

Specification for

**Unused and reclaimed mineral
insulating oils for
transformers and switchgear**

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Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee GEL/10, Fluids for electrotechnical applications, upon which the following bodies were represented:

- British Cable Makers Confederation
- British Lubricants Federation Limited
- Chemical Industries' Association
- Electricity Association
- Environmental Services Association
- Health and Safety Executive
- Institute of Petroleum
- Institution of Electrical Engineers
- London Regional Transport
- Transmission and Distribution Association (BEAMA Limited)

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Foreword

The revision of this British Standard has been prepared by Technical Committee GEL/10 and supersedes BS 148 : 1997, which is withdrawn. BS 148 : 1998 has replaced BS 148 : 1997 in order to incorporate a number of editorial changes but there have been no changes to the technical content. It is based on IEC Publication 296 : 1982 *Specification for unused mineral insulating oils for transformers and switchgear*, published by the International Electrotechnical Commission (IEC). For ease of cross-reference, the clause numbering of this standard follows that of IEC Publication 296 as far as possible. This standard differs from IEC Publication 296 in specifying limits for:

- i) Water content on delivery;
- ii) Oxidation stability using Method C of BS EN 61125 : 1993;
- iii) Gassing tendency;
- iv) Polycyclic aromatics (PCA);
- v) Polychlorinated biphenyls PCBs;
- vi) Total furans.

The limits for water content continue the UK practice in previous editions of BS 148 whilst the gassing tendency test reflects the change in oil quality which followed the demand for 'gas absorbing' oils in the 1970s.

The use of the oxidation test described in Method C of BS EN 61125 : 1993 (formally IEC 813) acknowledges the fact that oils operate under limited oxygen (air) availability in equipment and allows one oxidation test to be used with differing test durations for both oxidation inhibited and uninhibited oil.

Items (iv), (v) and (vi) above are introduced for the first time reflecting changes in the industry with respect to Health and Safety. In addition, the increasing use of total furfural/furans measurements as an in-service diagnostic tool has prompted the necessity to impose limits on unused oil.

This specification acknowledges UK practice whereby the limiting values for unused mineral insulating oils may also apply to reclaimed mineral insulating oils for transformers and switchgear.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 9, and a back cover.

Specification

1 General

1.1 Scope

This British Standard specifies requirements for unused and reclaimed oxidation inhibited and uninhibited mineral insulating oils, as delivered, for use in transformers, switchgear and similar electrical equipment in which oil is required as an insulant or for heat transfer. These oils are obtained by the distillation and refining of petroleum. Oils with and without additives are within the scope of this standard.

This standard does not apply to mineral insulating oils used as impregnates in cables or capacitors nor to hydrocarbon insulating liquids obtained by synthesis.

NOTE. Oils conforming to the requirements of this standard, of the same class and containing no additives, are considered to be compatible with one another and can be mixed in any proportion. This does not necessarily apply to oils containing additives and where the user wishes to mix such oils a check should be made to ensure that the mixture complies with the requirements of this standard.

1.2 References

1.2.1 Normative references

This British Standard incorporates, by reference, provisions from specific editions of other publications. These normative references are cited at the appropriate points in the text and the publications are listed on page 8. Subsequent amendments to, or revisions of, any of these publications apply to this British Standard only when incorporated in it by updating or revision.

1.2.2 Informative references

This British Standard refers to other publications that provide information or guidance. Editions of these publications current at the time of issue of this standard are listed on the inside back cover, but reference should be made to the latest edition.

2 Definitions

For the purposes of this British Standard, the following definitions apply.

2.1 unused oil

A mineral insulating oil which has not been used in, or been in contact with electrical equipment or other equipment not required for manufacture, storage or transport.

2.2 reclaimed oil

A mineral insulating oil used in electrical equipment which has been subjected to chemical and/or physical processing to eliminate soluble and insoluble contaminants.

2.3 reconditioned oil

A mineral insulating oil used in electrical equipment which has been subjected to physical processing to remove contaminants.

2.4 additive

A suitable substance, which is deliberately added to an insulating liquid in small proportion in order to improve certain characteristics.

2.5 anti-oxidant

An additive incorporated in an insulating liquid to reduce or delay its degradation by oxidation.

2.6 pour point depressant

An additive that enables the pour point of a mineral insulating oil to be lowered.

2.7 uninhibited oil

A mineral insulating oil, containing no anti-oxidant, but which may contain other additives.

2.8 inhibited oil

A mineral insulating oil which contains an anti-oxidant.

3 Classification

Three classes of oil are included in this standard, Class I, Class II and Class III (see tables 1 and 2). The classes differ in the values of certain physical properties, namely flash point, pour point and viscosity at 40 °C and at a specified lower temperature.

The presence of an anti-oxidant is indicated by the letter 'A' following the class number (see table 2).

4 Identification and delivery

4.1 Road or rail tank wagons and drums used for the delivery of oil shall be specially cleaned for this purpose.

4.2 Oil drums and containers of oil samples shipped by the oil supplier shall carry at least the following markings:

- a) supplier's designation;
- b) number and date of this British Standard, i.e. BS 148 : 1998¹⁾;
- c) class of oil, e.g. Class I.

¹⁾ Marking BS 148 : 1998 on or in relation to a product represents a manufacturer's declaration of conformity, i.e. a claim by or on behalf of the manufacturer that the product meets the requirements of the standard. The accuracy of the claim is solely the claimant's responsibility. Such a declaration is not to be confused with third party certification of conformity, which may also be used.