

SINGAPORE STANDARD

SS 404 : Part 8 : 2000

IEC 60076-8 : 1997

(ICS 29.180)

SPECIFICATION FOR

Power transformers

Part 8 : Application guide

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National Foreword

This Singapore Standard was prepared by the Technical Committee on Power Transformers under the direction of the Electrical and Electronic Product Standards Committee.

This standard is identical to and has been reproduced from the first edition of International Standard IEC 60076-8 : 1997-10 which is published by the International Electrotechnical Commission.

The editorial changes made to IEC 60076-8 are as follows:

- | | |
|-----------------|---|
| Figure 5 | Replace 'i ₁ ' with 'I ₁ ' and 'I ₂ - I ₁ ' with 'I ₁ - I ₂ ' |
| 4.1.1 | Paragraph 6
Replace 'superposed' with 'superimposed' |
| Figure 8 | Replace 'Z _c ' with 'Z _m ' |
| 5.2 | Paragraph 5
The letter 's' in the notation Z _{SI} [*] should be lower case |
| Figure 17a | Replace 'I _{allA} ' with 'I _{sIIA} ' |
| Figure 17b, 18b | Replace 'Z _{III} ' with 'Z _{I,II} ' and 'Z _{III} ' with 'Z _{I,II} ' |
| Figure 19a | Amend the sequence of labelling from 'I _{IC} , I _{IB} , I _{IA} ' to 'I _{IA} , I _{IB} , I _{IC} ' |
| Figure 23 | Replace the series impedance Z _r with Z _T and the load impedance Z _r with Z _L
Amend the expression for load impedance to Z _L = Z _L , φ |
| 7.3 | 5 th line from the bottom of the page
Replace 'et' with 'and' |
| 7.5 | Replace equation (69) with
$\left(\frac{Z_L + Z_T}{Z_L} \right) = \left(1 + \left \frac{S}{S_r} \right \left(\frac{X_T}{100} \sin \phi + \frac{r_T}{100} \cos \phi \right) + j \left \frac{S}{S_r} \right \left(\frac{X_T}{100} \cos \phi - \frac{r_T}{100} \sin \phi \right) \right)$ |
| 7.9 | Last paragraph
Replace '622.5' with '652.5' |
| Figure 30b | In the Note
Replace 'U ₄ /U _{2 min} ' with 'U ₄ /U _{20 min} ' |

Attention is also drawn to the following:

Where the phrase 'this standard' appears, it should be read as 'Singapore Standard SS 404 : Part 8'.

The comma has been used throughout as a decimal marker in IEC 60076-8, whereas in Singapore Standards it is a practice to use a full-point on the baseline as the decimal marker.

The IEC standards referred to shall be replaced by Singapore Standards as follows:

International Standard	Corresponding Singapore Standard
IEC 60076-1	SS 404 : Power transformers Part 1 : General
IEC 60076-3	Part 3 : Insulation levels and dielectric tests

NOTE

1. *Singapore Standards are subject to periodic review to keep abreast of technological changes and new technical developments. The revisions of Singapore Standards are announced through the issue of either amendment slips or revised editions.*
2. *Compliance with a Singapore Standard does not exempt users from legal obligations.*

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**POWER TRANSFORMERS –
APPLICATION GUIDE**

FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of the IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested National Committees.
- 3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical reports or guides and they are accepted by the National Committees in that sense.
- 4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
- 5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
- 6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60076-8 has been prepared by IEC technical committee 14: Power transformers.

This first edition of IEC 60076-8 cancels and replaces IEC 60606 published in 1978. This edition constitutes a technical revision.

The text of this standard is based on the following documents:

FDIS	Report on voting
14/260/FDIS	14/297/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

IEC 60076 consists of the following parts, under the general title: Power transformers.

- Part 1: 1993, General
- Part 2: 1993, Temperature rise
- Part 3: 1980, Insulation levels and dielectric tests
- Part 5: 1976, Ability to withstand short circuit
- Part 8: 1997, Application guide

Annex A is for information only.

POWER TRANSFORMERS – APPLICATION GUIDE

1 General

1.1 *Scope and object*

This Standard applies to power transformers complying with the series of publications IEC 60076.

It is intended to provide information to users about:

- certain fundamental service characteristics of different transformer connections and magnetic circuit designs, with particular reference to zero-sequence phenomena;
- system fault currents in transformers with YNynd and similar connections;
- parallel operation of transformers, calculation of voltage drop or rise under load, and calculation of load loss for three-winding load combinations;
- selection of rated quantities and tapping quantities at the time of purchase, based on prospective loading cases;
- application of transformers of conventional design to convertor loading;
- measuring technique and accuracy in loss measurement.

Part of the information is of a general nature and applicable to all sizes of power transformers. Several chapters, however, deal with aspects and problems which are of the interest only for the specification and utilization of large high-voltage units.

The recommendations are not mandatory and do not in themselves constitute specification requirements.

Information concerning loadability of power transformers is given in IEC 60354, for oil-immersed transformers, and IEC 60905, for dry-type transformers.

Guidance for impulse testing of power transformers is given in IEC 60722.

1.2 *Normative references*

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent edition of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60050(421):1990, *International Electrotechnical Vocabulary (IEV) – Chapter 421: Power transformers and reactors*

IEC 60076: *Power transformers*

IEC 60076-1:1993, *Power transformers – Part 1: General*