

## व्यापक परिचाला में संशोधन मसौदा

प्रलेख प्रेषण संज्ञापन

संदर्भ

दिनांक

ईटी १६ /टी-१, /टी-२५

०३-०६-२०१०

तकनीकी समिति: ईटी १६

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प्रेषती:

- १। ईटी १६ के सभी सदस्य,
- २। विद्युत तकनीकी विभाग परिषद के सभी सदस्य, तथा
- ३। रूचि रखने वाले अन्य सभी निकाय

महोदय,

कृप्या निम्नलिखित मसौदे संलग्न हैं

### प्रलेख संख्या

### शीर्षक

प्रलेख : ईटी १६ (६११७)

बाह्य-रंग तीन फेजी वितरण ट्रांसफार्मर 100  
kVA 11 kV तक एवं सहित भाग 1 सीलड सहित

प्रलेख : ईटी १६ (६११८)

बाह्य-रंग तीन फेजी वितरण : ट्रांसफार्मर 100  
kVA 11 kV तक एवं सहित भाग 2 सीलड टाइप

कृप्या इन मसौदों का अवलोकन करें और अपनी सम्मतियाँ यह बताते हुए भेजें कि अंततः यदि ये भारतीय मानक के रूप में प्रकाशित हो जाएँ तो इन पर अमल करने में आपके व्यवसाय अथवा कारोबार में क्या कठिनाइयाँ आ सकती हैं।

सम्मतियाँ भेजो की अंतिम तारीख ३१ ०७ २०१०।

सम्मतियाँ यदि कोई हों तो कृप्या अगले पृष्ठ पर दिए पत्र में अधोहस्ताक्षरी को उपरिलिखित पते पर भेज दें।

धयवाद,

भवदीय,

(आर के त्रेहन)

वैज्ञानिक 'एफ' एवं प्रमुख (विद्युततकनीकी)

संलग्न: उपरिलिखित

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**DOCUMENT DESPATCH ADVICE**

**Our Ref**

**Date**

**ET 16/T-1, T-25**

**03-06-2010**

**TECHNICAL COMMITTEE : ET 16**

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**ADDRESSED TO:**

1. All Members of Transformers Sectional Committee, ET 16;
2. All Members of Electrotechnical Division Council; and
3. All Interested.

Dear Sir(s),

Please find enclosed a copy of the following draft:

<b>Doc: No.</b>	<b>Title</b>
ET 16 (6117)	Outdoor type three-phasae distribution transformers upto and including 100 KVA 11 KV: Part 1 Non-sealed type (Fourth revision)
ET 16 (6118)	Outdoor type three-phasae distribution transformers upto and including 100 KVA 11 KV: Part 2 : Sealed type (Second revision)

Kindly examine this draft and forward your views stating any difficulties which you are likely to experience in your business or profession, if this is finally adopted as **STANDARD**.

Comments, if any, may please be made in the format given overleaf and mailed to the undersigned.

Last date for comments: **31-07-2010**.

Thanking you,

Yours faithfully

(R.K. Trehan)  
Sc 'F' & Head (Electrotechnical)

Encl: As above



Transformers Sectional Committee, ET 16

## **0. FOREWORD**

- 0.1 This Indian Standard IS 1180(Part 2): 2007 (Second Revision) was adopted by the Bureau of Indian Standards on the recommendations of Transformer Sectional Committee, ET16 and approval of the Electrotechnical Division Council.(To be added later)
- 0.2 Indian Standard IS 1180 (Part 2) was first published in 1979 and subsequently revised in 1989 (First Revision).  
This Second Revision has been brought out to take into account of the experience gained since the last revision of the standard particularly in terms of maximum losses which have now been aligned with the minimum energy performance standards for distribution transformers recommended by Bureau of Energy Efficiency (BEE) also taking cognizance of the fact that energy conservation standards for distribution transformers have the vast potential of savings in view of their usage in bulk.
- 0.3 Although IS 2026 “Power Transformers” includes the range of transformers covered by this standard, yet, it has been decided to retain the latter, considering the advantages of having a standard which has simplified the requirements in the distribution transformer range covered by it.  
  
However, for various common requirements, normative references have been made to IS 2026 “Power Transformers” which is, therefore, a necessary adjunct to this standard.
- 0.4 Besides improvement in loss levels and temperature rises, this standard, also enhances scope of existing standard from 100 kVA, 11 kV to 200 kVA, 33 kV. Also, corrugated tank construction in line with international practice is also included as an alternative.
- 0.5 The requirements of non-sealed type outdoor distribution transformers of similar voltage and kVA ratings are covered in Part-1 of this standard which is also revised on similar lines.
- 0.6 In the preparation of this standard, assistance has been derived from REC Specification 11/1976 (R-1993) issued by the Rural Electrification Corporation Ltd., APDRP Technical Specification for such transformers and CBIP Manual on Transformers, Publication 295.
- 0.7 This standard is intended to cover the generic technical specifications and it does not include all the necessary provisions of a contract. However, the standard calls for agreement between purchaser and manufacturer under 9.6, 11.2, and 18.1.
- 0.8 For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS 2:1960 ‘Rules for rounding off numerical values (revised)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

For BIS Use Only

**BUREAU OF INDIAN STANDARDS**

**Draft Indian Standard**  
**OUTDOOR TYPE THREE-PHASE**  
**DISTRIBUTION TRANSFORMERS**  
**UPTO AND INCLUDING 200 kVA, 33 kV**

**PART 2: SEALED TYPE**  
**[Second Revision of IS 1180(Part 2)]**

**1. SCOPE**

1.1 This standard (Part 2) specifies the requirements and tests for oil-immersed, naturally air-cooled, three phase, double-wound sealed type outdoor distribution transformers of ratings up to and including 200 kVA, for use on systems with nominal system voltages up to and including 33kV.

**2. NORMATIVE REFERENCES**

2.1 The Indian Standards listed in Annex A are necessary adjuncts to this standard.

**3. TERMINOLOGY**

3.1 *Sealed Type Transformers*

A transformer which is non-breathing, that is, so sealed that normally there can be no interchange between its contents and the external atmosphere. No conservator is provided. The transformer could be bolted or welded cover type.

3.2 For the purpose of this standard, other definitions given in IS 1885 : Part 38 shall apply.

**4. SERVICE CONDITIONS**

4.1 The provisions of 1.2 of IS 2026 : Part 1 shall apply.

**5. RATINGS**

**5.1 kVA Ratings :**

The standard ratings shall be as per table given below :

Nominal System Voltage	Standard Ratings
Up to 11 kV	16, 25, 63, 100, 160 and 200 kVA
22 kV	63, 100, 160 and 200 kVA
33 kV	100, 160 and 200 kVA

## **Table 1 : Standard Ratings**

### **5.2 Rated Frequency**

The rated frequency shall be 50 Hz.

### **5.3 Nominal System Voltage :**

Nominal system voltage shall be chosen from the following :

HV : 3.3, 6.6, 11, 22 & 33 kV

LV : 433 V

### **5.4 Rated Basic Insulation Level (BIL):**

Refer Table 2 below :

**Table 2 : Rated BIL**

<b>Nominal System Voltage (kV)</b>	<b>Rated BIL (kVp)</b>
33	170
22	125
11	75
6.6	60
3.3	40

## **6. NO-LOAD VOLTAGE RATIOS**

6.1 The no-load voltage ratios shall be as follows:

3 300/433-250, 6 600/433-250, 11 000/433-250, 22 000/433-250 and 33 000/433-250 V.

Note : LV may be rated for 415-240V for 25 kVA and below :

## **7. WINDING CONNECTIONS AND PHASE DISPLACEMENT**

7.1 The primary winding shall be connected delta and the secondary winding star [vector symbol, Dyn 11 (see IS 2026 :Part 1)], so as to produce, a positive phase displacement of 30° from the primary to the secondary vectors of the same phase. The neutral of the secondary winding shall be brought out to a separate insulated terminal.

## **8. TAPPING RANGES AND TAPPING METHODS**

8.1 No taps are normally required to be provided, unless specifically desired by the purchaser.

8.2 The standard tapping ranges, when taps are provided, shall be as follows:

**Above 25 kVA Rating**

Winding tapped	Primary
Number of tappings	5
Tappings at	±2 ½ and ±5 percent

8.2.1 Tap-changing shall be carried out with the transformer de-energised, by means of links or by means of an externally-operated switch with mechanical locking device and a position indicator. Arrangement for pad-locking shall be provided:

**9. TRANSFORMER TANK**

*9.1 Construction*

9.1.1 Transformer tank can be of plain tank configuration with/without radiator fins or round/elliptical cooling tubes. The tank can also be made of corrugated panels also used for cooling.

9.1.2 The transformer tank shall be of adequate strength to withstand positive and negative pressures built up inside the tank while the transformer is in operation. The transformer tank covers shall be bolted /welded with tank rim so as to make a leak-proof joint.

9.1.3 The transformer cover and frame shall be such that it is possible to remove the weld and re-weld twice, in case of welded construction.

*9.2 Tank Sealing*

9.2.1 The space above the oil-level in the tank shall be filled with dry air or nitrogen conforming to commercial grade of IS 1747.

9.2.2 Dry air/nitrogen plus oil volume inside the tank shall be such that even under the extreme operating conditions the pressure generated inside the tank does not exceed 40 kPa positive or negative.

9.2.3 The oil level before sealing the transformer shall be made upto the required level while the transformer filled with oil is maintained at a temperature of 45°C. Alternatively the tank may be sealed at any other temperature and free-oil level adjusted to meet the requirement of 9.2.2.

9.3 All welding operations shall be carried out by qualified welders.

9.4 All hardwares exposed to atmosphere shall be hot dip galvanized/or of stainless steel.

9.5 Gaskets wherever used shall conform to Type III as per IS 11149 / Type 'C' as per IS 4253 : Part 2.

9.6 Inside of tank shall be painted with varnish or oil resistant paint. External paint work shall be subject to agreement between the user and the transformer manufacturer.

## 10. TRANSFORMERS OIL

10.1 The transformer oil shall comply with the requirements of IS 335 .

## 11. FITTINGS

### 11.1 Standard Fittings

The following fittings shall be provided on each transformer :

- a) Two earthing terminals with the symbol  $\perp$  ;
- b) Lifting lugs for the complete transformer as well as for core and winding,
- c) Rating and terminal marking plate,
- d) Nitrogen / air filling device/pipe with welded cover capable of reuse,
- e) An extended pipe connection on upper end with welded cover. The pipe should be suitably threaded over a sufficient length to enable use of a refilling/siphon connection after removing the welded cover or any other similar arrangement capable of reuse,

### 11.2 Optional Fittings

The following shall be available as extra fittings at the option of the purchaser if specified when inviting tenders :

- a) Oil level gauge,
- b) A bottom connection as in 11.1(e),
- c) Pressure relief device
- d) Arcing horns or suitable rating lightning arrestors for HT side – 3 Nos.
- e) Bird Guard
- f) Terminal connectors

## 12. TERMINAL ARRANGEMENT & CLEARANCES

12.1 The transformers shall be fitted on high voltage and low voltage sides with outdoor type bushings of appropriate voltage and current ratings. The high voltage bushings (3 Nos.) shall conform to IS 2099. The low voltage bushings (4 Nos.) shall conform to IS 7421. Alternatively, the low voltage side may be made suitable for adoption of PVC XLPE cable of suitable size.

12.2 The terminal arrangements shall be such that it shall be possible to replace the bushings (external) without opening the cover and also without affecting the sealing of the transformer. The arrangement shall meet the following requirements :

#### a) HV Bushing :

The bushing shall be made in two parts. The outer bushing shall be of porcelain. The dimensions of the outer bushing shall conform to relevant part /Section No. of IS 3347 depending on the Voltage Class. The internal bushing shall be of either porcelain or tough insulating

material, like epoxy and shall have embedded stem. Metal portion of the internal HV bushing inside the tank shall remain dipped in oil in all operating conditions.

b) *LV Bushing :*

Where provided, these shall be of porcelain.

c) *Connectors :*

Wherever specified, suitable bimetal connectors (clamp type) shall be provided on both HV and LV side for making sound terminations.

d) The design of internal bushings shall be such as to provide adequate creepage distance in accordance with 7.1 of IS 2099.

e) The terminal arrangement shall not require a separate oil chamber not connected to oil in the main tank.

f) Gaskets shall be made of synthetic rubber or synthetic rubberized cork resistant to hot transformer oil.

Notes : 1) Cork/natural rubber gaskets shall not be used.

2) Specific requirements and tests on synthetic rubber for the above purpose are under consideration.

12.3 The minimum phase-to-phase and phase-to-earth external clearances for LV & HV bushings shall be as per Table-3 below :

Nominal System Voltage	Phase to Phase external clearance in mm	Phase to earth external clearance in mm
Upto 1.1kV	75	40
11 kV	280	140
22 kV	330	230
33 kV	350	320

**Table 3 : External (Air) Clearances**

Note : Higher clearances have been recommended to avoid birdage.

12.4 **Marking and Relative Positions of Terminals**

Appropriate characters in accordance with IS 2026 :Part 1 shall be indelibly marked upon or adjacent to terminals.

### 13 MOUNTING ARRANGEMENT

- 13.1 The under-base of all transformers shall be provided with two 75 x 40 mm channels 460 mm long as shown in Fig. 1 to make them suitable for fixing to a platform or plinth.

Reproduce Fig.1 of IS 1180:Part-1:1989

- 13.2 Pole mounting arrangement may alternatively provided for which type C adapter plates are for direct pole mounting of transformers having type C support lugs, subject to the stress limitations of the supporting structure. These adapter plates are not suitable for use with transformers weighing in excess of 2000 pounds as follows :

Reproduce from Fig. of ANSI

14. **LIMITS OF TEMPERATURE-RISE**

- 14.1 The permissible temperature-rise shall not exceed the limits of 40°C (when measured by resistance method) for transformer winding and 35°C (measured by thermometer) in top oil when tested in accordance with IS 2026 :Part 2.

## 15. LOSSES AND IMPEDANCE VALUES

### 15.1 Losses

Under any situation, for transformers of HV voltage upto 11 kV , the total losses (no-load + load losses at 75°C) at rated full load condition and total losses at 50% of load condition shall not exceed the values given below:

<i>Rating</i>	<i>Max. total losses at 50% of kVA rating</i>	<i>Max. total losses at 100% of kVA rating</i>
<b>kVA</b>	<b>W</b>	<b>W</b>
16	150	480
25	210	695
63	380	1250
100	520	1800
160	770	2200
200	890	2700

15.1.1 For transformers having voltage class above 11kV & up to 22 kV the permissible total loss values shall be 7.5% higher than the values mentioned in the above table for transformers up to 11 kV class.

15.1.2 For transformers having voltage class above 22 kV & up to 33 kV the permissible total loss values shall be 10 % higher than the values mentioned in the above table for transformers up to 11 kV class.

### 15.2 Impedance

The recommended impedance at 75°C is 4.5 percent.

## 16. TOLERANCES

16.1 The tolerance on electrical performance (excluding losses) shall be as given in IS 2026 :Part I .

## 17. ABILITY OF TRANSFORMERS TO WITHSTAND EXTERNAL SHORT-CIRCUIT

17.1 The performance of transformer under external short-circuit conditions shall be in accordance with IS 2026 :Part 5 .

## 18. EFFICIENCY AND REGULATION

18.1 When statements of efficiency and regulations are required they shall be based on specified loading at the rated kVA and unity power factor (and other power factors, if agreed between the purchaser and the manufacturer) and computed in accordance with Annex B and C respectively.

## 19. MARKING

### 19.1 Rating Plate

Each transformer shall be provided with non-detachable rating plate of weather proof material, fitted, in a visible position, showing the information

given in Fig. 2. The entries on the rating plate shall be indelibly marked (for example, by etching, engraving or stamping).

Reproduce Fig.2 of IS 1180:Part-1:1989

## 19.2 **Terminal Marking Plate**

Each transformer shall be provided with a terminal marking plate in accordance with Fig. 3 or 4 whichever is applicable.

Reproduce Fig.3 & 4 of IS 1180:Part-1:1989

19.3 The rating and terminal marking plates may be combined into one plate at the option of the manufacturers.

20 **INFORMATION REQUIRED WITH ENQUIRY AND ORDER**

The information to be supplied to the manufacturer with enquiry and order by the purchaser shall be in accordance with Annex A of IS 2026 :Part I 2007.

21 **TESTS**

21.1 **General**

The requirements given in 10.1 of IS 2026:Part I shall apply.

21.2 All the tests listed under 22.3, 22.4, 22.5 and 22.6 shall be carried out in accordance with the provisions of the clauses and standards given in the parentheses.

### 21.3 Routine Tests

The following shall constitute the routine tests:

- a) Measurement of winding resistance (IS 2026 :Part I)
- b) Measurement of voltage ratio and check of phase displacement (IS 2026: Part I )
- c) Measurement of short-circuit impedance (principal tapping, when applicable) and load loss at 50% and 100% load (IS 2026 :Part I )
- d) Measurement of no-load loss and current (IS 2026:Part I )
- e) Measurement of insulation resistance (IS 2026:Part I )
- f) Induced over-voltage withstand test (IS 2026 :Part 3 )
- g) Separate-source voltage withstand test (IS 2026 :Part 3)
- h) Air pressure test (see 22.6.1 in case of welded cover plain tank and 22.6.2 in case of corrugated tank)
- i) Oil leakage test for corrugated tanks (see 22.7)

### 21.4 Type Tests

The following shall constitute the type tests:

- a) Lightning impulse test (IS 2026:Part 3)
- b) Temperature-rise test (IS 2026:Part 2)
- c) Short-circuit test (IS 2026 :Part 5)
- d) Air pressure test (*see 22.6*)
- e) No load current at 112.5% voltage ( see 23.2)

### 21.5 Special Tests

The following shall constitute the special tests :

- a) Determination of sound levels (IS 2026:Part 10-1)

### 21.6 Air Pressure Test (Type Test) for Plain Tanks

The tank shall be fixed with a dummy cover with all fittings including bushings in position and shall be subjected to following pressure created inside the tank :

- a) 80 kPa above atmospheric pressure for 30 minutes, and
- b) A vacuum corresponding to -70 kPa for 30 minutes.

The permanent deflection of flat plate, after pressure has been released, shall not exceed the values given below:

<i>Length of Plate</i>	<i>Deflection</i>
Up to 750 mm	5 mm
751 to 1250 mm	6.5 mm

21.6.1 *Air pressure test (routine) in case of welded cover (for plain tanks)*

The transformer with welded cover and with all fittings including bushings in position shall be tested at a pressure of 80 kPa above atmosphere pressure maintained inside the tank for 10 minutes.

There should be no leakage at any point.

Note : As the above test is required to be carried out before final sealing of the transformer, to witness this test, the inspecting authority would ensure to be present at the time of final sealing. The test cannot be demonstrated on a completed transformer.

21.6.2 *Air pressure (routine) for corrugated tanks*

The corrugated transformer tank shall be tested for air pressure of 15 kPa above atmosphere pressure maintained inside the tank. There should be no leakage at any point.

21.6 **Acceptance Tests**

The following acceptance test shall be performed to prove that the transformer meets conditions laid down in the customer specification/contract in addition to routine test as per 22.3.

- a) Paint adhesion test
- b) BDV and Moisture content of oil in the transformer (IS 335)

21.7 **Oil leakage test (Routine for corrugated tanks)**

Tank with corrugations shall be tested for oil leakage test a pressure of 15 kPa measured at the top of the tank. There should be no leakage at any point.

22 **PERMISSIBLE FLUX DENSITY AND NO LOAD CURRENT**

22.1 The maximum flux density in any part of the core and yoke at rated voltage and frequency shall be such that the flux density with simultaneous + 12.5 % combined voltage and frequency variation from rated voltage and frequency shall not exceed 1.9 Tesla.

22.2 No load current shall not exceed 3% of full load current and will be measured by energizing the transformer at 433 volts, 50 Hz on the secondary. Increase of voltage of 433 volts by 12.5% shall not increase the no load current by Max. 6% of full load current.

**ANNEX A**  
(Clause 2.1)

**LIST OF REFERRED INDIAN STANDARDS**

<b>IS No.</b>	<b>Title</b>
IS 1885 :Part 38 : 1993	Electrotechnical vocabulary: Part 38: Power Transformers (second revision)
IS 2026 :	Power transformers
Part 1 : 2007	General (Third Revision)
Part 2 : 2007	Temperature rise (Third Revision)
Part 3 :2007	Insulation level and dielectric tests and external clearances in air (Fourth Revision)
Part 5 : 2007	Ability to withstand short circuit
Part 8 : 2007	Application Guide
Part 10-1:	Determination of sound levels
IS : 2099 : 1986	Specification for bushings for alternative voltages above 1 000 volts (second revision)
IS :3347	Dimensions for porcelain transformer bushings for use in normal and polluted atmosphere
(Part 1/Sec 1&2) : 1979	Part 1: Up to and including 1 kV bushings, Section 1 Porcelain parts, and Section 2 Metal parts
(Part 2/Sec 1 &2) : 1979	Part 2 : 3.6 kV bushings, Section I Porcelain parts, and Section 2 Metal parts
(Part 3/Sec 1 &2) : 1982	Part 3: 12 & 17.5 kV bushings, Section 1 Porcelain parts and Section 2 Metal parts
(Part 4/Sec 1 &2) : 1082	Part 4 : 24 kV Bushings, Section1 Porcelain parts and Section 2 Metal parts
(Part 5/Sec 1&2) :1979	Part 5 : 36 kV Bushings, Section 1 Porcelain parts and Section 2 Metal parts
IS 7421 : 1974	Specification for porcelain bushings for alternating voltages up to and including 1000V
IS 335 :1983	Specification for new insulating oils for transformers and switchgear (third revision)
IS 8999 : 1979	Gauging practice for pipe threads where pressure tight joints are required on the threads
IS 554 : 1975	Dimensions for pipe threads where pressure tight joints are required on the threads (second revision)
IS 3639-1966	Specification for fittings and accessories for Power Transformers (under revision)

**ANNEX B**  
*(Clause 18.1)*

**METHOD OF DECLARING EFFICIENCY**

**B-1 EFFICIENCY**

B-1.1 The efficiency to be declared is the ratio of the output in kW to the sum of the output in KW and the following losses :

- a) No-load loss, which is considered to be constant at all loads : and
- b) Load loss, which varies with load.

The total loss, on load is the sum of (a) and (b).

**ANNEX C**  
(Clause 18.1)

**CALCULATION OF INHERENT VOLTAGE REGULATION**

**C-1 INHERENT VOLTAGE REGULATION**

C-1.1 The inherent voltage regulation from no-load to a load of any assumed value and power factor may be computed from the impedance voltage and corresponding load loss measured with rated current in the winding (see also IS 10561 : 1983)

Let

$I$  = rated current in winding excited;  
 $E$  = rated voltage of winding excited;  
 $I_{SC}$  = current measured in winding excited  
 $E_{ZSC}$  = voltage measured across winding excited (impedance voltage);  
 $P_{SC}$  = watts measured across winding excited

$$E_{XSC} = \text{reactance voltage} = \sqrt{E^2_{ZSC} - \left(\frac{P_{SC}}{I_{SC}}\right)^2}$$

$P$  =  $P_{SC}$  corrected to 75°C, and from current  $I_{SC}$  to  $I$ ;

$$E_x = E_{XSC} \times \frac{I}{I_{SC}}$$

$$E_r = \frac{P}{I}$$

C-1.2 For rated load at unity power factor, the percentage regulation is approximately equal to

$$E_r\% + \frac{(E_x\%)^2}{200}$$

$$E_x\% = 100 E_x/E;$$

$$E_r\% = 100 E_r/E$$

$$n = I_a/I; \text{ and}$$

$I_a$  = current in the winding excited during the short circuit tests corresponding to that obtained when loading at the assumed load on the output side and with rated voltage on the input side.

C-1.3 For rated load any power factor  $\cos \phi$ , the percentage regulation is approximately equal to:

$$E_r\% \cos \phi + E_x \% \sin \phi + \frac{(E_x\% \cos \phi - E_r\% \sin \phi)^2}{200}$$

C-1.4 For any assumed load other than rated load and unity power factor, the percentage regulation is approximately equal to;

$$n.E_r\% + \frac{(n.E_x\%)^2}{200}$$

C-1.5 For any assumed load other than rated load and at any power factor  $\cos \phi$ , the percentage regulation is approximately equal to:

$$n.E_r\% \cos \phi + n.E_x\% \sin \phi + \frac{(n.E_x\% \cos \phi - n.E_r\% \sin \phi)^2}{200}$$

C-1.6 The above formulae are sufficiently accurate for transformers covered by this specification.

## Bureau of Indian Standards

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### Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue.

The Indian Standard has been developed from Doc: NO. ETD 16 (3030)

### Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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Southern : C.I.T Campus, IV Cross Road, Chennai – 600113	2350216, 235 0442, 235 1519, 2352315
Western : Manakalaya, E9 MIDC, Marol, Andheri (East). Mumbai – 400 093	832 9295, 832 7858, 832 7891, 832 7892
Branches : Ahmedabad, Bangalore, Bhopal, Bhubaneswar, Coimbatore, Faridabad, Gaziabad, Guwahati, Hyderabad, Jaipur, Kanpur, Lucknow, Nagpur, Patna, Pune, Thiruvanthapuram.	

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