



**SLOVENSKI STANDARD**  
**SIST IEC 60255-13:1995**  
**01-avgust-1995**

---

**Electrical relays - Part 13: Biased (percentage) differential relays**

Electrical relays - Part 13: Biased (percentage) differential relays

Relais électriques - Trezième partie: Relais différentiels à pourcentage

**Ta slovenski standard je istoveten z: IEC 60255-13**

[SIST IEC 60255-13:1995](https://standards.iteh.ai/catalog/standards/sist/770b84a9-7f13-4629-8ec3-ded238966d43/sist-iec-60255-13-1995)

<https://standards.iteh.ai/catalog/standards/sist/770b84a9-7f13-4629-8ec3-ded238966d43/sist-iec-60255-13-1995>

**ICS:**

29.120.70      Releji    Relays

**SIST IEC 60255-13:1995**    **en**

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

[SIST IEC 60255-13:1995](#)

<https://standards.iteh.ai/catalog/standards/sist/770b84a9-7f13-4629-8ec3-ded238966d43/sist-iec-60255-13-1995>

**NORME  
INTERNATIONALE  
INTERNATIONAL  
STANDARD**

**CEI  
IEC**

**255-13**

Première édition  
First edition  
1980

---

---

**Relais électriques**

**Treizième partie:**  
Relais différentiels à pourcentage

**iTeh STANDARD PREVIEW**  
**Electrical relays**  
**(standards.iteh.ai)**

**Part 13:**  
**Biased (percentage) differential relays**

<https://standards.iteh.ai/catalog/standards/sist/iec/60255-13:1995/ded238966d43/sist-iec-60255-13-1995>

© CEI 1980 Droits de reproduction réservés — Copyright - all rights reserved

Aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'éditeur.

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher

Bureau central de la Commission Electrotechnique Internationale 3, rue de Varembe Genève Suisse



Commission Electrotechnique Internationale  
International Electrotechnical Commission  
Международная Электротехническая Комиссия

CODE PRIX  
PRICE CODE

**M**

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

## CONTENTS

	Page
FOREWORD .....	5
PREFACE .....	5
SECTION ONE — SCOPE AND DEFINITIONS	
Clause	
1. Scope .....	7
2. Definitions .....	7
SECTION TWO — REQUIREMENTS	
3. Standard values .....	9
4. Operation and accuracy .....	13
5. Methods of presenting relay characteristics and performance .....	15
6. Thermal requirements .....	15
7. Mechanical requirements .....	15
8. Values of the limits of the operative range of the auxiliary energizing quantities .....	15
9. Shock and vibration .....	17
10. Contact performance .....	17
11. Rated burden .....	17
12. Insulation .....	17
13. Markings and data .....	17
14. High-frequency disturbance test .....	17
SECTION THREE — TEST METHODS	
15. Tests related to accuracy and operating characteristics .....	19
16. Tests for thermal requirements .....	21
17. Tests of performance with through current .....	21
18. Tests for mechanical requirements .....	21

Iteh STANDARD PREVIEW  
(standards.iteh.ai)

SIST IEC 60255-13:1995  
<https://standards.iteh.ai/catalog/standards/sist/770b84a9-7f13-4629-8ec3-dcd238966d43/sist-iec-60255-13-1995>

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

## ELECTRICAL RELAYS

## Part 13: Biased (percentage) differential relays

## 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 Sub-Committee 41B: Measuring Relays, of IEC Technical Committee No. 41: Electrical Relays.

Drafts were discussed at the meetings held Nice in 1976 and in Milan in 1977. A draft, Document 41B(Central Office)13, was submitted to the National Committees for approval under the Six Months' Rule in October 1978.

The National Committees of the following countries voted explicitly in favour of publication:

Australia	Korea (Democratic People's Republic of)
Austria	Norway
Belgium	Poland
Denmark	Romania
France	South Africa (Republic of)
Germany	Sweden
Italy	Switzerland
Japan	Turkey
Korea (Republic of)	United Kingdom
	United States of America

Technical Committee No. 41 has decided to classify its future publications on a hierarchical basis as follows:

- First level: General standards;
- Second level: Generic standards relating wholly or partly to a family of relays;
- Third level: Standards applicable wholly or partly to a particular group of relays;
- Fourth level: Particular requirements or specifications relating to a specific type (or pattern) of relay.

This standard, applicable to a particular group of measuring relays with more than one input energizing quantity, is hierarchically a third-level document.

*Other IEC publications quoted in this standard:*

- Publications Nos. 255-0-20: Electrical Relays—Contact Performance of Electrical Relays.  
 255-5: Part 5: Insulation Tests for Electrical Relays.  
 255-6: Part 6: Measuring Relays with More than One Input Energizing Quantity.  
 255-6A: First Supplement to Publication 255-6 (1978).

## ELECTRICAL RELAYS

### Part 13: Biased (percentage) differential relays

#### SECTION ONE – SCOPE AND DEFINITIONS

##### 1. Scope

This standard specifies the performance requirements of electrically biased (percentage) differential relays. These relays constitute a particular sub-family of measuring relays with more than one input energizing quantity as defined in IEC Publication 255-6, Electrical Relays, Part 6: Measuring Relays with More than One Input Energizing Quantity, and the parameters whose values are to be declared by the manufacturer of such relays. It also specifies methods of presentation of the characteristics and performance of these relays.

This standard applies to relays designed for the detection of faults particularly in a.c. generators, motors and transformers. It does not apply to relays designed for busbar protection, nor does it apply to current differential (e.g. pilot wire) relays used for the protection of transmission lines. This standard covers the majority of biased (percentage) differential relays and also, for example, those where the restraint percentage increases as the through-current increases. For particular cases, supplementary requirements may be stated in national standards.

## iTeh STANDARD PREVIEW

All tests in this standard are type tests.

This standard applies only to relays in a new condition.

##### 2. Definitions

SIST IEC 60255-13:1995

<https://standards.iteh.ai/catalog/standards/sist/770b84a9-7f13-4629-8ec3->

For definitions of general terms not defined in this standard, reference should be made to the IEC International Electrotechnical Vocabulary (I.E.V.), to IEC Publication 255-6, and to IEC Publication 255-6A: First supplement to IEC Publication 255-6 (1978).

For the purpose of this standard, the following definitions shall apply:

##### 2.1 *Differential relay*

A relay which, by its design, is intended to respond to differential current.

##### 2.2 *Biased (or percentage) differential relay*

A differential relay in which the designed response is modified by a restraint current.

##### 2.3 *Differential current*

In a differential relay, a current which is the phasor difference between specified incoming and outgoing currents.

##### 2.4 *Restraint current*

In a differential relay, the combination of incoming and outgoing currents, which restrains operation of the relay.

## 2.5 Restraint percentage

The ratio, expressed as a percentage, between the differential current and the restraint current(s) up to which the relay does not operate.

*Note.* — The definition of restraint percentage ignores an error, which may not be negligible, due to the finite operating current required under zero restraint conditions. This may be taken into account when necessary.

## 2.6 Through current

In a differential relay, that portion of the total incoming current that is also present in the outgoing current.

# SECTION TWO — REQUIREMENTS

## 3. Standard values

### 3.1 Input and auxiliary energizing quantities and frequency

The standard values of input and auxiliary energizing quantities, and of frequency, are specified in IEC Publication 255-6.

### 3.2 Standard reference values of influencing quantities and factors and standard values of their nominal and extreme ranges

#### 3.2.1 Influencing quantities and factors

The standard reference conditions are specified in Table I of IEC Publication 255-6. In addition, the standard conditions given in Table I in this standard apply to biased (percentage) differential relays.

SIST IEC TABLE I:1995

Standard reference conditions and test tolerances of influencing quantities and factors

Influencing quantity or factor		Reference conditions	Test tolerances
Characteristic and input energizing quantities	Input energizing currents – Restraint current – Differential current	As declared by the manufacturer or as specified in national standards unless specified in clauses below or in lower-level documents	
	Phase angle between input energizing quantities	0°	± 2°
	Transient d.c. component in a.c.	Zero (See note)	5% of peak a.c. value
	Setting value(s), where setting adjustments are possible	As declared by the manufacturer or as specified in national standards unless specified in clauses below or in lower-level documents	
Auxiliary energizing quantities	Transient d.c. component in a.c.	Zero (See note)	5% of peak a.c. value

*Note.* — In the special case of relays in which polyphase measurements are made on a single relay, the manufacturer or national standards shall define which of the input currents shall be under reference conditions.

### 3.2.2 Limits of the nominal ranges of influencing quantities and factors

The standard values are specified in Table II of IEC Publication 255-6. In addition, the standard values given in Table II in this standard apply to biased (percentage) differential relays.

TABLE II  
Standard values of the limits of the nominal ranges of influencing quantities and factors

Influencing quantity or factor		Nominal range
Characteristic and input energizing quantities	Reference input energizing quantity	As declared by the manufacturer or as specified in national standards
	Non-reference input energizing quantity	
	Phase angle between input energizing quantities	
	Frequency	
	Waveform	
	Steady-state d.c. component in a.c.	
	Transient d.c. component in a.c.	

(standards.iteh.ai)

Auxiliary energizing quantities	Voltage or current	As declared by the manufacturer or as specified in national standards unless specified in clauses below
	Frequency	
	Waveform	
	a.c. component in d.c. (ripple)	0 to 12% of the rated d.c. value <sup>1)</sup>
	Steady state d.c. component in a.c.	As declared by the manufacturer or as specified in national standards unless specified in clauses below
	Transient d.c. component in a.c.	

<sup>1)</sup> This value of the tolerance is based on the definition given in the International Electrotechnical Vocabulary (I.E.V. 131-03-14) Peak ripple factor.

### 3.3 Characteristic quantity(ies) and setting range(s)

There are no standard rated values of either characteristic quantity(ies) or setting range(s). The values and the limits of setting range(s) shall be declared by the manufacturer.

### 3.4 Restraint percentage

There are no standard values of restraint percentage. The setting values shall be declared by the manufacturer.



### 3.5 *Resetting and disengaging ratios*

There are no standard values of the resetting and disengaging ratios. The values shall be declared by the manufacturer.

## 4. **Operation and accuracy**

### 4.1 *Operation*

#### 4.1.1 *Operating characteristic*

The manufacturer shall declare the operating characteristics of the relay under reference conditions, these including the reference setting of the differential circuit, and at the maximum and minimum settings of the restraint circuits, when applicable.

#### 4.1.2 *Effective range\**

The manufacturer shall declare the effective range\* of restraint current values.

#### 4.1.3 *Maximum through current*

The manufacturer shall declare the maximum through current up to which the relay produces no output. The relay shall be able to withstand the sudden application and removal of through current up to this value. This duration shall be declared by the manufacturer and shall be at least 100 ms.

*Note.* — This maximum value is based on a test in which there is no intentional differential current, the incoming and outgoing (through) currents should be equal.

#### 4.1.4 *Harmonic restraint*

For relays which have harmonic restraint, the manufacturer shall declare which of the harmonics have a restraining effect and explain how the harmonic restraint interacts with the fundamental frequency restraint. The amount of each of these harmonics which will prevent operation of the relay shall be declared, the amount being expressed as a percentage of the differential current at the rated frequency. If different values are obtained under steady-state and dynamic conditions, the highest value shall be stated.

### 4.2 *Accuracy*

For biased (percentage) differential relays, considerations of accuracy apply to the operating characteristics and to the operating time under reference conditions. For these items the manufacturer shall declare the assigned errors, as defined in IEC Publication 255-6.

#### 4.2.1 *Operating characteristics*

The accuracy of the operating characteristics may be shown graphically by maximum and minimum lines, as in Figure 1, page 22. Alternatively, the manufacturer may declare the restraint percentage, with a plus or minus tolerance, over the effective range of restraint current.

#### 4.2.2 *Operating time*

The accuracy of the operating times may be shown graphically as in Figure 2, page 22, or it may be declared by the manufacturer for a specified range of differential currents.

*Note.* — Normally only a maximum operating time is specified.

\* See also IEC Publication 255-6A, Sub-clause 2.3.