Measuring relays and protection equipment - Part 1: Common requirements

EESTI STANDARDIKESKUS
ESTONIAN CENTRE FOR STANDARDISATION

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NATIONAL FOREWORD

Käesolev Eesti standard EVS-EN 60255-1:2010 sisaldab Euroopa standardi EN 60255-1:2010 ingliskeelset teksti.	This Estonian standard EVS-EN 60255-1:2010 consists of the English text of the European standard EN 60255-1:2010.
Standard on kinnitatud Eesti Standardikeskuse 31.03.2010 käskkirjaga ja jõustub sellekohase teate avaldamisel EVS Teatajas.	This standard is ratified with the order of Estonian Centre for Standardisation dated 31.03.2010 and is endorsed with the notification published in the official bulletin of the Estonian national standardisation organisation.
Euroopa standardimisorganisatsioonide poolt rahvuslikele liikmetele Euroopa standardi teksti kättesaadavaks tegemise kuupäev on 22.01.2010.	Date of Availability of the European standard text 22.01.2010.
Standard on kättesaadav Eesti standardiorganisatsioonist.	The standard is available from Estonian standardisation organisation.

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EUROPEAN STANDARD

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Measuring relays and protection equipment - Part 1: Common requirements

(IEC 60255-1:2009)

Relais de mesure et dispositifs de protection - Partie 1: Prescriptions communes (CEI 60255-1:2009)

Messrelais und Schutzeinrichtungen - Teil 1: Allgemeine Anforderungen (IEC 60255-1:2009)

This European Standard was approved by CENELEC on 2009-12-01. 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, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

CENELEC

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

Central Secretariat: Avenue Marnix 17, B - 1000 Brussels

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Foreword

The text of document 95/252/FDIS, future edition 1 of IEC 60255-1, prepared by IEC TC 95, Measuring relays and protection equipment, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60255-1 on 2009-12-01.

This European Standard supersedes EN 60255-6:1994.

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

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)	2010-09-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2012-12-01

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60255-1:2009 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 61508	NOTE	Harmonized in EN 61508 series (not modified).
IEC 60255-5	NOTE	Harmonized as EN 60255-5:2001 (not modified).
IEC 60300-1	NOTE	Harmonized as EN 60300-1

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 60044-1 (mod)	1996	Instrument transformers - Part 1: Current transformers	EN 60044-1	1999
IEC 60044-2 (mod)	1997	Instrument transformers - Part 2: Inductive voltage transformers	EN 60044-2	1999
IEC 60044-5	2004	Instrument transformers - Part 5: Capacitor voltage transformers	EN 60044-5	2004
IEC 60044-7	1999	Instrument transformers - Part 7: Electronic voltage transformers	EN 60044-7	2000
IEC 60044-8	2002	Instrument transformers - Part 8: Electronic current transformers	EN 60044-8	2002
IEC 60050-191	1990	International Electrotechnical Vocabulary (IEV) - Chapter 191: Dependability and quality of service	-	-
IEC 60050-447	2009	International Electrotechnical Vocabulary - Part 447: Measuring relays	-	-
IEC 60068-2-1	2007	Environmental testing - Part 2-1: Tests - Test A: Cold	EN 60068-2-1	2007
IEC 60068-2-2	2007	Environmental testing - Part 2-2: Tests - Test B: Dry heat	EN 60068-2-2	2007
IEC 60068-2-14	2009	Environmental testing - Part 2-14: Tests - Test N: Change of temperature	EN 60068-2-14	2009
IEC 60068-2-30	2005	Environmental testing - Part 2-30: Tests - Test Db: Damp heat, cyclic (12 h + 12 h cycle)	EN 60068-2-30	2005
IEC 60068-2-78	2001	Environmental testing - Part 2-78: Tests - Test Cab: Damp heat, steady state	EN 60068-2-78	2001
IEC 60068-3-4	2001	Environmental testing - Part 3-4: Supporting documentation and guidance - Damp heat tests	EN 60068-3-4	2002
IEC 60255-11	2008	Measuring relays and protection equipment - Part 11: Voltage dips, short interruptions, variations and ripple on auxiliary power supply port	EN 60255-11	2010

Publication	Year	Title	EN/HD	Year
IEC 60255-21-1	1988	Electrical relays - Part 21: Vibration, shock, bump and seismic tests on measuring relays and protection equipment - Section 1: Vibration tests (sinusoidal)	EN 60255-21-1	1995
IEC 60255-21-2	1988	Electrical relays - Part 21: Vibration, shock, bump and seismic tests on measuring relays and protection equipment - Section 2: Shock and bump tests	EN 60255-21-2	1995
IEC 60255-21-3	1993	Electrical relays - Part 21: Vibration, shock, bump and seismic tests on measuring relays and protection equipment - Section 3: Seismic tests	EN 60255-21-3	1995
IEC 60255-22-2	2008	Measuring relays and protection equipment - Part 22-2: Electrical disturbance tests - Electrostatic discharge tests	EN 60255-22-2	2008
IEC 60255-22-4	2008	Measuring relays and protection equipment - Part 22-4: Electrical disturbance tests - Electrical fast transient/burst immunity test	EN 60255-22-4	2008
IEC 60255-22-5	2008	Measuring relays and protection equipment - Part 22-5: Electrical disturbance tests - Surge immunity test	EN 60255-22-5	200X[1)]
IEC 60255-22-7	2003	Electrical relays - Part 22-7: Electrical disturbance tests for measuring relays and protection equipment - Power frequency immunity tests	EN 60255-22-7	2003
IEC 60255-25	2000	Electrical relays - Part 25: Electromagnetic emission tests for measuring relays and protection equipment	EN 60255-25	2000
IEC 60255-26	2008	Measuring relays and protection equipment - Part 26: Electromagnetic compatibility requirements	EN 60255-26	2009
IEC 60255-27	2005	Measuring relays and protection equipment - Part 27: Product safety requirements	EN 60255-27	2005
IEC 60255-1xx	Series	Measuring relays and protection equipment - Part 1xx: Protection functional standards	EN 60255-1xx	Series
IEC 60297-3-101	2004	Mechanical structures for electronic equipment - Dimensions of mechanical structures of the 482,6 mm (19 in) series - Part 3-101: Subracks and associated plug-in units	EN 60297-3-101	2004
IEC 60529	1989	Degrees of protection provided by enclosures (IP Code)	EN 60529 + corr. May	1991 1993
IEC 60688	-	Electrical measuring transducers for converting a.c. electrical quantities to analogue or digital signals	EN 60688	-

[1)] To be ratified.

Publication	Year	Title	EN/HD	Year
IEC 60721-3-3	-	Classification of environmental conditions - Part 3: Classification of groups of environmental parameters and their severities - Section 3: Stationary use at weatherprotected locations	EN 60721-3-3	-
IEC/TS 61000-2-5	1995	Electromagnetic compatibility (EMC) - Part 2-5: Environment - Classification of electromagnetic environments - Basic EMC publication	-	-
IEC 61810	-	Electromechanical elementary relays - Part 1: General requirements	EN 61810	-
IEC 61810-2	-	Electromechanical elementary relays - Part 2: Reliability	EN 61810-2	-
IEC 61850	Series	Communication networks and systems in substations	EN 61850	Series
IEC 61850-9-2	-	Communication networks and systems in substations - Part 9-2: Specific Communication Service Mapping (SCSM) - Sampled values over ISO/IEC 8802-3	EN 61850-9-2	-

CONTENTS

INTRODUCTION

NUMBERING OF STANDARDS FALLING UNDER THE RESPONSIBILITY OF TC 95

In accordance with the decision taken at the technical committee 95 meeting in Paris on 2006-04-06 (item 12 of 95/191/RM) a new numbering system will be established of the standards falling under the responsibility of TC 95. Numbering of the standards will follow the following principle:

- common standards will start with IEC 60255 –;
- protection functional standards will start with IEC 60255-100 series;
- technical reports will start with IEC 60255-200 series.

The IEC 60255 series will consist of the following parts, under the general title *Measuring relays and protection equipment.* Five parts (Parts 3, 8, 12, 13 and 16) will be renumbered and Part 6 will be replaced by Part 1.

a) Common standards:

Part 1: Common requirements

Part 11: Interruptions to and alternating component (ripple) in d.c. auxiliary energizing quantity of measuring relays

Part 21: Vibration, shock, bump and seismic tests

Part 22: Electrical disturbance tests

Part 24: Common format for transient data exchange (COMTRADE) for power systems

Part 25: Electromagnetic emission tests

Part 26: Electromagnetic compatibility requirements

Part 27: Product safety requirements

b) Protection functional standards:

121 Functional requirements for distance protection (revision of IEC 60255-16)

124 Functional requirements for volts per hertz protection

125 Functional requirements for synchronizing or synchronism-check

127 Functional requirements for over/under voltage protection (revision of IEC 60255-3) (including the phase, neutral, residual and negative sequence)

132 Functional requirements for over/under power protection (revision of IEC 60255-12) (including the real reactive and power factor)

140 Functional requirements for loss of excitation protection

149 Functional requirements for thermal protection (revision of IEC 60255-8)

151 Functional requirements for over/under current protection (revision of IEC 60255-3) (including the phase, ground, residual and negative sequence)

160 Functional requirements for voltage or current unbalance protection

167 Functional requirements for directional current protection

178 Functional requirements for power swing/out-of-step protection

179 Functional requirements for reclosing

181 Functional requirements for frequency relay (including over/under, rate of change)

185 Functional requirements for teleprotection function

187 Functional requirements for differential protection (revision of IEC 60255-13) (including generator, transformer, busbar, line and restricted earth fault)

195 Functional requirements for synchrophasor measurement

NOTE 1 The functional standard for synchrophasor measurement may be developed from IEEE Std C37.118:1995 [1][1].

NOTE 2 The last two digits of the part of the proposed functional standard new numbering correspond to device function numbers as established in IEEE Std C37.2:1996[2].

c) Technical reports:

Part 200: Application guide for generator protection

Part 201: Application guide for motor protection

Part 202: Application guide for transformer protection

Part 203: Application guide for reactor protection

Part 204: Application guide for bus protection

Part 205: Application guide for line protection

Part 206: Application guide for breaker failure protection

1 Figures in square brackets refer to the bibliography.

MEASURING RELAYS AND PROTECTION EQUIPMENT –

Part 1: Common requirements

1 Scope

This part of IEC 60255 specifies common rules and requirements applicable to measuring relays and protection equipment including any combination of devices to form schemes for power system protection such as control, monitoring and process interface equipment in order to obtain uniformity of requirements and tests.

All measuring relays and protection equipment used for protection within the power system environment are covered by this standard. Other standards in this series may define their own requirements which in such cases shall take precedence.

For special applications (marine, aerospace, explosive atmospheres, computers, etc.), the general requirements within this standard may need to be enhanced by additional special requirements.

The requirements are applicable only to relays in new condition. All tests in this standard are type tests, unless otherwise declared.

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.

IEC 60044-1:1996*, Instrument transformers – Part 1: Current transformers*

IEC 60044-2:1997, *Instrument transformers – Part 2: Inductive voltage transformers*

IEC 60044-5:2004, *Instrument transformers – Part 5: Capacitor voltage transformers*

IEC 60044-7:1999, *Instrument transformers – Part 7: Electronic voltage transformers*

IEC 60044-8:2002*, Instrument transformers – Part 8: Electronic current transformers*

IEC 60050-191:1990, *Internation Electrotechnical Vocabulary – Chapter 191: Dependability and quality of service*

IEC 60050-447:2009*, International Electrotechnical Vocabulary – Part 447: Measuring relays*

IEC 60068-2-1:2007, *Environmental testing – Part 2-1: Tests – Test A: Cold*

IEC 60068-2-2:2007, *Environmental testing – Part 2-2: Tests – Test B: Dry heat*

IEC 60068-2-14:2009, *Environmental testing – Part 2-14: Tests – Test N: Change of temperature*

IEC 60068-2-30:2005, *Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12 h + 12 h cycle)*

IEC 60068-2-78:2001, *Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state*

IEC 60068-3-4:2001, *Environmental testing – Part 3-4: Supporting documentation and guidance – Damp heat tests*

IEC 60255-11:2008, *Measuring relays and protection equipment – Part 11: Voltage dips, short interruptions, variations and ripple on auxiliary power supply port*

IEC 60255-21-1:1988, *Electrical relays – Part 21-1: Vibration, shock, bump and seismic tests on measuring relays and protection equipment – Vibration tests (sinusoidal)*

IEC 60255-21-2:1988, *Electrical relays – Part 21-2: Vibration, shock, bump and seismic tests on measuring relays and protection equipment – Shock and bump tests*

IEC 60255-21-3:1993, *Electrical relays – Part 21-3: Vibration, shock, bump and seismic tests on measuring relays and protection equipment – Seismic tests*

IEC 60255-22-2:2008, *Measuring relays and protection equipment – Part 22-2: Electrical disturbance tests – Electrostatic discharge tests*

IEC 60255-22-4:2008, *Measuring relays and protection equipment – Part 22-4: Electrical disturbance tests – Electrical fast transient/burst immunity test*

IEC 60255-22-5:2008, *Measuring relays and protection equipment – Part 22-5: Electrical disturbance tests – Surge immunity test*

IEC 60255-22-7:2003, *Electrical relays – Part 22-7: Electrical disturbance tests for measuring relays and protection equipment – Power frequency immunity tests*

IEC 60255-25:2000, *Electrical relays – Part 25: Electromagnetic emission tests for measuring relays and protection equipment*

IEC 60255-26:2008, *Measuring relays and protection equipment – Part 26: Electromagnetic compatibility requirements*

IEC 60255-27:2005, *Measuring relays and protection equipment – Part 27: Product safety equipment*

IEC 60255-100 (all parts), *Measuring relays and protection equipment – Parts 1XX: Protection functional standards*

IEC 60297-3-101:2004, *Mechanical structures for electronic equipment – Dimensions of mechanical structures of the 482,6 mm (19 in) series – Part 3-101: Subracks and associated plug-in units*

IEC 60529:1989, *Degrees of protection provided by enclosures (IP Code)*

IEC 60688, *Electrical measuring transducers for converting a.c. electrical quantities to analogue or digital signals*

IEC 60721-3-3, *Classification of environmental conditions – Part 3-3: Classification of groups of environmental parameters and their severities – Stationary use at weather-protected locations*

IEC/TR 61000-2-5:1995, *Electromagnetic compatability (EMC) – Part 2: Environment* – Section 5: *Classification of electromagnetic environments – Basic EMC publication*

IEC 61810-1, *Electromechanical elementary relays – Part 1: General requirements*

IEC 61810-2, *Electromechanical elementary relays – Part 2: Reliability*

IEC 61850 (all parts), *Communication networks and systems in substations*

IEC 61850-9-2, *Communication networks and systems in substations – Part 9-2: Specific Communication Service Mapping (SCSM) – Sampled values over ISO/IEC 8802-3*

3 Terms and definitions

For the purposes of this document, the terms and definitions of IEC 60050-447, as well as the following, apply.

3.1
absolute error
difference between a measured operate value of the characteristic quantity or a measured value of a specific time and its declared value (e.g. setting value).

3.2
alternating component
in d.c. expressed as a percentage of the difference between the maximum value U_{max} and the minimum value U_{min} of a pulsating d.c. voltage to the mean value U_0 of this voltage

$$\frac{U_{max} - U_{min}}{U_0} \times 100\%$$

3.3
analogue inputs and outputs
current or voltage inputs/outputs whose values are directly proportional to physical measured quantities i.e. transducer input

3.4
assigned error
error limits within which the manufacturer declares that any device of a given type will perform under the reference conditions

3.5
binary inputs/outputs
inputs/outputs which have either an on or off state and can be either physical connections or supplied via a communication port

3.6
dynamic performance
characteristics defining the ability of the relay to achieve the intended functions under fault conditions (for example single phase to earth fault) and/or abnormal system conditions which occur at the power system frequency (for example: power swings, harmonics, etc.)