Maintainability of equipment -- Part 5: Testability and diagnostic testing

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EESTI STANDARDI EESSÕNA **NATIONAL FOREWORD**

Käesolev Eesti standard EVS-EN 60706-5:2007 sisaldab Euroopa standardi EN 60706-5:2007 ingliskeelset teksti. Käesolev dokument on jõustatud 23.11.2007 ja selle kohta on avaldatud teade Eesti standardiorganisatsiooni ametlikus väljaandes. Standard on kättesaadav Eesti standardiorganisatsioonist.	This Estonian standard EVS-EN 60706-5:2007 consists of the English text of the European standard EN 60706-5:2007. This document is endorsed on 23.11.2007 with the notification being published in the official publication of the Estonian national standardisation organisation. The standard is available from Estonian standardisation organisation.

Käsitlusala: The purpose of this part of IEC 60706 is to – provide guidance for the early consideration of testability aspects in design and development; – assist in determining effective test procedures as an integral part of operation and maintenance. This International Standard can be applied to all types of products which may include commercial off-the-shelf (COTS) items. In this respect, it does not matter whether the product belongs to mechanical, hydraulic, electrical or some other technology. In addition, this International Standard applies to the development of any products, with the aim of designing the product characteristics so that they are verifiable (testable). The objective of this International standard is to ensure that prerequisites relating to the testability of products are defined in the preliminary phases of development, laid down by the customer, implemented, documented and verified during development. This International Standard also provides methods to implement and assess testability as an integral part of the product design. It recommends that the product testability documentation should be continually updated over the product's life cycle.	**Scope:** The purpose of this part of IEC 60706 is to – provide guidance for the early consideration of testability aspects in design and development; – assist in determining effective test procedures as an integral part of operation and maintenance. This International Standard can be applied to all types of products which may include commercial off-the-shelf (COTS) items. In this respect, it does not matter whether the product belongs to mechanical, hydraulic, electrical or some other technology. In addition, this International Standard applies to the development of any products, with the aim of designing the product characteristics so that they are verifiable (testable). The objective of this International standard is to ensure that prerequisites relating to the testability of products are defined in the preliminary phases of development, laid down by the customer, implemented, documented and verified during development. This International Standard also provides methods to implement and assess testability as an integral part of the product design. It recommends that the product testability documentation should be continually updated over the product's life cycle.

ICS 03.120.01, 03.120.30, 21.020

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 60706-5

October 2007

ICS 03.120.01; 03.120.30; 21.020

English version

Maintainability of equipment - Part 5: Testability and diagnostic testing

(IEC 60706-5:2007)

Maintenabilité de matériel - Partie 5: Testabilité et tests pour diagnostic (CEI 60706-5:2007)

Instandhaltbarkeit von Geräten - Teil 5: Prüfbarkeit und diagnostisches Prüfen (IEC 60706-5:2007)

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

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Foreword

The text of document 56/1211/FDIS, future edition 2 of IEC 60706-5, prepared by IEC TC 56, Dependability, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60706-5 on 2007-10-01.

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)	2008-07-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2010-10-01

Annex ZA has been added by CENELEC.

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Endorsement notice

The text of the International Standard IEC 60706-5:2007 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 60300-1	NOTE	Harmonized as EN 60300-1:2003 (not modified).
IEC 60300-2	NOTE	Harmonized as EN 60300-2:2004 (not modified).
IEC 60300-3-2	NOTE	Harmonized as EN 60300-3-2:2005 (not modified).
IEC 60300-3-3	NOTE	Harmonized as EN 60300-3-3:2004 (not modified).
IEC 60300-3-12	NOTE	Harmonized as EN 60300-3-12:2004 (not modified).
IEC 60300-3-14	NOTE	Harmonized as EN 60300-3-14:2004 (not modified).

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Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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.

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

Publication	Year	Title	EN/HD	Year
IEC 60050-191	-[1)]	International Electrotechnical Vocabulary (IEV) - Chapter 191: Dependability and quality of service	-	-
IEC 60300-3-10	-[1)]	Dependability management - Part 3-10: Application guide - Maintainability	-	-
IEC 60706-2	-[1)]	Maintainability of equipment - Part 2: Maintainability requirements and studies during the design and development phase	EN 60706-2	2006[2)]
IEC 60706-3	-[1)]	Maintainability of equipment - Part 3: Verification and collection, analysis and presentation of data	EN 60706-3	2006[2)]

[1)] Undated reference.

[2)] Valid edition at date of issue.

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INTERNATIONAL STANDARD

NORME INTERNATIONALE

Maintainability of equipment –
Part 5: Testability and diagnostic testing

Maintenabilité de matériel –
Partie 5: Testabilité et tests pour diagnostic

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

MAINTAINABILITY OF EQUIPMENT –

Part 5: Testability and diagnostic testing

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of 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, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). 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. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 60706-5 has been prepared by IEC technical committee 56: Dependability.

This second edition cancels and replaces the first edition published in 1994. This second edition constitutes a technical revision. It expands and provides more detail on the techniques and systems broadly outlined in the first edition.

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

FDIS	Report on voting
56/1211/FDIS	56/1231/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 2.

A list of all the parts in the IEC 60706 series, under the general title *Maintainability of equipment*, can be found on the IEC website.

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

Testability is an important feature in the operation and maintenance of a system or equipment and has a significant effect on its availability and maintainability. Diagnostic testing may be carried out manually or with test equipment which may contain various levels of automation. Optimum design for testability requires close cooperation between design, operation and maintenance organizations. This standard is intended to highlight the various aspects of testability and diagnostic testing and to assist in their timely coordination.

In this standard, items to be considered in respect of their testability design may be systems, equipment or functional units which are the objects of a contract, and will be referred to as "products". Each product has to perform its required functions which should be verified during the development and production phases and should be retained over the whole life cycle. For a product to retain its functionality, the functional status of each sub-function should be known at any time while the product is in its operating condition. If a failure occurs, action should be taken to ensure that the fault is recognized and the faulty item localized. This requirement placed on the testability of a product might appear to be quite simple, but if it is not considered at the start of product development, subsequent realization will result in increased work and significantly increased cost. If all requirements are available at the start of development, the development engineer can specify the functional characteristic "testability" without much additional effort and therefore achieve considerable cost savings e.g. by minimizing the number of test steps for verifying the development results. Experience has shown that the extra cost and effort in the development phase can be recovered for example in the production phase since available test equipment can be used. Reliable fault recognition and low in-service maintenance costs increase the market value of a testable product considerably.

As the technologies which are applied in the products covered by this standard are wide-ranging, this document has been written in a neutral manner with regard to technologies and techniques. This standard therefore only provides an assessment basis for making calculations and the basic approach for achieving the required testability of a product. The technical realization of fault recognition and fault localization in the product is the task of the product development engineer and has to be achieved according to the state of the art at the time when the product is being developed. It is therefore not of great importance whether the required test task is realized in hardware or software form, but it is essential that all functions are checked via test paths and that the characteristic values established for testability correspond to the specified target values. If there are deviations from the target values, action should be taken to ensure that the target values are met. These actions should take place at an early stage of development before freezing the design.

MAINTAINABILITY OF EQUIPMENT –

Part 5: Testability and diagnostic testing

1 Scope

The purpose of this part of IEC 60706 is to

- provide guidance for the early consideration of testability aspects in design and development;
- assist in determining effective test procedures as an integral part of operation and maintenance.

This International Standard can be applied to all types of products which may include commercial off-the-shelf (COTS) items. In this respect, it does not matter whether the product belongs to mechanical, hydraulic, electrical or some other technology. In addition, this International Standard applies to the development of any products, with the aim of designing the product characteristics so that they are verifiable (testable).

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

IEC 60706-2, *Maintainability of equipment – Part 2: Maintainability requirements and studies during the design and development phase*

IEC 60706-3, *Maintainability of equipment – Part 3: Verification and collection, analysis and presentation of data*

IEC 60300-3-10, *Dependability management – Part 3-10: Application guide – Maintainability*

3 Terms, definitions and acronyms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions of IEC 60050-191 apply together with the following: