

Power transformers —

Part 13: Self-protected liquid-filled transformers

The European Standard EN 60076-13:2006 has the status of a British Standard

ICS 29.180

National foreword

This British Standard was published by BSI. It is the UK implementation of EN 60076-13:2006. It is identical with IEC 60076-13:2006.

The UK participation in its preparation was entrusted to Technical Committee PEL/14, Power transformers.

A list of organizations represented on PEL/14 can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 November 2006

© BSI 2006

ISBN 0 580 49651 1

Amendments issued since publication

Amd. No.	Date	Comments

Power transformers
Part 13: Self-protected liquid-filled transformers
(IEC 60076-13:2006)

Transformateurs de puissance
Partie 13: Transformateurs auto-protégés
immergés dans un liquide diélectrique
(CEI 60076-13:2006)

Leistungstransformatoren
Teil 13: Selbstgeschützte
flüssigkeitsgefüllte Transformatoren
(IEC 60076-13:2006)

This European Standard was approved by CENELEC on 2006-09-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

The text of document 14/530/FDIS, future edition 1 of IEC 60076-13, prepared by IEC TC 14, Power transformers, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60076-13 on 2006-09-01.

The following dates were fixed:

- latest date by which the EN has to be implemented
at national level by publication of an identical
national standard or by endorsement (dop) 2007-06-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2009-09-01

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60076-13:2006 was approved by CENELEC as a European Standard without any modification.

CONTENTS

1	Scope	4
2	Normative references	4
3	Terms and definitions	5
4	Service conditions	5
5	Electrical characteristics	5
5.1	Rated power	5
5.2	Highest voltage for equipment	5
5.3	Windings	6
5.4	Tappings	6
5.5	Connection group	6
5.6	Dimensioning of the low-voltage winding neutral connection	6
5.7	Short-circuit impedance	6
5.8	Insulation levels and dielectric tests	6
5.9	Temperature rise limits at rated power	7
5.10	Overload capability	7
6	Self-protection and disconnection device (SPDD)	7
6.1	Functional requirements	7
6.2	Coordination principle	7
6.3	Mechanical requirements	8
7	Constructional requirements	8
7.1	Liquid preservation system	8
7.2	Bushings	8
7.3	Dielectric liquid and component materials	8
7.4	Disconnection function	8
8	Information to be supplied by the customer	8
9	Information to be supplied by the manufacturer	9
10	Rating plate	9
11	Tests	9
11.1	List and classification of tests (routine, type and special tests)	9
11.2	Routine tests	9
11.3	Type tests	9
11.4	Short-circuit test with the self-protection and disconnection device disconnected or bypassed	10
12	Test procedure	11
12.1	Measurement of partial discharges	11
12.2	Transformer pressure test	11
12.3	Switching cycle tests	12
12.4	Behaviour test of self-protection and disconnection device	12
Annex ZA (normative) Normative references to international publications with their corresponding European publications		18
Figure 1 – Partial discharge measurement cycle		11
Table 1 – Order for tests carried out on prototypes A, B, C, D, E		10

POWER TRANSFORMERS –

Part 13: Self-protected liquid-filled transformers

1 Scope

This part of IEC 60076 applies to high-voltage/low-voltage self-protected liquid-filled and naturally cooled transformers for rated power 50 kVA to 1 000 kVA for indoor or outdoor use having a

- primary winding (high-voltage) with highest voltage for equipment up to 24 kV;
- secondary winding (low-voltage) with highest voltage for equipment of 1,1 kV.

These transformers are equipped with a self-protection and disconnection device to protect the environment, property and people and prevent any disturbance of the high-voltage network from the consequences of an internal transformer fault.

Transformers covered by this standard comply with the relevant requirements prescribed in the IEC 60076 series.

The self-protected transformer may be used in conjunction with other devices to provide system coordination and sensitive system protection. The protection system is not designed to be functional when the power supply is from the low-voltage side. The self-protected transformer is not intended to function in parallel with another transformer.

NOTE This standard may be applied to transformers with a higher voltage than 24 kV or other rated power by agreement between the manufacturer and the purchaser. Validation tests should be carried out at the appropriate level.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60076-1:1993, *Power transformers – Part 1: General*
Amendment 1 (1999)¹

IEC 60076-2, *Power transformers – Part 2: Temperature rise*

IEC 60076-3:2000, *Power transformers – Part 3: Insulation levels, dielectric tests and external clearances in air*

IEC 60076-5:2000, *Power transformers – Part 5: Ability to withstand short circuit*

¹ There exists a consolidated edition 2.1 (2000) that includes edition 2 and its amendment.

IEC 60076-7, *Power transformers – Part 7: Loading guide for oil-immersed power transformers*

IEC 60137, *Insulated bushings for alternating voltages above 1 000 V*

IEC 60270, *High-voltage test techniques – Partial discharge measurements*

IEC 60282-1, *High-voltage fuses – Part 1: Current-limiting fuses*

IEC 60296, *Fluids for electrotechnical applications – Unused mineral insulating oils for transformers and switchgear*

IEC 60836, *Specifications for unused silicone insulating liquids for electrotechnical purposes*

IEC 61099, *Specifications for unused synthetic organic esters for electrical purposes*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1

self-protection function

function integrated into the transformer to prevent external consequences (tank rupture, explosion, substance spattering, arcing and disturbances to the power supply networks) resulting from a fault within the transformer

3.2

disconnection function

automatic interruption of the connection between high-voltage terminals and transformer active part by operation of the self-protection and disconnection device

The purpose of this function is to eliminate current and voltage on the low-voltage side.

3.3

self-protection and disconnection device

SPDD

device which has the self-protection function and the disconnection function

4 Service conditions

The normal service conditions prescribed in IEC 60076-1 apply.

5 Electrical characteristics

5.1 Rated power

The rated power shall comply with 4.3 of IEC 60076-1.

5.2 Highest voltage for equipment

The values of the highest voltage for equipment shall be

- up to 24 kV for the high-voltage winding;
- 1,1 kV for the low-voltage winding.