IEC 60255-187-1

Edition 1.0 2021-07

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Measuring relays and protection equipment – Part 187-1: Functional requirements for differential protection – Restrained and unrestrained differential protection of motors, generators and transformers

Relais de mesure et dispositifs de protection – Partie 187-1: Exigences fonctionnelles pour la protection différentielle – Protection différentielle avec et sans caractéristique de retenue des moteurs, générateurs et transformateurs

IEC 60255-187-1:2021-07(en-fr)

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MEASURING RELAYS AND PROTECTION EQUIPMENT –

Part 187-1: Functional requirements for differential protection – Restrained and unrestrained differential protection of motors, generators and transformers

FOREWORD

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IEC 60255-187-1 has been prepared by IEC technical committee 95: Measuring relays and protection equipment. It is an International Standard.

This document, together with IEC 60255-187-2 and IEC 60255-187-3, cancels and replaces IEC 60255-13. This document constitutes a technical revision.

This document includes the following significant technical changes with respect to IEC 60255-13:

a) IEC 60255-13 has been significantly revised to follow the common structure of the functional standards for protection relays (IEC 60255-1xx series). IEC 60255-187-1 has been developed to address the restrained and unrestrained differential protection of motors, generators and transformers. The revisions include detailed description of the functions including the performance specification, testing and documentation requirements.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
95/465/FDIS	95/471/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

This International Standard contains attached files in COMTRADE file format. Configuration file: IEC 60255-187-1_External_Internal_YY0_50 Hz_4 kHz.CFG and data file: IEC 60255-187-1_External_Internal_YY0_50 Hz_4 kHz.DAT. These files are intended to be used as a complement and do not form an integral part of the document.

A list of all parts in the IEC 60255 series, published 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 document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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MEASURING RELAYS AND PROTECTION EQUIPMENT –

Part 187-1: Functional requirements for differential protection – Restrained and unrestrained differential protection of motors, generators and transformers

1 Scope

This part of IEC 60255 specifies the minimum requirements for functional and performance evaluation of (longitudinal) differential protection designed for the detection of faults in ac motors, generators and transformers. This document also defines how to document and publish performance test results.

This document covers the differential protection function whose operating characteristic can be defined on a bias-differential plane. It includes specification of the protection function, measurement characteristics, compensation of energizing quantities, additional restraint or blocking methods (for overexcitation and magnetizing inrush), starting and time delay characteristics. This document also covers unrestrained differential protection functions traditionally combined with the restrained (biased) differential element to form a single differential relay.

This document defines the influencing factors that affect the accuracy under steady state conditions and performance characteristics during dynamic conditions. The test methodologies for verifying performance characteristics and accuracy are also included in this document.

This document also includes current transformer requirements for the protection functions.

The differential protection functions covered by this document are as follows:

	IEEE/ANSI C37.2 function numbers	IEC 61850-7-4 logical nodes
Transformer differential	87T	PDIF
Motor differential	87M	PDIF
Generator differential	87G	PDIF
Restricted earth fault (ground differential)	87N	PDIF
Inrush restraint or inrush blocking		PHAR
Overexcitation restraint or overexcitation blocking		PHAR

This document does not specify the functional description of additional features often associated with biased differential relays such as current transformer (CT) supervision (CTS), switch onto fault (SOTF) and detection of geo-magnetically induced currents (GIC).

This document does not cover differential relays designed for bus bar protection (including high impedance differential protection and low impedance differential protection) or line protection. Additionally, this document does not explicitly cover generator incomplete longitudinal differential protection, generator split-phase transverse differential protection, self-balancing or magnetic balanced protection scheme, differential protection of phase-shifting transformers, directional restricted earth fault protection, railway transformers, convertor transformers and reactors. However, the principles covered by this document can be extended to provide guidance on these applications.

The general requirements for measuring relays and protection equipment are defined in IEC 60255-1.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60255-1, *Measuring relays and protection equipment – Part 1: Common requirements*

IEC 61850-8-1, *Communication networks and systems for power utility automation – Part 8-1: Specific communication service mapping (SCSM) – Mappings to MMS (ISO 9506-1 and ISO 9506-2) and to ISO/IEC 8802-3*

IEC 61869-2, *Instrument transformers – Part 2: Additional requirements for current transformers*

IEC 61869-9, *Instrument transformers – Part 9: Digital interface for instrument transformers*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1
differential relay
measuring relay that is intended to respond to the difference of the phasors and/or instantaneous values between specified incoming and outgoing electric currents

[SOURCE: IEC 60050-447:2020, 447-01-40]

3.2
biased relay
measuring relay, the characteristic of which is changed by means of an electrical bias

[SOURCE: IEC 60050-447:2020, 447-01-37]

3.3
percentage relay
biased relay, the characteristic of which is changed according to a percentage relationship of given input energizing quantity(ies)

[SOURCE: IEC 60050-447:2020, 447-01-38]