
British Standard

Electrical protection relays

Part 2. Requirements for the principal families of protection relays

Section 2.2 Specification for general requirements for measuring relays used for protection

Relais de protection électrique

Partie 2. Caractéristiques des principales familles de relais de protection

Section 2.2 Caractéristiques générales des relais de mesure utilisés pour la protection

Elektrische Schutzrelais

Teil 2. Anforderungen an die Hauptgruppen von Schutzrelais

Abschnitt 2.2 Allgemeine Anforderungen an Meßschutzrelais

Foreword

This revision of BS 142 : Section 2.2 has been prepared under the direction of the General Electrotechnical Standards Policy Committee. It rationalizes the text so that it can refer to electrical disturbance tests and vibration, shock and bump testing* as given in the recently published Subsections 1.4.1, 1.5.1 and 1.5.2 of BS 142, and has also been amended so as to align as closely as possible with the second edition of IEC (International Electrotechnical Commission) Publication 255-6 published in 1988.

This revision, which involves no changes in technical principle, supersedes BS 142 : Section 2.2 : 1982, which is withdrawn.

NOTE. This Section should be read in conjunction with BS 142 : Part 0 'General introduction and list of Parts' and BS 142 : Section 1.1 'Glossary of protection relay terms'.

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

*Seismic testing will be the subject of a further Subsection of BS 142.

Contents

	Page		Page
Foreword	Inside front cover	Appendices	
Committees responsible	Back cover	A Information on specifying measuring relays for protection	15
Specification		B Specified independent time relays	15
Subsection one. General		C Explanatory notes on auxiliary power supplies for static measuring relays	15
1 Scope	2		
2 Definitions	2	Tables	
Subsection two. Performance		1 Recommended rated values for input energizing and auxiliary energizing quantities	4
3 Standard rated values	3	2 Standard reference conditions and test tolerances of influencing quantities and factors	5
4 Limits of the operative ranges for auxiliary energizing quantities	8	3 Standard values of the limits of the nominal ranges of influencing quantities and factors	7
5 Thermal requirements	8	4 Preferred values for specified time	15
6 Accuracy	9	Figures	17
7 Overshoot time	9	1 Internal power supply unit	17
8 Rated burden and rated impedance	10	2 External power supply unit	
9 Mechanical requirements	10		
10 Construction	10		
11 Marking and data	11		
12 Insulation	12		
13 Additional requirements for static relays	12		
14 Contact performance	12		
Subsection three. Tests			
15 General	13		
16 Thermal tests	13		
17 Mechanical tests	14		
18 Tests for interruptions to d.c. auxiliary energizing quantities	14		

Subsection one. General

1 Scope

This Section of BS 142 specifies the general performance requirements for electrical protection measuring relays and also the parameters whose values are to be declared by the manufacturer of such relays.

The relays covered by this Section are as follows:

- (a) those constructed with or without contacts;
- (b) those having one or more input energizing quantities;
- (c) those with operating times that are non-specified, dependent or independent specified times.

This Section applies only to relays in new condition. All the tests in this Section are type tests except for those specifically designated routine tests (see 15.2). It excludes relays used in the following electrotechnical fields:

- (1) telephony;
- (2) telegraphy;
- (3) signalling and blocking in railway systems;
- (4) devices complying with BS 4794, BS 4941 and BS 5424.

Special applications, such as marine, aerospace, explosive atmospheres and computers, are not covered by this Section.

Information on specifying measuring relays for protection is given in appendix A.

NOTE. The titles of the publications referred to in this standard are listed on the inside back cover.

2 Definitions

For the purposes of this Section of this British Standard, the definitions given in BS 142 : Section 1.1 apply, together with the following.

2.1 single input measuring relay. A relay which is designed to respond to a single input energizing quantity and where the measuring function is determined by a single energizing quantity.

NOTE. If single input measuring elements of the same type are packaged as protection equipment, e.g. 3-phase overcurrent relays, they are to be considered as single input measuring relays.

2.2 multi input measuring relay. A relay which is designed to respond to more than one input energizing quantity and where the measuring function is determined by the interaction of the energizing quantities.

Subsection two. Performance

3 Standard rated values

NOTE. In general, rated values for input energizing and auxiliary energizing quantities are not specified as standard values, because most of the relays covered by this standard are custom-built. The values listed in table 1 are recommendations which wherever possible should be observed. The underlined values have found greater acceptance.

3.1 Frequency

The rated values of frequency shall be selected from the following, the underlined value being preferred:

60 Hz, 50 Hz and $16\frac{2}{3}$ Hz.

3.2 Operating times

Rated values of dependent specified time shall be in accordance with lower level documents*.

NOTE. Rated values of independent specified times are not specified, but for relays having a time-setting range, the maximum values given in appendix B are preferred.

3.3 Characteristic quantities

Values of characteristic quantities shall be in accordance with lower level documents.

3.4 Standard reference values for influencing quantities and factors and values of their nominal and extreme ranges

3.4.1 *Standard reference values for influencing quantities and factors*

3.4.1.1 The standard reference values for influencing quantities and factors, and the associated test tolerances shall be as given in table 2.

3.4.1.2 Where special conditions of application or the character of the relay necessitate the use of non-standard values, the manufacturer shall state the reference values and tolerances, e.g. where special applications necessitate the use of 40 °C as the reference value of ambient temperature instead of 20 °C.

3.4.1.3 The manufacturer shall declare the effects of self heating of relays mounted as in normal service where these are significant, i.e. if they cause changes in accuracy that are of the same order of magnitude or greater than the assigned error.

3.4.1.4 In the absence of any specific requirements being given in other Sections of BS 142 dealing with more specific types of relay, i.e. lower level documents, the following shall apply.

(a) Each of the voltages (between any two lines and between line and neutral) of a polyphase symmetrical system shall not differ by more than 1 % from the average of such voltages.

(b) Phase currents shall not differ by more than 1 % from the average of the system currents.

(c) The angles between each current vector and its phase to neutral voltage vector shall be the same, subject to a tolerance of 2 °.

3.4.2 *Standard values of the limits of the nominal ranges of influencing quantities and factors*

3.4.2.1 The standard values of the limits of the nominal ranges of influencing quantities and factors shall be either as given in table 3 or, where special conditions of application do not permit this, as declared by the manufacturer. The following additional requirements shall apply.

(a) There shall be neither condensation nor ice formation inside the relay.

(b) The manufacturer shall declare the conditions under which the calibration has been made and the effects due to the transient d.c. component in the a.c. if these are significant, i.e. of the same order of magnitude or greater than the assigned error. In this case, the manufacturer shall declare the errors for the following three values of time constant: 0, 40 and 100 ms.

The reference conditions, both for transient and steady state, shall be in accordance with **3.4.1**.

* Lower level documents are other Sections of BS 142 dealing with more specific types of relay (see BS 142-2-2:1990).

Table 1. Recommended rated values for input energizing and auxiliary energizing quantities			
Relay type	Quantity	Values	Unit
<i>Input energizing quantities</i>			
Primary	—	None	—
Secondary	A.C. voltages (r.m.s.)	100, <u>110</u> , 115, 120, 200, 220, <u>240</u> plus these values multiplied by $\sqrt{3}$ or $1/\sqrt{3}$	$V_{r.m.s.}$
	A.C. currents (r.m.s.)	0.5, <u>1</u> , <u>2</u> , <u>5</u>	$A_{r.m.s.}$
Shunt	—	30, 45, 50, 60, 75, 100, 150, 300, 600	mV
<i>Auxiliary energizing quantities</i>			
—	A.C. voltage (r.m.s.)	24, 48, 50*, 55*, $100/\sqrt{3}$, $110/\sqrt{3}$, $120/\sqrt{3}$, 100, <u>110</u> , 115, 127, 200, 220, $415/\sqrt{3}$, 380, <u>415</u> , 480, 500, 660	$V_{r.m.s.}$
—	A.C. currents (r.m.s.)	None	—
—	D.C. voltages	6, 12, <u>24</u> , <u>48</u> , 60, <u>110</u> , <u>125</u> , 220, <u>250</u> , 440	V
—	D.C. currents	None	—
*Used in monophasic railways systems only.			

Table 2. Standard reference conditions and test tolerances of influencing quantities and factors			
Influencing quantity or factor		Reference condition (see 3.4.1.2)	Test tolerance
<i>General</i>			
Ambient temperature		20 °C	± 2 °C
Atmospheric pressure		86 kPa to 106 kPa*	—
Relative humidity		45 % to 75 %	See note 1
Position		As declared by the manufacturer	2 ° in any direction, or for static relays, as declared by the manufacturer
External magnetic induction		Equal to or less than 10 times the Earth's induction (see note 2)	—
Self heating		See 3.4.1.3	—
<i>Characteristic and input energizing quantities</i>			
Magnitude of input energizing voltages (reference for determination of variations)		As specified in lower level documents (see also note 3)	As declared by the manufacturer
Magnitude of input energizing currents (reference for determination of variations)			
Phase angle between input energizing quantities		As specified in lower level documents	± 2 °
Frequency		Rated value	± 0.5 % (see note 4)
Waveform		Sinusoidal	Distortion factor 2 % (see notes 5 and 6)
Alternating component in d.c. (ripple) (see note 7)		Zero	Not greater than 6 %
D.C. component in a.c.	Steady state	Zero	Not greater than 2 % of peak value
	Transient	Zero	Not greater than 2 % of peak value
Setting value		To be declared by the manufacturer when it differs from the value nearest to the mean of the range	To be declared by the manufacturer
Balanced polyphase supplies		See 3.4.1.4	See 3.4.1.4
*1 bar = 100 N/m ² = 100 Pa.			