

Electrical protection relays

**Part 2. Requirements for the principal families of
protection relays**

Section 2.3 Specification for thermal electrical relays

Relais de protection électrique
Partie 2. Caractéristiques des principales
familles de relais de protection
Section 2.3 Spécification relative aux relais
électriques thermiques

Elektrische Schutzrelais
Teil 2. Anforderungen an die Hauptgruppen
von Schutzrelais
Abschnitt 2.3 Meßrelais zum Schutz vor
thermischer Überlastung (Überlastrelais)

Committees responsible for this British Standard

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Association of Consulting Engineers
British Railways Board
Electricity Supply Industry in England and Wales
Electronic Components Industry Federation
Transmission and Distribution Association (BEAMA Limited)

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Contents

	Page
Committees responsible	Inside front cover
National foreword	ii
Specification	
Section one. General	
1 Scope and object	1
2 Definitions	1
Section two. Requirements	
3 Standard values	2
4 Accuracy	6
Section three. Test methods	
5 Tests related to operating characteristics and accuracy	7
6 Tests for thermal requirements	8
Appendices	
A Characteristic curves, cold curves	10
B Characteristic curves, hot curves	11
C Example for determining accuracy	13
Tables	
1 Reference conditions and test tolerances of influencing quantities and factors	3
2 Previous current values when measuring the effect of influencing quantities	4
3 Standard reference conditions and test tolerances of correcting quantities when measuring the effect of influencing quantities	4
4 Standard values of the limits of the nominal ranges of influencing quantities and factors	5
5 Standard values of the limits of the nominal range of previous current values	5
6 Standard values of the limits of the nominal range of correcting quantities	6
Figures	
1 Test circuit for determining the minimum operating current and the cold characteristic	9
2 Test circuit for determining the hot characteristics	9

National foreword

This Section of BS 142 has been prepared under the direction of the General Electrotechnical Standards Policy Committee. It is identical with IEC 255-8 : 1990 'Electrical relays — Part 8 : Thermal electrical relays' published by the International Electrotechnical Commission (IEC) and supersedes BS 142 : Section 2.3 : 1984, which is withdrawn.

The term 'as specified in National Standards or as declared by the manufacturer' is used extensively in the text and in tables within this standard. Where this is encountered it should be interpreted as 'as declared by the manufacturer'.

Attention is drawn to the fact that the particular requirements for thermal electrical relays used for motor protection have been included.

Cross-references

In clause 2 of the text, reference is made to the International Electrotechnical Vocabulary (IEV) (IEC Publication 50). There are two chapters of IEC 50 concerned with electrical relays, IEC 50 (446) and IEC 50 (448). BS 142 : Part 1.1 and BS 4727 : Part 1 : Group 03 are related to IEC 50 (446). There is no related British Standard to IEC 50 (448).

Reference is also made in the text to higher level documents. This refers to Parts 0, 1 and 3 to 7 of IEC 255 for which the following identical, technically equivalent or related British Standards exist. BS 142 : Part 0 explains the relationship of the Parts and Sections of BS 142 to one another, to BS 5992 and to IEC 255.

International standard ¹⁾	British Standard
IEC 255-0-20 : 1974	BS 5992 Electrical relays Part 1 : 1980 Specification for contact performance of electrical relays (Identical)
IEC 255-1-00 : 1975	Part 2 : 1980 Specification for all-or-nothing electrical relays (Identical)
IEC 255-3 : 1989	BS 142 Electrical protection relays Part 3 Requirements for single input energizing quantity relays Section 3.1 : 1990 Specification for single input energizing quantity measuring relays with non-specified time or independent specified time Section 3.2 : 1990 Specification for single input energizing quantity measuring relays with dependent specified time (Both related)
IEC 255-4 : 1976	None
IEC 255-5 : 1977	BS 5992 Electrical relays Part 3 : 1980 Specification for the insulation testing of electrical relays (Identical)
IEC 255-6 : 1988	BS 142 Electrical protection relays Part 2 Requirements for the principal families of protection relays Section 2.2 : 1990 Specification for general requirements for measuring relays used for protection (Related)

¹⁾ Undated in the text.

IEC 255-7 : 1978 BS QC 160000 Harmonized system of quality assessment
for electronic components. Electrical relays. Generic
specification: electromechanical all-or-nothing relays
Part 1 : 1987 Test and measurement procedures
(Identical)

The Technical Committee has reviewed the provisions of IEC 50 (446), IEC 50 (448), IEC 255-3, IEC 255-4 and IEC 255-6 and has decided that they are acceptable for use in conjunction with this standard.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

ELECTRICAL RELAYS

Part 8: Thermal electrical relays

SECTION ONE – GENERAL

1 Scope and object

This standard is applicable to dependent specified time electrical measuring relays which protect equipment from electrical thermal damage by the measurement of current flowing in the protected equipment.

1.1 This standard covers the following two types of relays:

- a) thermal electrical relays having a total memory function of the load-current conditions before the conditions which caused the switching of the relay;
- b) thermal electrical relays having a partial memory function, i.e. of the overload current conditions only.

1.2 This standard also covers the particular requirements for thermal electrical relays used for motor protection.

The object of this standard is to state the particular requirements for thermal electrical relays. It is to be read in conjunction with higher level documents in the IEC Publication 255 series.

2 Definitions

For definitions of general terms not defined in this standard, reference should be made to the International Electrotechnical Vocabulary (IEV) (IEC Publication 50) and higher level documents.

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

2.1 **hot curve:** For a thermal electrical relay with a total memory function, the characteristic curve representing the relationship between specified operating time and current, taking account of the thermal effect of a specified steady-state load current before the overload occurs.

2.2 **cold curve:** For a thermal electrical relay, the characteristic curve representing the relationship between specified operating time and current, with the relay at reference and steady-state conditions with no-load current flowing before the overload occurs.

2.3 **correcting quantity (compensating quantity):** A quantity modifying the specified characteristics of the relay in a specified manner. Such quantities can be oil temperature, etc.

2.4 **basic current:** The specified limiting value of the current for which the relay is required not to operate.

NOTE – The basic current serves as a reference for the definition of the characteristics of thermal electrical relays. Settings of a thermal electrical relay are made in terms of this current.

2.5 **constant k :** The constant by which the basic current is multiplied to obtain the current value to which the accuracy of the minimum operating current referred.

2.6 **previous load ratio:** The ratio of the load current preceding the overload to basic current under specified conditions.

SECTION TWO – REQUIREMENTS

3 Standard values**3.1 Characteristic curves**

The characteristics of time with respect to current can be stated either by equations or by graphical methods. The equations for a simple thermal model are given below under Sub-clauses 3.1.1 and 3.1.2. Other characteristic curves are permitted and should be declared by the manufacturer. As an example, see Appendix A.

NOTES

1 – For practical purpose, e.g. testing, it is convenient to give the characteristic curve as a combination of current and time values.

2 – The time constant used in an equation should be as specified in National Standards or as declared by the manufacturer.

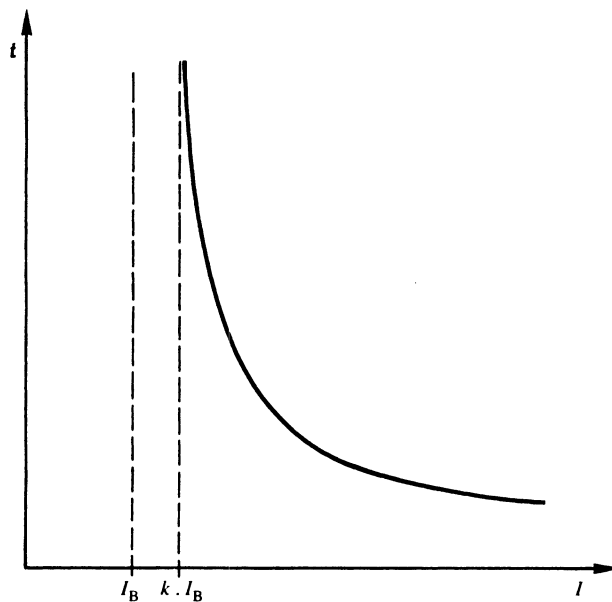
3.1.1 Cold curve

A general curve for thermal electrical relays, based on the heating effect and on the time constant, is given by the following formula:

$$t = \tau \cdot \ln \frac{I^2}{I^2 - (k \cdot I_B)^2}$$

where

- t = operating time;
- τ = time constant;
- I_B = basic current;
- k = constant;
- I = relay current.



Cold curve