

**Otsetoimelised elektrilised analoog-
näitmõõteriistad ja nende lisaseadmed.
Osa 9: Soovitatavad katsetusmeetodid**

Direct acting indicating analogue electrical
measuring instruments and their accessories - Part
9: Recommended test methods

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

Käesolev Eesti standard EVS-EN 60051-9:2001 sisaldab Euroopa standardi EN 60051-9:1989+ A1,2:1995 ingliskeelset teksti. Käesolev dokument on jõustatud 19.03.2001 ja selle kohta on avaldatud teade Eesti standardiorganisatsiooni ametlikus väljaandes. Standard on kättesaadav Eesti standardiorganisatsioonist.	This Estonian standard EVS-EN 60051-9:2001 consists of the English text of the European standard EN 60051-9:1989+ A1,2:1995. This document is endorsed on 19.03.2001 with the notification being published in the official publication of the Estonian national standardisation organisation. The standard is available from Estonian standardisation organisation.
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Käsitlusala: Gives test methods for direct acting indicating analogue electrical measuring instruments and their accessories, but no requirements since these are contained in IEC 51-1 to IEC 51-8.	Scope: Gives test methods for direct acting indicating analogue electrical measuring instruments and their accessories, but no requirements since these are contained in IEC 51-1 to IEC 51-8.
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ICS 17.220.20

Võtmesõnad: analogue indicating instruments, direct acting measuring instruments, electrical measuring instruments, recommended test methods for direct acting measuri

UDC: 621.317.7.037.33:620.1

KEY WORDS: Electrical measuring instruments; analogue indicating instruments;
direct acting measuring instruments; recommended test methods for
direct acting measuring instruments

ENGLISH VERSION

DIRECT ACTING INDICATING ANALOGUE ELECTRICAL
MEASURING INSTRUMENTS AND THEIR ACCESSORIES
PART 9: RECOMMENDED TEST METHODS
(IEC 51-9 (1988) edition 4)

Appareils mesureurs électriques
indicateurs analogiques
à action directe
et leurs accessoires
Neuvième partie: Méthodes
d'essais recommandées
(CEI 51-9 (1988) édition 4)

Direkt wirkende anzeigende
elektrische Meßgeräte und
ihr Zubehör
Meßgeräte mit Skalenanzeige
Teil 9: Empfohlene
Prüfverfahren
(IEC 51-9 (1988) Ausgabe 4)

This European Standard was ratified by CENELEC on 11 September 1989.
CENELEC members are bound to comply with the requirements of the 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 CENELEC Central Secretariat or to any
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This European Standard exists in three official versions (English, French and German).
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United Kingdom.

CENELEC

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

Central Secretariat: rue Bréderode 2, B-1000 Brussels

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BRIEF HISTORY

TECHNICAL TEXT

TECHNICAL TEXT

The following dates are applicable:

- latest date of announcement
of the EN at national level (doa) : 1990-03-01
- date of latest publication of
a new harmonized standard (dop) : 1990-09-01
- date of withdrawal of conflicting
national standards (dow) : 1990-09-01

UDC 621.317.7.037.33:620.1
ICS 17.220.20

Descriptors: Electrical measuring instruments, analogue indicating instruments, direct acting measuring instruments, recommended test methods for direct acting measuring instruments

English version

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Part 9: Recommended test methods
(IEC 51-9:1988/A1:1994)

Appareils mesureurs électriques
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Teil 9: Empfohlene Prüfverfahren
(IEC 51-9:1988/A1:1994)

This amendment A1 modifies the European Standard EN 60051-9:1989; it was approved by CENELEC on 1995-05-15. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this amendment 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.

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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 amendment 1:1994 to the International Standard IEC 51-9:1988, prepared by IEC TC 85, Measuring equipment for electromagnetic quantities, was submitted to the Unique Acceptance Procedure and was approved by CENELEC as amendment A1 to EN 60051-9:1989 on 1995-05-15 without any modification.

The following dates were fixed:

- latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 1996-02-15
- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 1996-02-15

For products which have complied with EN 60051-9:1989 before 1996-02-15, as shown by the manufacturer or by a certification body, this previous standard may continue to apply for production until 2001-02-15.

Endorsement notice

The text of amendment 1:1994 to the International Standard IEC 51-9:1988 was approved by CENELEC as an amendment to the European Standard without any modification.

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**Direct acting indicating analogue electrical-measuring
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Part 9: Recommended test methods
(IEC 51-9:1988/A2:1995)**

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This amendment A2 modifies the European Standard EN 60051-9:1989; it was approved by CENELEC on 1995-02-15. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this amendment the status of a national standard without any alteration.

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Foreword

The text of document 85(CO)65 + 65A, future amendment 2 to IEC 51-9:1988, prepared by IEC TC 85, Measuring equipment for electromagnetic quantities, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as amendment A2 to EN 60051-9:1989 on 1995-02-15.

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Endorsement notice

The text of amendment 2:1995 to the International Standard IEC 51-9:1988 was approved by CENELEC as an amendment to the European Standard without any modification.

BRIEF HISTORY

The text of IEC-Publication 51-9 (4th edition - 1988) was submitted to the CENELEC members for unique acceptance.

TECHNICAL TEXT

The text of the International Standard IEC 51-9 (4th edition - 1988) was approved by CENELEC on 11 September 1989 as a European Standard.

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**NORME
INTERNATIONALE
INTERNATIONAL
STANDARD**

**CEI
IEC
51-9**

Quatrième édition
Fourth edition
1988

**Appareils mesureurs électriques
indicateurs analogiques à action directe
et leurs accessoires**

**Neuvième partie:
Méthodes d'essai recommandées**

**Direct acting indicating analogue
electrical measuring instruments
and their accessories**

**Part 9:
Recommended test methods**



Numéro de référence
Reference number
CEI/IEC 51-9: 1988

Validité de la présente publication

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Des renseignements relatifs à la date de reconfirmation de la publication sont disponibles auprès du Bureau Central de la CEI.

Les renseignements relatifs à ces révisions, à l'établissement des éditions révisées et aux amendements peuvent être obtenus auprès des Comités nationaux de la CEI et dans les documents ci-dessous:

- **Bulletin de la CEI**
- **Annuaire de la CEI**
Publié annuellement
- **Catalogue des publications de la CEI**
Publié annuellement et mis à jour régulièrement

Terminologie

En ce qui concerne la terminologie générale, le lecteur se reportera à la CEI 50: *Vocabulaire Electrotechnique International* (VEI), qui se présente sous forme de chapitres séparés traitant chacun d'un sujet défini. Des détails complets sur le VEI peuvent être obtenus sur demande. Voir également le dictionnaire multilingue de la CEI.

Les termes et définitions figurant dans la présente publication ont été soit tirés du VEI, soit spécifiquement approuvés aux fins de cette publication.

Symboles graphiques et littéraux

Pour les symboles graphiques, les symboles littéraux et les signes d'usage général approuvés par la CEI, le lecteur consultera:

- la CEI 27: *Symboles littéraux à utiliser en électro-technique;*
- la CEI 417: *Symboles graphiques utilisables sur le matériel. Index, relevé et compilation des feuilles individuelles;*
- la CEI 617: *Symboles graphiques pour schémas;*

et pour les appareils électromédicaux,

- la CEI 878: *Symboles graphiques pour équipements électriques en pratique médicale.*

Les symboles et signes contenus dans la présente publication ont été soit tirés de la CEI 27, de la CEI 417, de la CEI 617 et/ou de la CEI 878, soit spécifiquement approuvés aux fins de cette publication.

Publications de la CEI établies par le même comité d'études

L'attention du lecteur est attirée sur les listes figurant à la fin de cette publication, qui énumèrent les publications de la CEI préparées par le comité d'études qui a établi la présente publication.

Validity of this publication

The technical content of IEC publications is kept under constant review by the IEC, thus ensuring that the content reflects current technology.

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Information on the revision work, the issue of revised editions and amendments may be obtained from IEC National Committees and from the following IEC sources:

- **IEC Bulletin**
- **IEC Yearbook**
Published yearly
- **Catalogue of IEC publications**
Published yearly with regular updates

Terminology

For general terminology, readers are referred to IEC 50: *International Electrotechnical Vocabulary* (IEV), which is issued in the form of separate chapters each dealing with a specific field. Full details of the IEV will be supplied on request. See also the IEC Multilingual Dictionary.

The terms and definitions contained in the present publication have either been taken from the IEV or have been specifically approved for the purpose of this publication.

Graphical and letter symbols

For graphical symbols, and letter symbols and signs approved by the IEC for general use, readers are referred to publications:

- IEC 27: *Letter symbols to be used in electrical technology;*
- IEC 417: *Graphical symbols for use on equipment. Index, survey and compilation of the single sheets;*
- IEC 617: *Graphical symbols for diagrams;*

and for medical electrical equipment,

- IEC 878: *Graphical symbols for electromedical equipment in medical practice.*

The symbols and signs contained in the present publication have either been taken from IEC 27, IEC 417, IEC 617 and/or IEC 878, or have been specifically approved for the purpose of this publication.

IEC publications prepared by the same technical committee

The attention of readers is drawn to the end pages of this publication which list the IEC publications issued by the technical committee which has prepared the present publication.

**NORME
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Quatrième édition
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Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

CODE PRIX
PRICE CODE **XB**

Pour prix, voir catalogue en vigueur
For price, see current catalogue

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COMMISSION ELECTROTECHNIQUE INTERNATIONALE

APPAREILS MESUREURS ELECTRIQUES INDICATEURS ANALOGIQUES

A ACTION DIRECTE ET LEURS ACCESSOIRES

Neuvième partie: Méthodes d'essai recommandées

PREAMBULE

- 1) Les décisions ou accords officiels de la CEI en ce qui concerne les questions techniques, préparés par des Comités d'Etudes où sont représentés tous les Comités nationaux s'intéressant à ces questions, expriment dans la plus grande mesure possible un accord international sur les sujets examinés.
- 2) Ces décisions constituent des recommandations internationales et sont agréées comme telles par les Comités nationaux.
- 3) Dans le but d'encourager l'unification internationale, la CEI exprime le vœu que tous les Comités nationaux adoptent dans leurs règles nationales le texte de la recommandation de la CEI, dans la mesure où les conditions nationales le permettent. Toute divergence entre la recommandation de la CEI et la règle nationale correspondante doit, dans la mesure du possible, être indiquée en termes clairs dans cette dernière.

PREFACE

La présente norme a été établie par le Comité d'Etudes n° 85 de la CEI: Appareillage de mesure des grandeurs électriques fondamentales (anciennement Sous-Comité 13B: Instruments électriques de mesurage).

Cette quatrième édition remplace la troisième édition de la Publication 51 de la CEI.

Cette norme constitue la neuvième partie.

La disposition générale de la Publication 51 de la CEI révisée est la suivante:

- | | | |
|------------------|---|---|
| Première partie | : | Définitions et prescriptions générales communes à toutes les parties. |
| Deuxième partie | : | Prescriptions particulières pour les ampèremètres et les voltmètres. |
| Troisième partie | : | Prescriptions particulières pour les wattmètres et les varmètres. |
| Quatrième partie | : | Prescriptions particulières pour les fréquencemètres. |
| Cinquième partie | : | Prescriptions particulières pour les phasemètres, les indicateurs de facteur de puissance et les synchronoscopes. |
| Sixième partie | : | Prescriptions particulières pour les ohmmètres (les impédancemètres) et les conductancemètres. |
| Septième partie | : | Prescriptions particulières pour les appareils à fonctions multiples. |

INTERNATIONAL ELECTROTECHNICAL COMMISSION

DIRECT ACTING INDICATING ANALOGUE ELECTRICAL MEASURING
INSTRUMENTS AND THEIR ACCESSORIESPart 9: Recommended test methods

FOREWORD

- 1) The formal decisions or agreements of the IEC on technical matters, prepared by Technical Committees on which all the National Committees having a special interest therein are represented, express, as nearly as possible, an international consensus of opinion on the subjects dealt with.
- 2) They have the form of recommendations for international use and they are accepted by the National Committees in that sense.
- 3) In order to promote international unification, the IEC expresses the wish that all National Committees should adopt the text of the IEC recommendation for their national rules in so far as national conditions will permit. Any divergence between the IEC recommendation and the corresponding national rules should, as far as possible, be clearly indicated in the latter.

PREFACE

This standard has been prepared by IEC, Technical Committee No. 85: Measuring equipment for basic electrical quantities (former Sub-Committee 13B: Electrical measuring instruments).

This fourth edition replaces the third edition of IEC Publication 51.

This standard constitutes Part 9.

The general layout for the revised Publication 51 is as follows:

- Part 1: Definitions and general requirements common to all parts.
- Part 2: Special requirements for ammeters and voltmeters.
- Part 3: Special requirements for wattmeters and varmeters.
- Part 4: Special requirements for frequency meters.
- Part 5: Special requirements for phase meters, power factor meters and synchrosopes.
- Part 6: Special requirements for ohmmeters (impedance meters) and conductance meters.
- Part 7: Special requirements for multi-function instruments.

Huitième partie : Prescriptions particulières pour les accessoires.

Neuvième partie: Méthodes d'essai recommandées.

La neuvième partie n'est pas complète par elle-même et ne contient pas de prescriptions. Les prescriptions sont contenues dans les parties 1 à 8 de même que les références aux paragraphes d'essais de la neuvième partie.

Trois essais ne correspondent pas à des prescriptions des parties 1 à 8, mais sont indiqués dans la neuvième partie pour permettre une normalisation des méthodes d'essai des caractéristiques normalement spécifiées par accord entre le constructeur et l'utilisateur. Ce sont:

- Fréquence différentielle d'accrochage
- Erreur d'échelle
- Influence simultanée de la tension et du facteur de puissance.

Le texte de cette norme est issu des documents suivants:

Règle des Six Mois	Rapport de vote
13B(BC)105	85(BC)5

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à l'approbation de cette norme.

Part 8: Special requirements for accessories.

Part 9: Recommended test methods.

Part 9 is not complete in itself as it contains no requirements. The requirements are contained in Parts 1 to 8 and include references to the test sub-clauses of Part 9.

Three tests specified in Part 9 have no corresponding requirements in Parts 1 to 8 but are included to permit standardization of the test methods for characteristics that are normally specified by agreement between the manufacturer and the user. These tests are:

- Pull-in difference frequency
- Tracking error
- Simultaneous influence of voltage and power factor.

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

Six Months' Rule	Report on Voting
13B(C0)105	85(C0)5

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

APPAREILS MESUREURS ELECTRIQUES INDICATEURS ANALOGIQUES
A ACTION DIRECTE ET LEURS ACCESSOIRES

Neuvième partie: Méthodes d'essai recommandées

1. Domaine d'application et conditions générales d'essai

1.1 *Domaine d'application*

Cette neuvième partie de la Publication 51 contient des méthodes d'essai recommandées pour les appareils mesureurs électriques indicateurs analogiques à action directe et leurs accessoires.

1.2 *Conditions générales d'essai*

Sauf spécification contraire, les méthodes d'essai décrites dans la présente partie doivent être appliquées dans les conditions suivantes:

1.2.1 *Conditions de référence*

Les conditions de référence doivent être celles du tableau I de la partie appropriée. Lorsque le tableau spécifie un domaine de référence, les essais doivent être effectués aux deux extrémités de ce domaine.

1.2.2 *Parallaxe*

Note.- Lors de la lecture de l'appareil, il convient de prendre soin de ne pas commettre d'erreur de parallaxe.

Pour un appareil de profil, la ligne de visée doit être perpendiculaire au cadran de l'appareil à l'extrémité de l'index.

Pour un appareil ayant un cadran à miroir, la ligne de visée doit être telle que l'extrémité de l'index coïncide avec son image dans le miroir.

1.2.3 *Tapotement*

Immédiatement avant la lecture, l'appareil ou son support doivent être tapotés légèrement avec le doigt ou avec la gomme fixée en bout de certains crayons.

DIRECT ACTING INDICATING ANALOGUE ELECTRICAL MEASURING
INSTRUMENTS AND THEIR ACCESSORIES

Part 9: Recommended test methods

1. Scope and general test conditions

1.1 *Scope*

Part 9 of Publication 51 contains recommended test methods for direct acting indicating analogue electrical measuring instruments and their accessories.

1.2 *General test conditions*

The test methods described in this part shall be applied under the following conditions unless otherwise specified.

1.2.1 *Reference conditions*

Reference conditions shall be according to Table I of the relevant part. Where a reference range is specified, tests shall be performed at both limits of the reference range.

1.2.2 *Parallax*

Note.- Care should be taken to avoid the effect of parallax error when taking instrument readings.

For an edgewise instrument, the line of vision should be perpendicular to the instrument dial at the index tip.

For an instrument having a mirror scale, the line of vision should be such that the index tip is coincident with its reflection in the mirror.

1.2.3 *Tapping*

Immediately prior to taking a reading, either the instrument or its support shall be tapped lightly as with a finger or the eraser end of a pencil.