p>
---	---

**ICS** 25.040.40

**Võtmesõnad:** control, diagnosis (medical), management, medicine, policy, process measuring and contr, programmable, reliability, reliability assurance, safety, safety devices, safety engineering, safety requirements, safety systems, specification (approval), specifications, use

**Functional safety of electrical/electronic/programmable electronic  
safety-related systems****Part 6: Guidelines on the application  
of IEC 61508-2 and IEC 61508-3  
(IEC 61508-6:2000)**

Sécurité fonctionnelle des systèmes  
électriques/électroniques/électroniques  
programmables relatifs à la sécurité  
Partie 6: Lignes directrices pour  
l'application de la CEI 61508-2 et  
de la CEI 61508-3  
(CEI 61508-6:2000)

Funktionale Sicherheit  
sicherheitsbezogener elektrischer/  
elektronischer/programmierbarer  
elektronischer Systeme  
Teil 6: Anwendungsrichtlinie für  
IEC 61508-2 und IEC 61508-3  
(IEC 61508-6:2000)

This European Standard was approved by CENELEC on 2001-07-03. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

**CENELEC**

European Committee for Electrotechnical Standardization  
Comité Européen de Normalisation Electrotechnique  
Europäisches Komitee für Elektrotechnische Normung

**Central Secretariat: rue de Stassart 35, B - 1050 Brussels**

## Foreword

The text of the International Standard IEC 61508-6:2000, prepared by SC 65A, System aspects, of IEC TC 65, Industrial-process measurement and control, was submitted to the Unique Acceptance Procedure and was approved by CENELEC as EN 61508-6 on 2001-07-03 without any modification.

The following dates were fixed:

- latest date by which the EN has to be implemented  
at national level by publication of an identical  
national standard or by endorsement (dop) 2002-08-01
- latest date by which the national standards conflicting  
with the EN have to be withdrawn (dow) 2004-08-01

Annexes designated "normative" are part of the body of the standard.

Annexes designated "informative" are given for information only.

In this standard, annex ZA is normative and annexes A to E are informative.

Annex ZA has been added by CENELEC.

IEC 61508 is a basic safety publication covering the functional safety of electrical, electronic and programmable electronic safety-related systems. The scope states:

"This International Standard covers those aspects to be considered when electrical/electronic/programmable electronic systems (E/E/PESs) are used to carry out safety functions. A major objective of this standard is to facilitate the development of application sector international standards by the technical committees responsible for the application sector. This will allow all the relevant factors associated with the application, to be fully taken into account and thereby meet the specific needs of the application sector. A dual objective of this standard is to enable the development of electrical/electronic/programmable electronic (E/E/PE) safety-related systems where application sector international standards may not exist".

The CENELEC Report R0BT-004, ratified by 103 BT (March 2000) accepts that some IEC standards, which today are either published or under development, are sector implementations of IEC 61508. For example:

- IEC 61511, Functional safety - Safety instrumented systems for the process industry sector;
- IEC 62061, Safety of machinery – Functional safety of electrical, electronic and programmable electronic control systems;
- IEC 61513, Nuclear power plants – Instrumentation and control for systems important to safety – General requirements for systems.

The railways sector has also developed a set of European Standards (EN 50126; EN 50128 and prEN 50129).

NOTE EN 50126 and EN 50128 were based on earlier drafts of IEC 61508. prEN 50129 is based on the principles of the latest version of IEC 61508.

This list does not preclude other sector implementations of IEC 61508 which could be currently under development or published within IEC or CENELEC.

---

### Endorsement notice

The text of the International Standard IEC 61508-6:2000 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 61078      NOTE    Harmonized as EN 61078:1993 (not modified).

IEC 61131-3    NOTE    Harmonized as EN 61131-3:1993 (not modified).

---

## Annex ZA (normative)

### Normative references to international publications with their corresponding European publications

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 61508-1 + corr. May	1998 1999	Functional safety of electrical/electronic/programmable electronic safety-related systems Part 1: General requirements	EN 61508-1	2001
IEC 61508-2	2000	Part 2: Requirements for electrical/electronic/programmable electronic safety-related systems	EN 61508-2	2001
IEC 61508-3 + corr. April	1998 1999	Part 3: Software requirements	EN 61508-3	2001
IEC 61508-4 + corr. April	1998 1999	Part 4: Definitions and abbreviations	EN 61508-4	2001
IEC 61508-5 + corr. April	1998 1999	Part 5: Examples of methods for the determination of safety integrity levels	EN 61508-5	2001
IEC 61508-7	2000	Part 7: Overview of techniques and measures	EN 61508-7	2001
IEC Guide 104	1997	The preparation of safety publications and the use of basic safety publications and group safety publications	-	-
ISO/IEC Guide 51	1990	Guidelines for the inclusion of safety aspects in standards	-	-

# INTERNATIONAL STANDARD

**IEC**  
**61508-6**

First edition  
2000-04

---

---

**Functional safety of electrical/electronic/  
programmable electronic safety-related systems –**

**Part 6:  
Guidelines on the application of  
IEC 61508-2 and IEC 61508-3**

*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 61508-6:2000(E)

## Publication numbering

As from 1 January 1997 all IEC publications are issued with a designation in the 60000 series. For example, IEC 34-1 is now referred to as IEC 60034-1.

## Consolidated editions

The IEC is now publishing consolidated versions of its publications. For example, edition numbers 1.0, 1.1 and 1.2 refer, respectively, to the base publication, the base publication incorporating amendment 1 and the base publication incorporating amendments 1 and 2.

## Further information on IEC publications

The technical content of IEC publications is kept under constant review by the IEC, thus ensuring that the content reflects current technology. Information relating to this publication, including its validity, is available in the IEC Catalogue of publications (see below) in addition to new editions, amendments and corrigenda. Information on the subjects under consideration and work in progress undertaken by the technical committee which has prepared this publication, as well as the list of publications issued, is also available from the following:

- **IEC Web Site** ([www.iec.ch](http://www.iec.ch))

- **Catalogue of IEC publications**

The on-line catalogue on the IEC web site ([www.iec.ch/searchpub](http://www.iec.ch/searchpub)) enables you to search by a variety of criteria including text searches, technical committees and date of publication. On-line information is also available on recently issued publications, withdrawn and replaced publications, as well as corrigenda.

- **IEC Just Published**

This summary of recently issued publications ([www.iec.ch/online\\_news/justpub](http://www.iec.ch/online_news/justpub)) is also available by email. Please contact the Customer Service Centre (see below) for further information.

- **Customer Service Centre**

If you have any questions regarding this publication or need further assistance, please contact the Customer Service Centre:

Email: [custserv@iec.ch](mailto:custserv@iec.ch)

Tel: +41 22 919 02 11

Fax: +41 22 919 03 00



# INTERNATIONAL STANDARD

**IEC**  
**61508-6**

First edition  
2000-04

---

---

## **Functional safety of electrical/electronic/ programmable electronic safety-related systems –**

### **Part 6: Guidelines on the application of IEC 61508-2 and IEC 61508-3**

© IEC 2000 Copyright - all rights reserved

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

International Electrotechnical Commission, 3, rue de Varembe, PO Box 131, CH-1211 Geneva 20, Switzerland  
Telephone: +41 22 919 02 11 Telefax: +41 22 919 03 00 E-mail: [inmail@iec.ch](mailto:inmail@iec.ch) Web: [www.iec.ch](http://www.iec.ch)



Commission Electrotechnique Internationale  
International Electrotechnical Commission  
Международная Электротехническая Комиссия

PRICE CODE **XB**

*For price, see current catalogue*

## CONTENTS

	Page
FOREWORD .....	11
INTRODUCTION .....	15
Clause	
1 Scope .....	19
2 Normative references .....	23
3 Definitions and abbreviations .....	23
Annex A (informative) Application of IEC 61508-2 and of IEC 61508-3 .....	25
A.1 General .....	25
A.2 Functional steps in the application of IEC 61508-2 .....	29
A.3 Functional steps in the application of IEC 61508-3 .....	37
Annex B (informative) Example technique for evaluating probabilities of hardware failure ...	41
B.1 General .....	41
B.2 Average probability of failure on demand (for low demand mode of operation) .....	49
B.3 Probability of failure per hour (for high demand or continuous mode of operation) .....	75
B.4 References .....	91
Annex C (informative) Calculation of diagnostic coverage and safe failure fraction: worked example .....	93
Annex D (informative) A methodology for quantifying the effect of hardware-related common cause failures in E/E/PE systems .....	101
D.1 General .....	101
D.2 Brief overview .....	101
D.3 Scope of the methodology .....	109
D.4 Points taken into account in the methodology .....	109
D.5 Using the $\beta$ -factor to calculate the probability of failure in an E/E/PE safety-related system due to common cause failures .....	111
D.6 Using the tables to estimate $\beta$ .....	113
D.7 Examples of the use of the methodology .....	121
D.8 References .....	123
Annex E (informative) Example applications of software safety integrity tables of IEC 61508-3 .....	125
E.1 General .....	125
E.2 Example for safety integrity level 2 .....	125
E.3 Example for safety integrity level 3 .....	135
Bibliography .....	145

	Page
Figure 1 – Overall framework of IEC 61508 .....	21
Figure A.1 – Application of IEC 61508-2 .....	33
Figure A.2 – Application of IEC 61508-2 (continued) .....	35
Figure A.3 – Application of IEC 61508-3 .....	39
Figure B.1 – Example configuration for two sensor channels .....	45
Figure B.2 – Subsystem structure .....	49
Figure B.3 – 1oo1 physical block diagram .....	51
Figure B.4 – 1oo1 reliability block diagram .....	51
Figure B.5 – 1oo2 physical block diagram .....	53
Figure B.6 – 1oo2 reliability block diagram .....	55
Figure B.7 – 2oo2 physical block diagram .....	55
Figure B.8 – 2oo2 reliability block diagram .....	55
Figure B.9 – 1oo2D physical block diagram .....	57
Figure B.10 – 1oo2D reliability block diagram .....	57
Figure B.11 – 2oo3 physical block diagram .....	59
Figure B.12 – 2oo3 reliability block diagram .....	59
Figure B.13 – Architecture of an example for low demand mode of operation .....	69
Figure B.14 – Architecture of an example for high demand or continuous mode of operation .....	87
Figure D.1 – Relationship of common cause failures to the failures of individual channels..	105
Table B.1 – Terms and their ranges used in this annex (applies to 1oo1, 1oo2, 2oo2, 1oo2D and 2oo3) .....	47
Table B.2 – Average probability of failure on demand for a proof test interval of six months and a mean time to restoration of 8 h .....	61
Table B.3 – Average probability of failure on demand for a proof-test interval of one year and mean time to restoration of 8 h .....	63
Table B.4 – Average probability of failure on demand for a proof-test interval of two years and a mean time to restoration of 8 h .....	65
Table B.5 – Average probability of failure on demand for a proof-test interval of 10 years and a mean time to restoration of 8 h .....	67
Table B.6 – Average probability of failure on demand for the sensor subsystem in the example for low demand mode of operation (one year proof-test interval and 8 h MTTR) .....	69
Table B.7 – Average probability of failure on demand for the logic subsystem in the example for low demand mode of operation (one year proof-test interval and 8 h MTTR) .....	71
Table B.8 – Average probability of failure on demand for the final element subsystem in the example for low demand mode of operation (one year proof-test interval and 8 h MTTR) .....	71

Table B.9 – Example for a non-perfect proof test.....	75
Table B.10 – Probability of failure per hour (in high demand or continuous mode of operation) for a proof-test interval of one month and a mean time to restoration of 8 h.....	79
Table B.11 – Probability of failure per hour (in high demand or continuous mode of operation) for a proof test interval of three months and a mean time to restoration of 8 h.....	81
Table B.12 – Probability of failure per hour (in high demand or continuous mode of operation) for a proof test interval of six months and a mean time to restoration of 8 h.....	83
Table B.13 – Probability of failure per hour (in high demand or continuous mode of operation) for a proof-test interval of one year and a mean time to restoration of 8 h.....	85
Table B.14 – Probability of failure per hour for the sensor subsystem in the example for high demand or continuous mode of operation (six month proof-test interval and 8 h MTTR).....	87
Table B.15 – Probability of failure per hour for the logic subsystem in the example for high demand or continuous mode of operation (six month proof-test interval and 8 h MTTR).....	89
Table B.16 – Probability of failure per hour for the final element subsystem in the example for high demand or continuous mode of operation (six month proof-test interval and 8 h MTTR) .....	89
Table C.1 – Example calculations for diagnostic coverage and safe failure fraction .....	97
Table C.2 – Diagnostic coverage and effectiveness for different subsystems .....	99
Table D.1 – Scoring programmable electronics or sensors/final elements.....	115
Table D.2 – Value of Z: programmable electronics .....	119
Table D.3 – Value of Z: sensors or final elements.....	119
Table D.4 – Calculation of $\beta$ or $\beta_D$ .....	121
Table D.5 – Example values for programmable electronics.....	123
Table E.1 – Software safety requirements specification (see 7.2 of IEC 61508-3).....	127
Table E.2 – Software design and development: software architecture design (see 7.4.3 of IEC 61508-3).....	129
Table E.3 – Software design and development: support tools and programming language (see 7.4.4 of IEC 61508-3) .....	129
Table E.4 – Software design and development: detailed design (see 7.4.5 and 7.4.6 of IEC 61508-3) (this includes software system design, software module design and coding) .....	131
Table E.5 – Software design and development: software module testing and integration (see 7.4.7 and 7.4.8 of IEC 61508-3).....	131
Table E.6 – Programmable electronics integration (hardware and software) (see 7.5 of IEC 61508-3).....	131
Table E.7 – Software safety validation (see 7.7 of IEC 61508-3) .....	133
Table E.8 – Software modification (see 7.8 of IEC 61508-3) .....	133
Table E.9 – Software verification (see 7.9 of part 3) .....	133
Table E.10 – Functional safety assessment (see clause 8 of IEC 61508-3) .....	135

	Page
Table E.11 – Software safety requirements specification (see 7.2 of IEC 61508-3).....	137
Table E.12 – Software design and development: software architecture design (see 7.4.3 of IEC 61508-3).....	137
Table E.13 – Software design and development: support tools and programming language (see 7.4.4 of IEC 61508-3) .....	139
Table E.14 – Software design and development: detailed design (see 7.4.5 and 7.4.6 of IEC 61508-3) (this includes software system design, software module design and coding) .....	139
Table E.15 – Software design and development: software module testing and integration (see 7.4.7 and 7.4.8 of IEC 61508-3).....	141
Table E.16 – Programmable electronics integration (hardware and software) (see 7.5 of IEC 61508-3).....	141
Table E.17 – Software safety validation (see 7.7 of IEC 61508-3).....	141
Table E.18 – Modification (see 7.8 of IEC 61508-3).....	143
Table E.19 – Software verification (see 7.9 of IEC 61508-3).....	143
Table E.20 – Functional safety assessment (see clause 8 of IEC 61508-3) .....	143

Document is a preview generated by EVS

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**FUNCTIONAL SAFETY OF ELECTRICAL/ELECTRONIC/PROGRAMMABLE  
ELECTRONIC SAFETY-RELATED SYSTEMS –**
**Part 6: Guidelines on the application of IEC 61508-2  
and IEC 61508-3**

## FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of the IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested National Committees.
- 3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.
- 4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
- 5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
- 6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

IEC 61508-6 has been prepared by subcommittee 65A: System aspects, of IEC technical committee 65: Industrial-process measurement and control.

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

FDIS	Report on voting
65A/295/FDIS	65A/304/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 publication has been drafted in accordance with the ISO/IEC Directives, Part 3.

Annexes A to E are for information only.

IEC 61508 consists of the following parts, under the general title *Functional safety of electrical/electronic/programmable electronic safety-related systems*:

- Part 1: General requirements
- Part 2: Requirements for electrical/electronic/programmable electronic safety-related systems

- Part 3: Software requirements
- Part 4: Definitions and abbreviations
- Part 5: Examples of methods for the determination of safety integrity levels
- Part 6: Guidelines on the application of IEC 61508-2 and IEC 61508-3
- Part 7: Overview of techniques and measures

The committee has decided that the contents of this publication will remain unchanged until 2005. At this date, the publication will be

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

## INTRODUCTION

Systems comprised of electrical and/or electronic components have been used for many years to perform safety functions in most application sectors. Computer-based systems (generically referred to as programmable electronic systems (PESs)) are being used in all application sectors to perform non-safety functions and, increasingly, to perform safety functions. If computer system technology is to be effectively and safely exploited, it is essential that those responsible for making decisions have sufficient guidance on the safety aspects on which to make those decisions.

This International Standard sets out a generic approach for all safety lifecycle activities for systems comprised of electrical and/or electronic and/or programmable electronic components (electrical/ electronic/programmable electronic systems (E/E/PESs)) that are used to perform safety functions. This unified approach has been adopted in order that a rational and consistent technical policy be developed for all electrically based safety-related systems. A major objective is to facilitate the development of application sector standards.

In most situations, safety is achieved by a number of protective systems which rely on many technologies (for example mechanical, hydraulic, pneumatic, electrical, electronic, programmable electronic). Any safety strategy must therefore consider not only all the elements within an individual system (for example sensors, controlling devices and actuators) but also all the safety-related systems making up the total combination of safety-related systems. Therefore, while this International Standard is concerned with electrical/ electronic/programmable electronic (E/E/PE) safety-related systems, it may also provide a framework within which safety-related systems based on other technologies may be considered.

It is recognized that there is a great variety of E/E/PES applications in a variety of application sectors and covering a wide range of complexity, hazard and risk potentials. In any particular application, the exact prescription of safety measures is dependent on many factors specific to the application. This International Standard, by being generic, will enable such a prescription to be formulated in future application sector international standards.

This International Standard

- considers all relevant overall, E/E/PES and software safety lifecycle phases (for example, from initial concept, through design, implementation, operation and maintenance to decommissioning) when E/E/PESs are used to perform safety functions;
- has been conceived with a rapidly developing technology in mind; the framework is sufficiently robust and comprehensive to cater for future developments;
- enables application sector international standards, dealing with safety-related E/E/PESs, to be developed; the development of application sector international standards, within the framework of this International Standard, should lead to a high level of consistency (for example, of underlying principles, terminology, etc.) both within application sectors and across application sectors; this will have both safety and economic benefits;
- provides a method for the development of the safety requirements specification necessary to achieve the required functional safety for E/E/PE safety-related systems;
- uses safety integrity levels for specifying the target level of safety integrity for the safety functions to be implemented by the E/E/PE safety-related systems;



- adopts a risk-based approach for the determination of the safety integrity level requirements;
- sets numerical target failure measures for E/E/PE safety-related systems which are linked to the safety integrity levels;
- sets a lower limit on the target failure measures, in a dangerous mode of failure, that can be claimed for a single E/E/PE safety-related system; for E/E/PE safety-related systems operating in
  - a low demand mode of operation, the lower limit is set at an average probability of failure of  $10^{-5}$  to perform its design function on demand,
  - a high demand or continuous mode of operation, the lower limit is set at a probability of a dangerous failure of  $10^{-9}$  per hour;

NOTE A single E/E/PE safety-related system does not necessarily mean a single-channel architecture.

- adopts a broad range of principles, techniques and measures to achieve functional safety for E/E/PE safety-related systems, but does not rely on the concept of fail-safe, which may be of value when the failure modes are well-defined and the level of complexity is relatively low – the concept of fail-safe was considered inappropriate because of the full range of complexity of E/E/PE safety-related systems that are within the scope of the standard.

## FUNCTIONAL SAFETY OF ELECTRICAL/ELECTRONIC/PROGRAMMABLE ELECTRONIC SAFETY-RELATED SYSTEMS –

### Part 6: Guidelines on the application of IEC 61508-2 and IEC 61508-3

#### 1 Scope

**1.1** This part of IEC 61508 contains information and guidelines on IEC 61508-2 and IEC 61508-3.

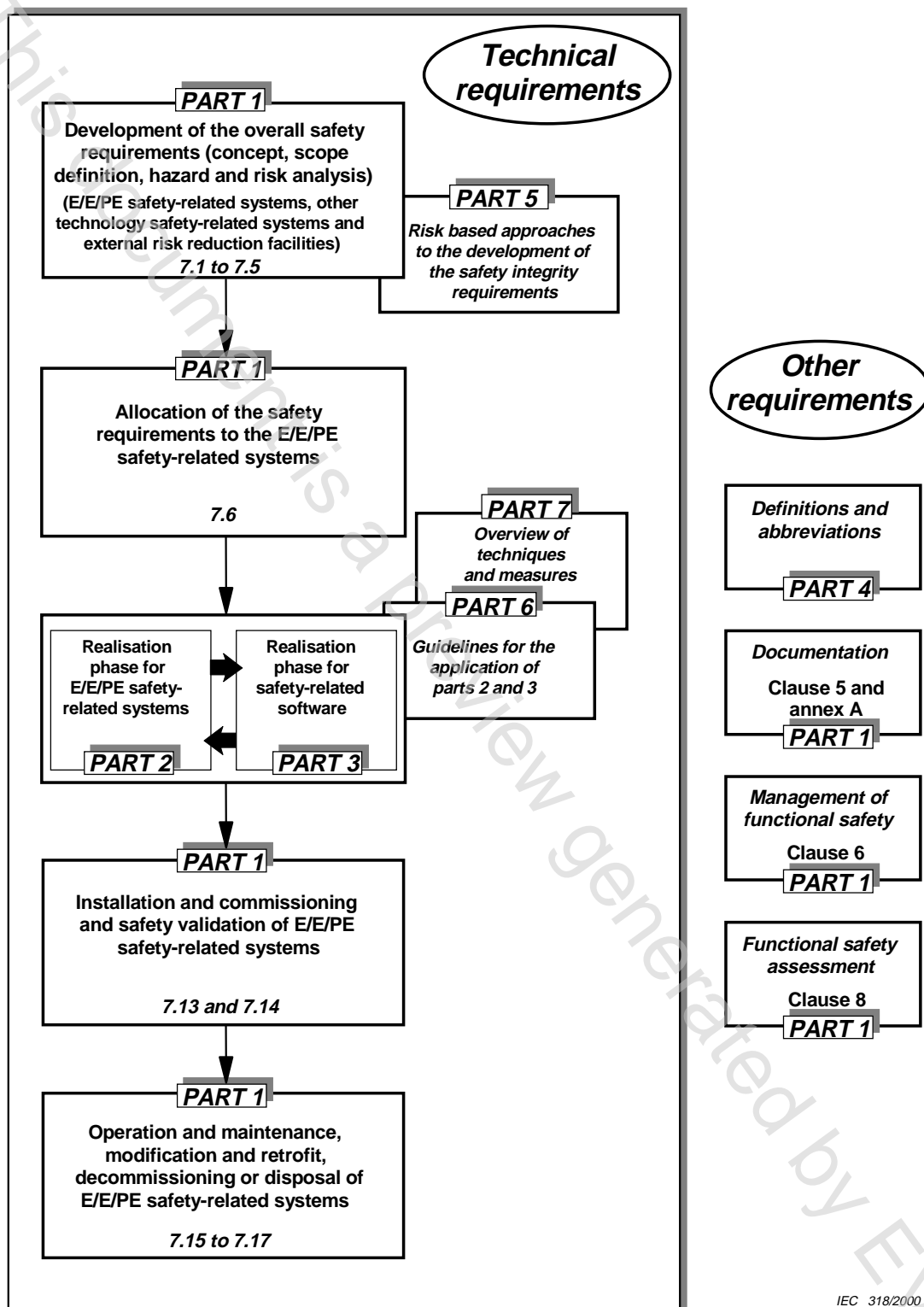
- Annex A gives a brief overview of the requirements of IEC 61508-2 and IEC 61508-3 and sets out the functional steps in their application.
- Annex B gives an example technique for calculating the probabilities of hardware failure and should be read in conjunction with 7.4.3 and annex C of IEC 61508-2 and annex D.
- Annex C gives a worked example of calculating diagnostic coverage and should be read in conjunction with annex C of IEC 61508-2.
- Annex D gives a methodology for quantifying the effect of hardware-related common cause failures on the probability of failure.
- Annex E gives worked examples of the application of the software safety integrity tables specified in annex A of IEC 61508-3 for safety integrity levels 2 and 3.

**1.2** IEC 61508-1, IEC 61508-2, IEC 61508-3 and IEC 61508-4 are basic safety publications, although this status does not apply in the context of low complexity E/E/PE safety-related systems (see 3.4.4 of IEC 61508-4). As basic safety publications, they are intended for use by technical committees in the preparation of standards in accordance with the principles contained in IEC Guide 104 and IEC/ISO Guide 51. IEC 61508 is also intended for use as a stand-alone standard.

**1.3** One of the responsibilities of a technical committee is, wherever applicable, to make use of basic safety publications in the preparation of its publications. In this context, the requirements, test methods or test conditions of this basic safety publication do not apply unless specifically referred to or included in the publications prepared by those technical committees.

**NOTE** In the USA and Canada, until the proposed process sector implementation of IEC 61508 (i.e. IEC 61511) is published as an international standard, existing national process safety standards based on IEC 61508 (i.e. ANSI/ISA S84.01-1996) can be applied to the process sector instead of IEC 61508.

**1.4** Figure 1 shows the overall framework for parts 1 to 7 of this standard and indicates the role that IEC 61508-6 plays in the achievement of functional safety for E/E/PE safety-related systems.



IEC 318/2000

Figure 1 – Overall framework of IEC 61508

## 2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 61508. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of IEC 61508 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

IEC 61508 (all parts), *Functional safety of electrical/electronic/programmable electronic safety-related systems*

IEC Guide 104:1997, *Guide to the drafting of safety standards and the rôle of committees with safety pilot functions and safety group functions*

IEC/ISO Guide 51:1990, *Guidelines for the inclusion of safety aspects in standards*

## 3 Definitions and abbreviations

For the purpose of this standard, the definitions and abbreviations given in IEC 61508-4 apply.