



Engineering Recommendation L38

Issue 3 2016

Overhead line conductors - protection against corrosion by the application of anti-corrosion grease during manufacture

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Issue 2 published, 2009

Amendments since publication

Issue	Date	Amendment
Issue 3	December, 2016	<p>Major revision of Issue 2 to reflect changes made to the standards referenced and to update grease testing procedures and greasing application in the light of on-going experience.</p> <p>This issue includes the following principal technical changes.</p> <p>Foreword: Expanded to describe the role of the document more completely.</p> <p>Clause 1:</p> <p>(i) Paragraph 1: Wording added to clarify that document covers conductors at operating voltages up to and including 132 kV.</p> <p>(ii) Paragraph 3: Wording XLPE added for clarification.</p> <p>Clause 2: References updated, deleted or added as relevant.</p> <p>New Clause 3 'Terms and definitions' added: Definitions of Type A and Type B greases included.</p> <p>Clause 4.4.2 (Issue 2, Clause 3.4.2), 1st bullet point: Reference to BS EN 50236 corrected to BS EN 50326.</p> <p>Clause 4.3.6: Requirement added that grease shall not contain substances to which restrictions apply under the REACH Regulations, as listed in Annex XVII of the regulations.</p> <p>Clause 4.5.1 (Issue 2, Clause 3.5.1): Note added that whilst Type A greases are normally supplied for the conductors, the requirements for Type B greases are included so as not to preclude their use, if specified by and/or agreed with the conductor purchaser.</p>

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		<p>Clause 4.5.2.1 (Issue 2, Clause 3.5.2.1)</p> <p>(i) Paragraph 1: Wording added to clarify that in order to determine the conditioning temperature for the samples, the dropping point temperature for each sample shall be that determined in Clause 4.5.1.</p> <p>(ii) Paragraph 3: Wording corrected to “The maximum difference in temperature between the occurrences of meniscus movement ... shall be not greater than 10 °C”.</p> <p>(iii) Paragraph 4: Wording added to clarify that dropping point temperature after cooling to be not be less than the temperature value recorded in the corrosivity test in Clause 6.12.4 of BS EN 50326.</p> <p>Clause 5.1 (Issue 2, Clause 4.1): Category 4 greasing: Wording added to clarify that the requirement to wipe the outer surface of the conductor clean of grease applies only to Type B greases.</p> <p>Clause 5.8.1 (Issue 2, Clause 4.8.1): Reference to BS EN 45014 updated to BS EN ISO/IEC 17050-1 and BS EN ISO/IEC 17050-2.</p> <p>Table 2A: Entries added for Pine, Poplar, Sorbus and Redwood conductors. Reference to code AL5 aluminium alloy in column 1 extended to include all conductor sizes.</p> <p>Annex C: Thermal history test</p> <p>(i) In the table: Column header ‘t_{dp}’ renamed ‘Drop point temperature’.</p> <p>(ii) Note added to table to clarify that for Type A greases where the high temperature stability type test (BS EN 50326 clause 6.6) was discontinued at ($\theta_2 \pm 20$ °C), because the grease does not have a well-defined drop point, this temperature shall be taken as being the drop point temperature for the purpose of this test.</p> <p>(iii) C.10.2: Wording “(to be known as the “Thermal History Temperature Difference”)” deleted as unnecessary.</p> <p>(iv) Note added that an alternative test procedure applicable to Type A greases is in development. A test procedure applicable to Type A greases is intended to be introduced into EREC L38 at a later date.</p> <p>Annex D: Oxidation test: Note added that an alternative test procedure based on IP 142 is in development. The revised test procedure is intended to be introduced into EREC L38 at a later date.</p> <p>Bibliography added: Two background documents included: BS EN 60721-3-3 and EC Regulation No 1907/2006 (REACH).</p> <p>Details of all other technical, general and editorial amendments are included in the associated Document Amendment Summary for this Issue (available on request from the Operations Directorate of ENA).</p>
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Foreword

This Engineering Recommendation (EREC) is published by the Energy Networks Association (ENA) and comes into effect from the date of publication. It has been prepared under the authority of the ENA Engineering Policy and Standards Manager and has been approved for publication by the ENA Electricity Networks and Futures Group (ENFG). The approved abbreviated title of this engineering document is “EREC L38”, which replaces the previously used abbreviation “ER L38”.

This document replaces and supersedes Engineering Recommendation L38 Issue 2 2009.

Overhead lines with nominal system voltages up to, and including, 132 kV constructed by or on behalf of the Electricity Industry in the United Kingdom incorporate conductors manufactured generally in accordance with the Standards referenced in this document with the addition of anti-corrosion grease applied to the strands during manufacture.

This Engineering Recommendation has been published to ensure uniform standards of anti-corrosion protection are applied to such overhead line conductors and includes requirements both for the grease itself and for its application to conductors.

This Engineering Recommendation includes ‘Self Certification Conformance Declaration’ and ‘Type Test Conformance Declaration’ sheets that may be used to enable manufacturers to declare conformance or otherwise, clause by clause, with relevant parts of this document.

Where the term “shall” or “must” is used in this document it means the requirement is mandatory. The term “should” is used to express a recommendation. The term “may” is used to express permission.

NOTE: Commentary, explanation and general informative material is presented in smaller type, and does not constitute a normative element.

1 Scope

This Engineering Recommendation shall be applied, unless otherwise specified, to the production of overhead line conductors otherwise manufactured in accordance with BS 215-1, BS 6485, BS 7884 and BS EN 50182 for use where the maximum conductor temperature does not exceed 75 °C, at operating voltages up to and including 132 kV.

NOTE: It should be noted that the use of fully greased and wiped conductors at voltages higher than 132 kV may lead to noise problems; therefore Category 4 greased conductors should not be used on circuits that are likely to be upgraded to 275 or 400 kV.

This Engineering Recommendation does not apply to covered conductors manufactured in accordance with ENA TS 43-122 [N2].

The principles set out in this Engineering Recommendation may be applied to conductors not listed herein and/or those with a higher operating temperature by suitable adjustment of the stated test parameters and/or calculation of the appropriate mass of grease per unit length. This should be done by agreement between the relevant parties (i.e. the conductor purchaser, the conductor manufacturer and the grease manufacturer as appropriate).

2 Normative references

The following referenced documents, in whole or part, 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.

Standards publications

BS EN ISO/IEC 17050-1, *Conformity assessment. Supplier's declaration of conformity. General requirements*

BS EN ISO/IEC 17050-2, *Conformity assessment - Supplier's declaration of conformity. Supporting documentation*

BS EN 50182:2001, *Conductors for overhead lines – round wire concentric lay stranded conductors*

BS EN 50326:2002, *Conductors for overhead lines – characteristics of greases*

BS EN 60721-3-4:1995, *Classification of environmental conditions: stationary use at non-weather protected location*

BS 215-1, *Specification for aluminium conductors and aluminium conductors, steel-reinforced for overhead power transmission*

BS 6485, *Specification for PVC-covered conductors for overhead power lines*

BS 7884, *Overhead line conductors; copper and copper-cadmium stranded; for traction and power transmission systems*

Other publications

[N1] ENA TS 43-92, *Conductor fittings for overhead lines*

[N2] ENA TS 43-122, *XLPE covered-conductors for overhead lines (having rated voltages U_0/U greater than 0.6/1 kV up to and including 19/33kV)*

[N3] IP 328, *The assessment of oxygen stability of mineral turbine oil during use*

[N4] *REACH Enforcement (Amendment) Regulations 2014*

3 Terms and definitions

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

3.1

Type A grease

applied without heating, e.g. greases consisting essentially of a stabilised mixture of mineral or synthetic oil and thickeners such as metal soaps or inorganic compounds

3.2

Type B grease

applied with heating, e.g. greases consisting of petrolatum waxes associated with small quantities of mineral oil and organic additives

4 Specification for anti-corrosion grease

4.1 General requirements

Anti-corrosion grease shall meet all the requirements of BS EN 50326 together with the additional requirements of this section.

4.2 Storage and use conditions

4.2.1 Lifespan

The lifespan of conductors to which the anti-corrosion grease shall be applied is deemed to be, as follows:

- Storage for 10 years, and
- Subsequent use for 40 years.

The anti-corrosion grease shall be suitable for application to conductors that may be subject to the storage and use conditions at any geographic location in the United Kingdom.

4.2.2 Maintainability and maintenance objectives

Maintainability is not required. There shall be no prescribed maintenance.

4.2.3 Resistance to misuse

The protection provided by the anti-corrosion grease shall be of a robust nature suitable for the likely conditions of storage and use.

4.3 Functional specification

4.3.1 Temperature stability

No degradation of properties shall be exhibited by the anti-corrosion grease or any constituent of it within the temperature range $t = -20\text{ °C}$ to $t = 80\text{ °C}$.

No anti-corrosion grease, nor any constituent of it, shall flow within or exude from the conductor to which it is applied at any stage within the temperature range $t = -20\text{ °C}$ to $t = 80\text{ °C}$.

4.3.2 Durability as a constituent of finished conductor

The anti-corrosion grease shall be suitable for application to conductors that:

- after finishing, may be stored as described in Table 1;