

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



**Measuring relays and protection equipment –  
Part 1: Common requirements**

**Relais de mesure et dispositifs de protection –  
Partie 1: Exigences communes**



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**MEASURING RELAYS AND PROTECTION EQUIPMENT –****Part 1: Common requirements**

## FOREWORD

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International Standard IEC 60255-1 has been prepared by IEC technical committee 95: Measuring relays and protection equipment.

This standard cancels and replaces the second edition of IEC 60255-6, published in 1988, and constitutes a technical revision.

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

FDIS	Report on voting
95/252FDIS	95/257/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 60255 series, under the general title *Measuring relays and protection 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

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## 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]<sup>1</sup>.

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

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<sup>1</sup> 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, *International 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 compatibility (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.)