bsi.

...making excellence a habit.™

Please be aware that this PDF has been created from the original hardcopy document, which might not be in good condition and so the PDF might reflect this.

BSI Group
389 Chiswick High Road
London, W4 4AL
United Kingdom

T: +44 20 845 086 9001
F: +44 20 8996 7400
cservices@bsigroup.com
bsigroup.com

British Standards Limited
Registered in England no: 07864997
Registered address: 389 Chiswick High Road
London, W4 4AL, United Kingdom

AVA Documents
INVESTORS IN PEOPLE
Document Sharing Hub

Full document details: BS 142:1953

BRITISH STANDARD 142 1953

ELECTRICAL PROTECTIVE RELAYS

LIBRARY

BRITISH STANDARDS INSTITUTION

Document details: BS 142:1953

AVA Documents
Document Sharing Hub

BRITISH STANDARD SPECIFICATION

ELECTRICAL PROTECTIVE RELAYS

B.S. 142 : 1953

Price ~~6/-~~ 7/- net

BRITISH STANDARDS INSTITUTION
INCORPORATED BY ROYAL CHARTER
BRITISH STANDARDS HOUSE, 2 PARK ST., LONDON, W.1
TELEGRAMS: STANDARDS, AUDLEY, LONDON TELEPHONE: MAYFAIR 9000

Full document details: BS 142:1953
AVA Documents
Document Sharing Hub

THIS BRITISH STANDARD, having been approved by the Electrical Industry Standards Committee and endorsed by the Chairman of the Engineering Divisional Council, was published under the authority of the General Council on 29th August, 1953.

First published February, 1927
First revision September, 1942
Second revision August, 1953

The Institution desires to call attention to the fact that this British Standard does not purport to include all the necessary provisions of a contract.

In order to keep abreast of progress in the industries concerned, British Standards are subject to periodical review. Suggestions for improvements will be recorded and in due course brought to the notice of the committees charged with the revision of the standards to which they refer.

A complete list of British Standards, numbering over 2000, indexed and cross-indexed for reference, together with an abstract of each standard, will be found in the Institution's Yearbook, price 12s. 6d.

British Standards are revised, when necessary, by the issue either of amendment slips or of revised editions. It is important that users of British Standards should ascertain that they are in possession of the latest amendments or editions.

ELE/13

CO-OPERATING ORGANIZATIONS

The Electrical Industry Standards Committee, under whose supervision this British Standard was prepared, consists of representatives from the following Government departments and scientific and industrial organizations:—

*Admiralty
Air Ministry
*Association of Consulting Engineers Incorporated
*Association of Supervising Electrical Engineers
British Electrical and Allied Industries Research Association
*British Electrical and Allied Manufacturers' Association
British Electrical Development Association
*British Electricity Authority and Area Boards
*British Railways, The Railway Executive
Cable Makers' Association
Crown Agents for the Colonies
Electric Lamp Manufacturers' Association
Electric Light Fittings Association
Electrical Contractors' Association, Incorporated
Electrical Contractors' Association of Scotland
*Engineering Equipment Users' Association
*General Post Office
*Institution of Electrical Engineers
*Ministry of Fuel and Power
*Ministry of Labour and National Service (Factory Dept.)
*Ministry of Supply
Ministry of Works
*National Physical Laboratory
*North of Scotland Hydro Electric Board
Public Transport Association Incorporated
Radio Industry Council

The Government departments and scientific and industrial organizations marked with an asterisk in the above list, together with the following, were directly represented on the Committees entrusted with the preparation of the standard:—

Inter-Service Radio Components Standardization Committee
War Office

AVA Documents
Document Sharing Hub

CONTENTS

	Page
Co-operating organizations	3
Foreword	6

SPECIFICATION

SECTION ONE : GENERAL

1. Scope	6
2. Definitions	6

SECTION TWO : CLASSIFICATION

3. Functional characteristics	8
4. Constructional characteristics	9
5. Time characteristics	10
6. Bias characteristics	10
7. Contact characteristics	10

SECTION THREE : RATINGS

8. Rating of transformer-operated relays	11
9. Rating of contacts	11

SECTION FOUR : GENERAL

10. Standard ambient temperature	12
11. Standard frequency	13
12. Relays with non-standard settings	13

SECTION FIVE : CONSTRUCTION

13. General	13
14. Adjustable settings	13
15. Operation indicator	13
16. Auxiliary elements	14

SECTION SIX : MARKING

17. General	14
18. Indication of settings	15

SECTION SEVEN : TESTS

19. General	15
20. Temperature rise (type test)	15
21. Ability to withstand overload (type test)	16
22. Durability (type test)	18
23. Contacts (type test)	18
24. High voltage tests of insulation	19

SECTION EIGHT : LIMITS OF SETTINGS AND LIMITS OF ERROR

A. Over-current and earth-fault relays without a directional feature (general characteristics) Clauses 25-26	20
B. Inverse-with-definite-minimum-time-lag over-current and earth-fault relays without a directional feature Clauses 27-30	21

	Page
C. Inverse-without-definite-minimum-time-lag over-current and earth-fault relays without a directional feature Clauses 31-33	22
D. Instantaneous over-current and earth-fault relays without a directional feature Clauses 34-36	22
E. A.C. and D.C. over-voltage, under-voltage and no-voltage relays with or without time-lag Clauses 37-40	23
F. Differential-current relays, A.C. and D.C. Instantaneous and with time-lag but without a directional feature Clauses 41-44	24
G. Phase-unbalance relays Clauses 45-48	24
H. D.C. forward-current and/or reverse-current relays of the permanent-magnet moving-coil type Clauses 49-50	26
I. Thermal relays Clauses 51-53	26
J. Distance relays Clauses 54-56	28
K. Frequency relays Clauses 57-58	29
L. Instantaneous and definite time-lag relays Clauses 59-60	30
M. A.C. directional relays with or without time-lag Clause 61	31
N. A.C. directional relays other than reverse power relays (without time-lag) Clauses 62-63	32
O. A.C. directional relays in combination with an over-current and/or earth-fault relay Clauses 64-65	33

APPENDICES

A. Current-operated relays	33
B. Recognized methods of measuring temperature	34
C. Classification of insulating materials	35
D. Relay contact arrangements	37

AVA Documents
Document Sharing Hub

BRITISH STANDARD SPECIFICATION FOR

ELECTRICAL PROTECTIVE RELAYS

FOREWORD

The previous revision of this British Standard was undertaken in 1942 as an urgent war-time need but, in view of the prevailing conditions, it was not practicable to bring it fully into line with the state of the art at that time. For that reason its status could not be other than temporary.

The present revision is intended to be a more permanent version. It has been revised and strengthened so that it more truly corresponds to modern knowledge and practice, thereby contributing to a higher standard of performance. In addition many new features and improvements have been introduced. Notable among these is the conversion of the recommended standard time-current characteristic for inverse-with-definite-minimum-time-lag relays to a mandatory standard.

It is believed also that the new arrangement and re-grouping of the clauses will be found to add greatly to the usefulness of the specification.

SPECIFICATION

SECTION ONE : GENERAL

SCOPE

1. This British Standard relates to relays intended for use in equipment designed for the protection of electrical plant against damage consequent upon abnormal conditions. It does not apply to relays intended for regulation or control purposes or for use in starters and controllers, nor to direct-acting attachments to circuit-breakers, such as under-voltage and over-current trip-coils and the like. Electronic devices, which do not depend for their operation on moving mechanical parts and metallic contacts, are specifically excluded.

DEFINITIONS

2. For the purposes of this British Standard the following definitions shall apply :—

1. Relay. A device by means of which an electrical circuit is indirectly controlled by a change in the same or in another electrical circuit.

2. Protective relay. A relay designed to bring about automatic de-energization and/or disconnection of electrical plant from the source of supply, under pre-determined conditions, usually abnormal and likely to cause damage to the affected plant.

A protective relay may consist of a single element (e.g. an over-current relay consisting of a solenoid element or an induction element) or of two or more elements which together provide the desired characteristics (e.g. a directional over-current relay consisting of a directional element in combination with an over-current element).

The term 'protective relay' includes the above-mentioned elements, together with any supplementary elements, auxiliary elements, or other components required to give the desired characteristics. It excludes current and voltage transformers, and equivalent apparatus.

Where the term 'relay' is used in this specification a protective relay is to be understood.

3. Main relay element. That part of a relay which responds directly to the changed conditions in the protected circuit.

4. Supplementary relay element. That part of a relay which, used in conjunction with the main element, modifies its characteristics or settings or renders it inoperative.

5. Auxiliary relay element. That part of a relay which assists the main element in the performance of its functions and which operates in response to the functioning of the main element.

6. Rated current and rated voltage. The value of the current or voltage marked on the relay as that upon which its performance is based.

7. Relay settings :—

the assigned quantity at which the relay will function under specified conditions ; and/or

the assigned time in which the relay will function under specified conditions.

The values are usually marked on the relay, and may be expressed as direct values, percentages of a rated value, or multipliers.

8. Operating value. The relay setting, or a prescribed multiple thereof, subject to the limits of error prescribed in the specification.

9. Resetting value. The value, within the prescribed limits of error, at which the relay returns, after operation, to the non-operated or reset position.

10. Operation. The response of a relay so as to complete its required function.

11. Angle of phase compensation. The angle of phase compensation (of a directional relay) is the phase displacement between the current and voltage measured at the relay terminals, at which the relay gives the maximum torque or force.

Full document details: BS 142:1953
AVA Documents
Document Sharing Hub

12. Type test. A test of one article intended to show that all articles made to the same specification, and having the same essential details, would pass an identical test.

13. Routine test. A test required on every article made to the same specification.

SECTION TWO : CLASSIFICATION

FUNCTIONAL CHARACTERISTICS

3. The functional characteristics of relays are classified as follows :—

a. Current relay, which operates at a pre-determined value of current. This includes an over-current and an under-current relay.

b. Voltage relay, which operates at a pre-determined value of voltage This includes an over-voltage relay, an under-voltage relay, and a no-voltage relay.

c. Power relay, which operates at a pre-determined value of power. This includes an over-power relay and an under-power relay.

d. Directional relay, alternating current, which operates in accordance with the phase relation between alternating quantities and includes :

(i) A relay in which the maximum torque or force is exerted when the relay current and voltage are in phase, and which is not compensated for fall of voltage. (This is sometimes described as a *reverse-power relay*.)

(ii) A relay in which the maximum torque or force is exerted when the relay current and voltage have a pre-determined phase-displacement other than zero and which is not compensated for fall of voltage.

(iii) A relay in either of the above categories, but compensated for fall of voltage. (This is sometimes described as a *reverse-current relay*.)

(iv) A relay in which the maximum torque or force is exerted when two currents or two voltages are in phase or have some pre-determined phase displacement.

(v) A relay in which the maximum torque or force is exerted when the operating current and voltage are in phase or have a pre-determined phase displacement, the magnitude of the power required for operation being influenced by a second (restraining) voltage.

e. Directional relay, direct current, which operates in accordance with the direction of the current and is usually of the permanent-magnet moving-coil type.

f. Frequency relay, which operates at a pre-determined frequency. This includes an over-frequency and an under-frequency relay.

g. Differential relay, which has two or more windings and operates in response to either the scalar or the vectorial difference between two or more electrical quantities.

h. Current-unbalance relay, which operates when the currents in a polyphase system are unbalanced by a pre-determined amount.

i. Voltage-unbalance relay, which operates when the voltages of a polyphase system are unbalanced by a pre-determined amount.

j. Negative phase-sequence current relay (also known as a reverse phase-sequence current-relay), which operates when the value of current in one phase differs by a pre-determined amount from that in another phase, or when the phase sequence of balanced currents is reversed.

k. Negative phase-sequence voltage relay (also known as a reverse phase-sequence voltage relay), which operates when the voltages of a polyphase system are unbalanced by a pre-determined amount, or when the phase sequence of balanced voltages is reversed. Some types of relay also operate on a fall of voltage.

l. Definite-distance relay, whose operation is dependent upon the 'distance' between the relaying point and the fault, the distance being a function of reactance or impedance, as determined by the design. Operation occurs if the fault-distance is equal to or less than the setting value.

m. Time-distance relay, which operates with a time-lag dependent upon the fault-distance.

The characteristic curve connecting distance and time in a time-distance relay may take the form of either a stepped line or a continuous sloping line, straight or curved.

CONSTRUCTIONAL CHARACTERISTICS

4. The constructional characteristics of relays are classified as follows:—

a. Solenoid relay, dependent upon the movement of an iron core in an axial direction within a solenoid.

b. Armature or moving-iron relay, dependent upon the movement of an iron armature.

c. Permanent-magnet moving-coil relay, dependent upon the movement of a coil in the air-gap of a permanent-magnet.

d. Electrodynamic relay, dependent upon the movement of a coil in an electromagnetic field.

e. Induction relay, dependent upon the interaction of one or more magnetic fields with currents induced in a movable conducting member.

f. Motor-pattern relay, dependent upon the rotation of a motor armature.

AVA Documents
Document Sharing Hub