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Engineering Recommendation C79

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Type tests for connectors for copper and aluminium conductors of insulated power cables

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PUBLISHING AND COPYRIGHT INFORMATION

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Amendments since publication

Issue	Date	Amendment
Issue 3	2014	This issue has been editorially restructured to conform to the ENA template for presentation of engineering documents. There are no principal technical changes. Table 1 modified to align the load current pick-up values for stranded and solid aluminium conductors. An introduction has been added regarding the impending major revision of IEC/EN 61238-1. Bibliography added to reference relevant Standards covering the testing of cable accessories and the design and construction of power cable conductors. 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).

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Foreword

This Engineering Recommendation (EREC) is published by the Energy Networks Association (ENA) and comes into effect from 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. The approved abbreviated title of this engineering document is “EREC C79”, which replaces the previously used abbreviation “ER C79”.

This issue of EREC C79 replaces and supersedes Issue 2 2009.

EREC C79 defines the type tests and requirements for compression and mechanical connectors including IPCs for use on copper and aluminium conductors of power cables for rated voltages up to 36 kV (U_m = 42 kV). A connector conforming to the requirements of this EREC is expected to perform in service such that:

a) the resistance of the connection remains stable;

b) the temperature of the connector is not greater than that of the cable conductor;

c) its mechanical strength is fit for purpose;

d) anticipated short-circuit currents will not affect a) and b).

Although the electrical and mechanical tests specified in this EREC are to prove the suitability of connectors for most operating conditions, they do not necessarily apply to situations where the connector may be raised to a high temperature by virtue of connection to highly rated plant, or where the connector is subjected to excessive mechanical vibration or shock or to corrosive conditions. In these instances, the tests in this EREC may need to be supplemented by special tests agreed between supplier and purchaser.

This EREC has been prepared to implement BS EN 61238-1:2003, which in turn implements the European Standard EN 61238-1:2003.

EREC C79 meets the requirements of The Utilities Contract Regulations 2006 (S.I. 2006 No.6) and amendment, The Utilities Contract (Amendment) Regulations 2009 (S.I. 2009 No. 3100) [N1].

General guidelines for the assessment process used by ENA are given in ENA EREC G79 Part 1 [N2], which outlines the procedure for conformity assessment of power system plant and products for use by ENA member companies. It is recommended that the assessment process used by ENA member companies follows these guidelines.

Introduction

EREC C79 implements the test methods and requirements of BS EN 61238-1. BS EN 61238-1 has not been revised since EREC C79 was last published in 2009, thus this Issue 3 does not include any significant technical revision. However, this document has been revised as part of a 5-yearly review of ENA engineering documents and incorporates general and editorial changes to align with ENA EREC G0 [N3].

This revision of EREC C79 has been made in advance of a major revision of IEC 61238-1 expected to be published during 2015 together with the parallel-voted European Standard EN 61238-1. This will be implemented in the UK as a revision of BS EN 61238-1.

It is probable that the revised IEC 61238-1 will become four parts, with each part specific to a voltage range and will include a part specifying requirements for IPCs. A new part has been designated for tests and requirements for HV connectors (for use on cables above 42 kV) and its content will be developed for a future revision.

The revised BS EN 61238-1 can be expected to have significant technical consequences for EREC C79 and, therefore, a further revision of this EREC will be necessary to ensure compatibility of requirements.

1 Scope

This EREC details the performance requirements of the following types of compression or mechanical connectors, including IPCs, for power cables with copper or aluminium conductors.

- Terminal connectors (lugs).
- Through (straight) connectors.
- Branch connectors.

This EREC is not applicable to connectors for overhead conductors, which are designed for special mechanical requirements, or separable connectors with sliding contacts or multi-core connectors, e.g. ring connectors.

Conductor cross-sections covered by this EREC are as follows.

- Copper: 4 mm^2 and above.
- Aluminium: 10 mm^2 and above.

This EREC is applicable to connectors for application on power cables with a rated voltage of up to 36 kV (U_m = 42 kV).

NOTE: This EREC may be used as the basis for test requirements for connectors for application to power cables rated at higher voltages. However, some of the test parameters, in particular those of the tensile test, may be inadequate, especially for large conductor cross-sectional areas.

Two broad classes of connector are identified in BS EN 61238-1 as follows.

- Class A connectors that are intended for electricity distribution or industrial networks in which they can be subjected to short-circuit currents of relatively high intensity and duration. As a consequence, Class A connectors are suitable for the majority of applications. During electrical tests they are subjected to both heat cycle and short-circuit tests.

- Class B connectors that are suitable for networks in which overloads or short-circuits are rapidly restricted by the installed protective devices, e.g. fast-acting fuses. During electrical tests they are subjected to heat cycle tests only.

Both Class A and Class B connectors are subjected to the mechanical tests.

Mains-to-mains, mains-to-service and service-to-service connectors including IPCs are generally required to pick up load when being installed in the network. Test sample connectors are therefore required to pick up load at system voltage when being installed in the test loop.

No test is included to determine whether the performance of connectors is affected by compounds or encapsulants with which they are or could be used.

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 61238-1:2003, *Compression and mechanical connectors for power cables for rated voltages up to 36 kV (U_m = 42 kV). Test methods and requirements*

Other publications

[N1] The Utilities Contract Regulations 2006 (S.I. 2006 No.6) and amendment, The Utilities Contract (Amendment) Regulations 2009 (S.I. 2009 No. 3100)

[N2] ENA EREC G79, *Procedure for the conformity assessment of plant & products for use by Energy Networks Association member companies*

[N3] ENA EREC G0, *Rules for structure, drafting and presentation of ENA engineering documents*

3 Terms and definitions

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

The terms and definitions in the referenced Standards shall apply together with the following.

3.1
IPC
insulation piercing connector