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SS-ISO 26262-5:2011

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Vägfordon – Funktionssäkerhet i el- och elektroniksystem –
Del 5: Produktutveckling på hårdvarunivå
(ISO 26262-5:2011, IDT)

Road vehicles – Functional safety –
Part 5: Product development at the hardware level
(ISO 26262-5:2011, IDT)

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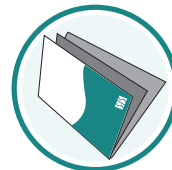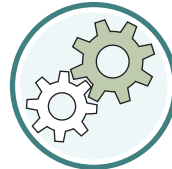
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Den internationella standarden ISO 26262-5:2011 gäller som svensk standard. Detta dokument innehåller den officiella engelska versionen av ISO 26262-5:2011.

The International Standard ISO 26262-5:2011 has the status of a Swedish Standard. This document contains the official version of ISO 26262-5:2011.

Upplysningar om sakinnehållet i standarden lämnas av SIS, Swedish Standards Institute, telefon 08-555 520 00. Standarder kan beställas hos SIS Förlag AB som även lämnar allmänna upplysningar om svensk och utländsk standard.

Information about the content of the standard is available from the Swedish Standards Institute (SIS), telephone +46 8 555 520 00. Standards may be ordered from SIS Förlag AB, who can also provide general information about Swedish and foreign standards.

Denna standard är framtagen av kommittén för Funktionssäkerhet i elektroniksystem, SIS/TK 240/AG 16.

Har du synpunkter på innehållet i den här standarden, vill du delta i ett kommande revideringsarbete eller vara med och ta fram andra standarder inom området? Gå in på www.sis.se - där hittar du mer information.

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 26262-5 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 3, *Electrical and electronic equipment*.

ISO 26262 consists of the following parts, under the general title *Road vehicles — Functional safety*:

— *Part 1: Vocabulary*

— *Part 2: Management of functional safety*

— *Part 3: Concept phase*

— *Part 4: Product development at the system level*

— *Part 5: Product development at the hardware level*

— *Part 6: Product development at the software level*

— *Part 7: Production and operation*

— *Part 8: Supporting processes*

— *Part 9: Automotive Safety Integrity Level (ASIL)-oriented and safety-oriented analyses*

— *Part 10: Guideline on ISO 26262*

Introduction

ISO 26262 is the adaptation of IEC 61508 to comply with needs specific to the application sector of electrical and/or electronic (E/E) systems within road vehicles.

This adaptation applies to all activities during the safety lifecycle of safety-related systems comprised of electrical, electronic and software components.

Safety is one of the key issues of future automobile development. New functionalities not only in areas such as driver assistance, propulsion, in vehicle dynamics control and active and passive safety systems increasingly touch the domain of system safety engineering. Development and integration of these functionalities will strengthen the need for safe system development processes and the need to provide evidence that all reasonable system safety objectives are satisfied.

With the trend of increasing technological complexity, software content and mechatronic implementation, there are increasing risks from systematic failures and random hardware failures. ISO 26262 includes guidance to avoid these risks by providing appropriate requirements and processes.

System safety is achieved through a number of safety measures, which are implemented in a variety of technologies (e.g. mechanical, hydraulic, pneumatic, electrical, electronic, programmable electronic) and applied at the various levels of the development process. Although ISO 26262 is concerned with functional safety of E/E systems, it provides a framework within which safety-related systems based on other technologies can be considered. ISO 26262:

a) provides an automotive safety lifecycle (management, development, production, operation, service, decommissioning) and supports tailoring the necessary activities during these lifecycle phases;

b) provides an automotive-specific risk-based approach to determine integrity levels [Automotive Safety Integrity Levels (ASIL)];

c) uses ASILs to specify applicable requirements of ISO 26262 so as to avoid unreasonable residual risk;

d) provides requirements for validation and confirmation measures to ensure a sufficient and acceptable level of safety being achieved;

e) provides requirements for relations with suppliers.

Functional safety is influenced by the development process (including such activities as requirements specification, design, implementation, integration, verification, validation and configuration), the production and service processes and by the management processes.

Safety issues are intertwined with common function-oriented and quality-oriented development activities and work products. ISO 26262 addresses the safety-related aspects of development activities and work products.

Figure 1 shows the overall structure of this edition of ISO 26262. ISO 26262 is based upon a V-model as a reference process model for the different phases of product development. Within the figure:

—— the shaded "V"s represent the interconnection between ISO 26262-3, ISO 26262-4, ISO 26262-5, ISO 26262-6 and ISO 26262-7;

—— the specific clauses are indicated in the following manner: "m-n", where "m" represents the number of the particular part and "n" indicates the number of the clause within that part.

EXAMPLE   "2-6" represents Clause 6 of ISO 26262-2.

1. Vocabulary

2. Management of functional safety

2-5 Overall safety management

2-6 Safety management during the concept phase and the product development

2-7 Safety management after the item´s release for production

3. Concept phase

3-5 Item definition

3-6 Initiation of the safety lifecycle

3-7 Hazard analysis and risk assessment

3-8 Functional safety concept

4. Product development at the system level

4-5 Initiation of product development at the system level

4-6 Specification of the technical safety requirements

4-7 System design

4-8 Item integration and testing

4-9 Safety validation

4-10 Functional safety assessment

4-11 Release for production

5. Product development at the hardware level

5-5 Initiation of product development at the hardware level

5-6 Specification of hardware safety requirements

5-7 Hardware design

5-8 Evaluation of the hardware architectural metrics

5-9 Evaluation of the safety goal violations due to random hardware failures

5-10 Hardware integration and testing

6. Product development at the software level

6-5 Initiation of product development at the software level

6-7 Software architectural design

6-8 Software unit design and implementation

6-9 Software unit testing

6-10 Software integration and testing

6-11 Verification of software safety requirements

7. Production and operation

7-5 Production

7-6 Operation, service (maintenance and repair), and decommissioning

8. Supporting processes

8-5 Interfaces within distributed developments

8-6 Specification and management of safety requirements

8-7 Configuration management

8-8 Change management

8-9 Verification

8-10 Documentation

8-11 Confidence in the use of software tools

8-12 Qualification of software components

8-13 Qualification of hardware components

8-14 Proven in use argument

9. ASIL-oriented and safety-oriented analyses

9-5 Requirements decomposition with respect to ASIL tailoring

9-6 Criteria for coexistence of elements

9-7 Analysis of dependent failures

9-8 Safety analyses

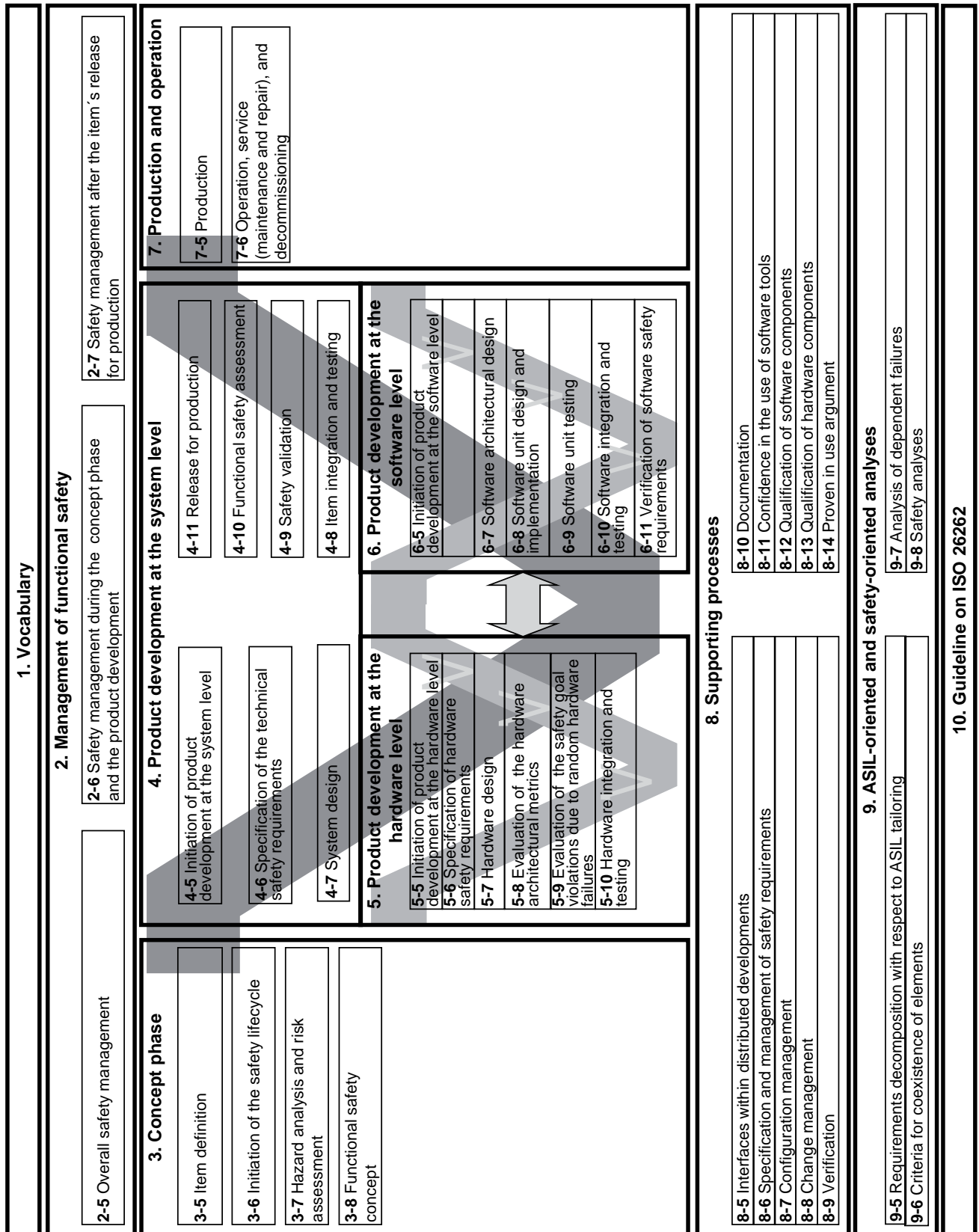**10. Guideline on ISO 26262**

Figure 1 — Overview of ISO 26262

Road vehicles — Functional safety —

Part 5:
Product development at the hardware level

1 Scope

ISO 26262 is intended to be applied to safety-related systems that include one or more electrical and/or electronic (E/E) systems and that are installed in series production passenger cars with a maximum gross vehicle mass up to 3 500 kg. ISO 26262 does not address unique E/E systems in special purpose vehicles such as vehicles designed for drivers with disabilities.

Systems and their components released for production, or systems and their components already under development prior to the publication date of ISO 26262, are exempted from the scope. For further development or alterations based on systems and their components released for production prior to the publication of ISO 26262, only the modifications will be developed in accordance with ISO 26262.

ISO 26262 addresses possible hazards caused by malfunctioning behaviour of E/E safety-related systems, including interaction of these systems. It does not address hazards related to electric shock, fire, smoke, heat, radiation, toxicity, flammability, reactivity, corrosion, release of energy and similar hazards, unless directly caused by malfunctioning behaviour of E/E safety-related systems.

ISO 26262 does not address the nominal performance of E/E systems, even if dedicated functional performance standards exist for these systems (e.g. active and passive safety systems, brake systems, Adaptive Cruise Control).

This part of ISO 26262 specifies the requirements for product development at the hardware level for automotive applications, including the following:

— requirements for the initiation of product development at the hardware level,

— specification of the hardware safety requirements,

— hardware design,

— hardware architectural metrics, and

— evaluation of violation of the safety goal due to random hardware failures and hardware integration and testing.

The requirements of this part of ISO 26262 for hardware elements are applicable both to non-programmable and programmable elements, such as ASIC, FPGA and PLD. Furthermore, for programmable electronic elements, requirements in ISO 26262-6, ISO 26262-8:2011, Clause 11, and ISO 26262-8:2011, Clause 12, are applicable.

2   Normative references

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

ISO 26262-1:2011, *Road vehicles — Functional safety — Part 1: Vocabulary*

ISO 26262-2:2011, *Road vehicles — Functional safety — Part 2: Management of functional safety*

ISO 26262-4:2011, *Road vehicles — Functional safety — Part 4: Product development at the system level*

ISO 26262-6:2011, *Road vehicles — Functional safety — Part 6: Product development at the software level*

ISO 26262-7:2011, *Road vehicles — Functional safety — Part 7: Production and operation*

ISO 26262-8:2011, *Road vehicles — Functional safety — Part 8: Supporting processes*

ISO 26262-9:2011, *Road vehicles — Functional safety — Part 9: Automotive Safety Integrity Level (ASIL)-oriented and safety-oriented analyses*