SLOVENSKI STANDARD
oSIST prEN IEC 60255-167:2026

01-oktober-2026

Merilni releji in zaščitna oprema - 167. del: Funkcionalne zahteve za smerno nadtokovno zaščito

Measuring relays and protection equipment - Part 167: Functional requirements for directional overcurrent protection

Relais de mesure et dispositifs de protection - Partie 167: Exigences fonctionnelles pour la protection directionnelle de surintensité

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COMMITTEE DRAFT FOR VOTE (CDV)

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DATE OF CIRCULATION: **2026-08-28**	CLOSING DATE FOR VOTING: **2026-11-20**
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IEC TC 95 : MEASURING RELAYS AND PROTECTION EQUIPMENT	
SECRETARIAT: France	SECRETARY: Mr Thierry BARDOU
OF INTEREST TO THE FOLLOWING COMMITTEES: TC 8,TC 13,TC 57	HORIZONTAL FUNCTION(S):
ASPECTS CONCERNED: Electricity transmission and distribution,Energy Efficiency	
☒ SUBMITTED FOR CENELEC PARALLEL VOTING	☐ NOT SUBMITTED FOR CENELEC PARALLEL VOTING

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TITLE:

Measuring relays and protection equipment - Part 167: Functional requirements for directional overcurrent protection

PROPOSED STABILITY DATE: 2032

NOTE FROM TC/SC OFFICERS:

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- OSD NC roles overview
- How to add and submit comments to the IEC

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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Measuring relays and protection equipment - Part 167: Functional requirements for directional overcurrent protection

FOREWORD

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IEC 60255-167 has been prepared by IEC technical committee 95: Measuring relays and protection equipment. It is an International Standard.

This document partially replaces the standard IEC 60255-12:1980 [1] (Directional relays and power relays with two input energizing quantities) published in 1980. This edition constitutes a technical revision for the directional overcurrent protection function.

This edition includes the following significant technical changes with respect to the previous edition:

a) this document is applicable to the directional overcurrent protection function only.
b) operating quantity and polarizing quantity of the directional element are defined.
c) the operating characteristic, the performance of the directional overcurrent protection function and corresponding test methods are specified in detail.
d) digitally interfaced directional overcurrent protection function is included.

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

Draft	Report on voting
95/XX/FDIS	95/XX/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/publications.

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, or
- revised.

INTRODUCTION

This document is part of the IEC 60255-1xx series of functional standards, which functionally describes protection functions and provides a framework for testing and assessing the performance of protection functions. It defines various technical features for protection function whose performance is declared, as well as the corresponding requirements for testing and reporting the performance.

For the standardized definitions of a protection function technical feature (such as operate time or start time) and for the standardized testing methods to evaluate it (e.g., test methods for assessing accuracy using pseudo-continuous ramp or ramp of shots), Clause 5 defines the standardized technical features of the protection function. Clause 6 and the related annexes detail how the performance of this technical feature is tested, evaluated, and reported.

In cases where a protection function technical feature is standardized but lacks a standardized testing method (for example, effective range , operating range , or the procedure to determine accuracy), Clause 5 defines the technical feature and requires the manufacturer to provide a report on the performance of this technical feature in a standardized format.

When neither a standardized definition of the technical feature nor a standardized testing method exists but the document needs to address a particular behaviour or application, Clause 4 offers a general description of the topic. In such cases, the manufacturer is required to provide a declaration explaining how they address the topic. This is a requirement in a broad sense.

All the declarations and test results from Clause 5 and Clause 6 are expected to be part of the protection function type tests according to this document. Declarations from Clause 4 are expected to be included in technical manuals or any other relevant technical documents related to the protection function. A note in the type test report, confirming that these declarations have been addressed, is also expected to be available.

Clause 7 provides a comprehensive list of the declarations and tests that are to be included in the type test report.

Overall, the presence of the term "shall" throughout the document indicates a requirement. While these requirements do not always relate strictly to the performance, they ensure transparency and consistency in testing and reporting the functionality. The performance measurement methods specified in this document reflect international consensus and provide a consistent framework for protection function testing and evaluation throughout the industry.

The mention of "minimum requirements" in this document refers to the standardized technical features as well as performance measurement methods where consensus has been reached on their definitions. Protection functions can have additional proprietary technical features not covered in this document, but their performance is also part of the product’s type tests. As such, at a minimum, a type test report for the protection function specified in this document is expected to provide the information to support and validate the declarations.

This document focuses on the directional overcurrent protection function, which is a combination of a directional element and an overcurrent element. This standard defines the specific performance characteristics, requirements and testing methods for the directional element. The requirements and testing methods for the overcurrent element are already specified in IEC 60255-151. Therefore, full compliance with IEC 60255-151 is a prerequisite for evaluating the overcurrent element as part of a directional overcurrent protection function. Users of this document are expected to refer to IEC 60255-151 for the overcurrent element aspects, making both documents necessary for complete application of the function.

1 Scope

This part of IEC 60255 specifies the minimum requirements for functional and performance evaluation of an a.c. directional overcurrent protection function. This document also defines how to document and publish performance test results.

The directional overcurrent protection function comprises an overcurrent element combined with a directional element. The directional element supervises the operation of the overcurrent element based on the direction of the fault current. This document specifies the requirements that apply to the directional element, and refers to IEC 60255-151where relevant to the overcurrent element. This document defines factors that influence the accuracy and dynamic performance of the directional overcurrent protection function. The test methods for verifying the declared performance are also included in this document.

This document covers directional phase, positive-sequence, negative-sequence, zero-sequence, and neutral overcurrent protection functions, as listed in Table 1. Annex A provides commonly used operating characteristics of these functions.

Table 1 – Directional overcurrent protection designations

Protection function	IEEE/ANSI C37.2-2022 [2] Applicable Function Numbers	IEC 61850-7-4:2010/AMD1:2020 Applicable Logical Nodes
Directional phase overcurrent protection	67	PTOC [a] RDIR+PTOC [a]
Directional positive-sequence overcurrent protection	67	
Directional negative-sequence overcurrent protection	67	
Directional zero-sequence overcurrent protection	67N	PTOC [a] RDIR+PTOC [a] PSDE [ab]
Directional neutral overcurrent protection	67G	

[a] The direction information of protection Logical Nodes can be available in Data Attribute 'dirGeneral' of its Data Object 'Str', 'Dir' or 'Op'.

[b] The Logical Node PSDE can be used for directional earth fault protection in resonant earthed (neutral) system and isolated neutral system.

Additional restraint or blocking elements may be part of the directional overcurrent protection function. This document does not specify the functional description of these additional restraint or blocking elements.

This document does not cover directional elements integrated into other protection functions, such as distance protection and power protection.

The general requirements for measuring relays and protection equipment are defined in IEC 60255-1. For digitally interfaced directional overcurrent functions via IEC 61850, Annex B contains the associated requirements based on IEC TS 60255-216-1:2025.

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 60255-151:2009, *Measuring relays and protection equipment - Part 151: Functional requirements for over/under current protection*

IEC 60255-151, *Measuring relays and protection equipment - Part 151: Functional requirements for over/under current protection*

IEC TS 60255-216-1:2025, *Measuring relays and protection equipment - Part 216-1: Digital Interface - General Requirements and Tests for Protection Functions using digital communication as input and output*

IEC 61850-7-1:2011/AMD1:2020, *Communication networks and systems for power utility automation - Part 7-1: Basic communication structure - Principles and models*

IEC 61850-7-4:2010/AMD1:2020, *Communication networks and systems for power utility automation - Part 7-4: Basic communication structure - Compatible logical node classes and data object classes*

IEC 61850-8-1:2011/AMD1:2020, *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 61850-9-2, *Communication networks and systems for power utility automation - Part 9-2: Specific communication service mapping (SCSM) - Sampled values over ISO/IEC 8802-3*

IEC/IEEE 61850-9-3:2016, *Communication networks and systems for power utility automation - Part 9-3: Precision time protocol profile for power utility automation*

IEC 61869-9:2016, *Instrument transformers - Part 9: Digital interface for instrument transformers*

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

IEC 61869-13, *Instrument transformers - Part 13: Stand-alone merging unit (SAMU)*

3 Terms, definitions and abbreviations

3.1 Terms and definitions

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

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

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

3.1.1
directional overcurrent protection
protection designed to operate only for a fault located in one direction from the installation point, and when the current as an energizing quantity exceeds a predetermined value for a given time

3.1.2
characteristic quantity
electric quantity, or one of its parameters, the name of which characterizes a protection function and the value of which are the subject of accuracy requirement

[SOURCE: IEC 60050-447:2020 [3], **447-07-01,** modified — "measuring relay or protection equipment" has been replaced with "protection function", and the original examples have been deleted.]

3.1.3
operating range
<of a measuring relay or protection equipment> interval for which the measuring relay or protection equipment under specified conditions is able to perform its intended function(s) in accordance with the specified requirements

Note 1 to entry: When accuracy requirements have to be met, see "effective range (3.1.4) ".

[SOURCE: IEC 60050-447:2020 [3], 447-03-16]

3.1.4
effective range
interval of an input energizing quantity or a characteristic quantity (3.1.2) within which the accuracy requirements are met

[SOURCE: IEC 60050-447:2020 [3], 447-07-08]

3.1.5
rated value
value of a quantity used for specification purposes, established for a specified set of operating conditions of a component, device, equipment, or system

[SOURCE: IEC 60050-151:2001 [4] **, 151-16-08**]

3.1.6
operating quantity
<of directional element> electric quantity, the phase angle of which with respect to the polarizing quantity (3.1.7) is recognized by the directional element to determine the fault direction

3.1.7
polarizing quantity
electric quantity that provides an angular reference to the directional element to determine the fault direction

3.1.8
characteristic angle
maximum sensitivity angle
φ_{RCA}

angle between the phasor representing operating quantity (3.1.6) and the phasor representing polarizing quantity (3.1.7) at which the directional element achieves maximum sensitivity

3.1.9
operate value
<of a protection function> value of the characteristic quantity (3.1.2) at which a protection function operates

[SOURCE: IEC 60050-447:2020 [3], 447-02-10, modified — "measuring relay or protection equipment" has been replaced with "protection function", and the original figure has been deleted.]

3.1.10
reset value
value of the characteristic quantity (3.1.2) at which a protection function resets

[SOURCE: IEC 60050-447:2020 [3], 447-02-12, modified — "measuring relay or protection equipment" has been replaced with "protection function", and the original figure has been deleted.]

3.1.11
angular reset hysteresis
absolute value of the angle difference between a reset value (3.1.10) and an operate value (3.1.9) of directional element

3.1.12
zero-sequence current
<of a three-phase system> one of the three symmetrical sequence components which exists only in an unsymmetrical three-phase system of sinusoidal quantities and which is defined by the following complex mathematical expression:

$$\underline{I}_0 = \frac{1}{3}(\underline{I}_{L1} + \underline{I}_{L2} + \underline{I}_{L3})$$

where $\underline{I}_{L1}$, $\underline{I}_{L2}$ and $\underline{I}_{L3}$ are the complex expressions of the phase current phasors

[SOURCE: IEC 60050-448:1995 [5], 448-11-29, modified — "component" has been replaced with "current" in term and its definition.]

3.1.13
zero-sequence voltage

<of a three-phase system> one of the three symmetrical sequence components which exists only in an unsymmetrical three-phase system of sinusoidal quantities and which is defined by the following complex mathematical expression:

$$\underline{U}_0 = \frac{1}{3}(\underline{U}_{L1} + \underline{U}_{L2} + \underline{U}_{L3})$$

where $\underline{U}_{L1}$, $\underline{U}_{L2}$ and $\underline{U}_{L3}$ are the complex expressions of the phase voltage phasors

[SOURCE: IEC 60050-448:1995 [5], 448-11-29, modified — "component" has been replaced with "voltage" in term and its definition.]

3.1.14
neutral current
electric current in the neutral conductor of a polyphase line

[SOURCE: IEC 60050-141:2004 [6], 141-03-05]

3.1.15
neutral overcurrent protection
ground overcurrent protection (US)
overcurrent protection in the earthing connection of the neutral of transformers, reactors or generators

[SOURCE: IEC 60050-448:1995 [5], 448-14-30, modified — "current protection" has been replaced with "overcurrent protection " in term and its definition.]