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BRITISH STANDARD SPECIFICATION

FOR

INSTRUMENT TRANSFORMERS

(REVISED JULY 1936)

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The Electrical Industry Committee,† under whose supervision this Specification was prepared, consists of representatives from the following Government Departments and Scientific and Industrial Organisations :—

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Electricity Commissioners.
*General Post Office.
*Home Office.
*H.M. Office of Works.
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*War Office.
*Association of Consulting Engineers.
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Cable Makers' Association.
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*Incorporated Municipal Electrical Association.
*Institution of Electrical Engineers.
*London Electricity Supply Association.
Municipal Tramways and Transport Association.
*Provincial Electric Supply Association.
Railway Companies of Great Britain.
Tramways, Light Railways and Transport Association.

The Government Departments and Scientific and Industrial Organisations marked with an asterisk in the above list, were directly represented on the Committee entrusted with the preparation of this Specification.

This Specification having been approved by the Electrical Industry Committee and endorsed by the Chairman of the Engineering Divisional Council, was published under the authority of the General Council as a British Standard on 27th July, 1936.

NOTE.

In order to keep abreast of progress in the Industries concerned, the British Standard Specifications are subjected to periodical review.

Suggestions for improvements, addressed to the British Standards Institution, 28, Victoria Street, London, S.W.1, will be welcomed at all times. They will be recorded, and in due course brought to the notice of the Committee charged with the revision of the Specifications to which they refer.

† The Electrical Industry Committee is the British National Committee of the International Electrotechnical Commission.

British Standards Institution.

BRITISH STANDARD
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(B.S.S. No. 81—1936.)

ADDENDUM.

Table 13. Limits of Error for Voltage Transformers.

For Class C. substitute "6c min." for "30 min." under "Phase Difference" in the third column.

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NOTE.—This Specification includes reference to the following British Standard Specifications:—

No. 37. Electricity Meters.

No. 89. Indicating Ammeters, Voltmeters, Wattmeters, Frequency and Power-factor Meters.

No. 128. Bare Annealed Copper Wire for Electrical Machinery and Apparatus.

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NOTE.—*The Institution desires to call attention to the fact that this Specification is intended to include the technical provisions necessary for the supply of the material herein referred to, but does not purport to include all the necessary provisions of a contract.*

BRITISH STANDARD SPECIFICATION

FOR

INSTRUMENT TRANSFORMERS.

(REVISED JULY, 1936.)

SCOPE.

1. This Specification applies primarily to Instrument Transformers for use in connection with electrical measuring instruments, such, for example, as are covered by British Standard Specifications Nos. 37, 89 and 90.

For the purpose of this Specification, instrument transformers are divided into classes according to the degree of accuracy prescribed. (*See* Clauses 16 and 23 and Appendix B.)

This Specification is also applicable to Instrument Transformers intended for the operation of protective devices and the like, such, for example, as are covered by British Standard Specification No. 142, but it does not then purport to deal with the requirements as to accuracy, or with any special characteristics which may be desirable in such transformers. Clauses 12, 16, 17, 23 and 24, in particular, in so far as they deal with rated burden and accuracy, are inapplicable to such transformers. (*See* also Appendix B (*b*)).

DEFINITIONS.

2. The following Definitions have been adopted for the purposes of this Specification :—

(*a*) *Instrument Transformer.*—A transformer for use with a measuring instrument or similar piece of apparatus.

(*b*) *Current Transformer.*—An instrument transformer for the transformation of current from one value to another, usually a lower one, or for the transformation of a current which is at a voltage above earth into a proportionate current at a lower voltage above earth.

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(*c*) *Voltage Transformer.*—An instrument transformer for the transformation of voltage from one value to another, usually a lower one.

(*d*) *Rated Primary Current of a Current Transformer.*—The value of the primary current marked on the rating-plate.

(*e*) *Rated Secondary Current of a Current Transformer.*—The value of the secondary current marked on the rating-plate.

(*f*) *Rated Primary Voltage of a Voltage Transformer.*—The value of the primary voltage marked on the rating-plate.

(*g*) *Rated Secondary Voltage of a Voltage Transformer.*—The value of the secondary voltage marked on the rating-plate.

(*h*) *Primary Winding of an Instrument Transformer.*—The winding through which flows the current to be measured or controlled, or to which is applied the voltage to be measured or controlled, as the case may be.

(*j*) *Secondary Winding of an Instrument Transformer.*—The winding the terminals of which are connected to the instrument.

(*k*) *Burden of an Instrument Transformer.*—The value of the load connected across the secondary terminals of an instrument transformer, expressed as the output in volt-amperes :—

(i) If of a current transformer, at the rated secondary current, or,

(ii) If of a voltage transformer, at the rated secondary voltage.

(*l*) *Rated Burden of an Instrument Transformer.*—The value of the burden marked on the rating-plate.

(*m*) *Phase Difference.*—(i) As applied to a current transformer. The difference of phase between the primary and reversed secondary currents. It is said to be positive when the reversed secondary current vector leads the primary current vector, and negative when the reversed secondary current vector lags behind the primary current vector.

(ii) As applied to a voltage transformer. The difference of phase between the primary and reversed secondary voltages. It is said to be positive when the reversed secondary voltage vector leads the primary voltage vector, and negative when the reversed secondary voltage vector lags behind the primary voltage vector.

(*n*) *Ratio Error.*—The error in the secondary current or voltage, due to incorrect ratio, is commonly known as the ratio error, and is expressed as a percentage as follows :—

(i) *Of a Current Transformer.*—The percentage ratio error is:—

$$\frac{K_n I_s - I_p}{I_p} \times 100$$

Where

K_n is the nominal ratio (*i.e.* rated primary current/rated secondary current),

I_s the actual secondary current, and

I_p the actual primary current.

(ii) *Of a Voltage Transformer.*—The percentage ratio error is :—

$$\frac{K_n V_s - V_p}{V_p} \times 100$$

Where

K_n is the nominal ratio (*i.e.* rated primary voltage/rated secondary voltage),

V_s the actual secondary terminal voltage, and

V_p the actual primary terminal voltage.

(*o*) *Over-current Factor.*—Of a current transformer. The ratio of the rated primary over-current (R.M.S.) to the rated primary current (R.M.S.). (*See* Clause 18.)

(*p*) *Reference Ambient Temperature.*—A conventional reference temperature for the available cooling air, stated fundamentally as a maximum peak limit and considered in conjunction with a maximum value of the average temperature over 24 hour periods.

SPECIFICATION

Standard Frequency.

3. The standard frequency shall be 50 cycles per second.

Standard Transformers for Non-standard Frequencies.

4. Instrument transformers for use on systems employing frequencies other than the standard shall be considered to be British Standard instrument transformers if they comply in all other respects with the requirements of this Specification at the frequency for which they are intended. The frequency for which they are intended and the rated burden at that frequency shall be marked on the transformer.

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High-voltage Tests for Instrument Transformers intended for Permanent Connection in Circuit.

5. Instrument transformers intended for permanent connection in circuit shall be subjected to the high-voltage tests set out in Clauses 7–9, as follows :—

(*a*) Unless otherwise agreed, the tests shall be carried out at the Manufacturer's Works.

(*b*) The tests shall be carried out on a new transformer, in its normal working condition, in its tank, with oil or compound (if any), and with the cover and all parts in place.

(*c*) The tests shall follow immediately after the temperature test, if made (*see* Clause 11), otherwise the tests shall be carried out with the transformer at normal test-room temperature.

(*d*) During the test a primary winding which purports to be fully insulated from earth at all points shall not be earthed, but a primary winding which normally has one end earthed shall have that end earthed.

System Conditions.

6. For the purpose of high-voltage tests, supply systems are grouped as follows :—

TABLE 1.

No.	System Conditions.	System Symbol.
	Three-phase.	
1	Neutral point earthed directly or through a resistor	L
2	Normally insulated, or neutral point earthed through a reactor. (*See* Note below)	L
3	One line terminal permanently earthed	H
	Two-phase.	
4	Three-wire system, common terminal directly earthed	H
	Single-phase.	
5	Normally insulated or mid-point directly earthed. (*See* Note below.)	L
6	One line terminal directly earthed	H

NOTE.—Unless a statement to the contrary is made it shall be understood that system conditions L apply.

If in exceptional circumstances one line of an insulated system is liable to be earthed for extended periods, this should be given special consideration.

Applied High-voltage Tests on Primary Windings.

7. All current transformers, and voltage transformers in which the primary winding is fully insulated, shall be subjected to a high-voltage test, applied from a separate source, as set out in sub-clauses (*a*) to (*f*) hereof.

(*a*) *Magnitude of Test Voltage.*—A test voltage of appropriate magnitude, as indicated in Col. 3 of Table 2, shall be applied between the primary winding and the secondary winding—the secondary winding, core (if accessible), frame and case (if any) being connected together and to earth.

TABLE 2.

Col. 1	Col. 2	Col. 3
Rated System Voltage between Lines.	System Symbol (see Clause 6).	Test Voltage (see Note).
Not exceeding 440 volts	L or H	2000
Exceeding 440 volts and up to and including 660 volts	L	1000 + 2·25 V
	H	1000 + 3·90 V
Exceeding 660 volts and up to and including 220 000 volts	L	2000 + 2·25 V
	H	2000 + 3·90 V

NOTE.—"V" in Col. 3 is the rated system voltage between lines.

In instrument transformers having their primaries and/or secondaries divided into two or more separate sections, each section shall be capable of withstanding an alternating voltage of 2000 volts applied between it and all other sections and windings connected together and to the frame.

(*b*) *Supplementary High-voltage Test.*—When for any reason it is desired to make (either at Works or on Site) an additional applied high-voltage test, after erection in switchgear or control gear, on a transformer which has already passed its Works Test in accordance with sub-clause (*a*) hereof, this additional high-voltage test shall be made in accordance with the requirements of sub-clause (*a*), except that the test voltage shall correspond with that applicable to the switchgear (as set forth in the appropriate British Standard Specification), but shall in no case exceed 90 per cent of the magnitude given in Col. 3 of Table 2. Care shall be taken to ensure that the transformer is in a suitable state to be tested and is in the condition in which it will be used.

* See also Appendix F.

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