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BSI Standards Publication

Power transformers

Part 26: Functional requirements of insulating liquids for use in power transformers

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National foreword

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

A list of organizations represented on this committee can be obtained on request to its secretary.

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FOREWORD

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IEC TR 60076-26, which is a technical report, has been prepared by IEC technical committee 14, Power transformers.

The text of this Technical Report is based on the following documents:

Draft TR	Report on voting
14/1010/DTR	14/1018/RVDTR

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

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 60076 series, published under the general title *Power transformers*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

At the time of writing of this document, many new insulating liquids for power transformers are being offered by various suppliers. The end users of insulating liquids in power transformers assume that a particular liquid has been properly qualified to perform the functional requirements as a coolant and an electrical insulating liquid without failure for the expected lifetime of the specific device.

So far, there is no available IEC International Standard in the form of a roadmap that lays out the many requirements of liquids for use in power transformers, reactors and other high voltage equipment other than simply conforming to a liquid standard specification, as for example IEC 60296, IEC 62770 or IEC 61099.

In this document, the functional requirements of an insulating liquid that are considered necessary for use in a power transformer application, are assembled and listed in a structured manner. Detailed technical information on the individual requirements and their validation is purposely not given. This is because this document is intended to serve as a reference document for the transformer industry, including liquid suppliers as well as relevant scientific and technical bodies dealing with insulating liquids (materials).

Certain functional requirements of an insulating liquid are not independent from design aspects and materials in contact with the liquid. For example, dielectric withstand capability/testing and transformer systems ageing, widely require consideration of solid and liquid insulation materials together as a system. For transformers with tap-changers, additional requirements not yet included in standards are applicable.

To address this, a matrix of functional requirements, including their status of validation (testing) has been developed and is presented in this document. It is recommended to consider the requirements for any insulating liquid to be used in power transformers, including for example reactors, HVDC transformers.

The individual requirements (parameters) in the matrix are given a relevance index as to their importance for design and service. Furthermore, for each parameter the status of the method is indicated as

– already existing as an IEC/ISO International Standard,
– existing as an IEC/ISO International Standard that requires updating / extension, or
– does not exist as an IEC/ISO International Standard, thus would require future development.

Some of the identified tests are only available as ASTM or IEEE standards. Such tests, as well as missing tests, are recommended as future work items for the relevant CIGRE and IEC bodies.

The intention is for this document to be regularly updated based on results produced by the previously mentioned bodies. This will ensure the availability of prevailing information on the functional requirements of insulating liquids used in the transformer industry.

POWER TRANSFORMERS –

Part 26: Functional requirements of insulating liquids for use in power transformers

1 Scope

In this document, the functional requirements of insulating liquids that are considered necessary for use in power transformers, including, for example, reactors and HVDC transformers, are assembled and listed. A relevance index of importance for design and for service as well as the status of validation is given for all individual requirements (parameters). All parameters are assigned to one of the following categories:

– General (physical / chemical)
– Dielectric / Insulation
– Thermal / Cooling
– Ageing and Stability
– Liquid-solid system
– Material compatibility

The document is intended to serve as a general reference document for the transformer industry, including liquid suppliers as well as relevant scientific and technical bodies dealing with insulating liquids (materials).

2 Normative references

There are no normative references in this document.

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp