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Technical Specification 35-1

Issue 6 2014

Distribution transformers

Part 2 Ground mounted transformers—not close-coupled

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PUBLISHING AND COPYRIGHT INFORMATION

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Amendments since publication

Issue	Date	Amendment
6	2014	Major revision to make ENA TS 35-1 a multi-part specification. The new Part 2 document is based on the requirements from the previous Issue 5, Clause 15 'Transformer fittings for cable connected transformers'. The document structure follows the recommendations in ER G0. This issue includes the following principal technical changes. Foreword and Scope have are aligned to Part 1 document. Clause 2: Normative references are included where they have not been used in Part 1. New reference to ENA TS 41-36 added. Clause 4: The previous Issue 5 Clauses 15, 15.1, 15.2 and 15.3 have been significantly revised in Clauses 4.1 - 4.4. The layout options for, not close-coupled transformers, have been amended and clarified. The options for fitting cable boxes, flanges or separable connectors have been added. The option for having top cover terminations fitted has been added. Clause 4.5: New clause added to capture requirements from previous Issue 5 for Clauses 6.1 and 6.2 for connection and phase displacement symbols. Clauses 4.6: New clauses capture the dual ratio and tapping requirements from previous Issue 5 Clauses 5.4.2 and 6.3 with some minor amendments. The option for internal captive connectors for tappings on single-phase transformers has been removed. Clause 4.7: Significant revision of the fittings for the transformer. Previous requirements in the Common clauses Part 1 have been moved to this Part.

		Clause 5: New clause includes Table 2B from Issue 5 and an 'Additional test' clause for future requirements for top cover terminations. Figures: Some figures from Issue 5 referred in Part 2 have been amended and included in the new document and some new figures have been added. Some figure titles have been revised to align with the terminology change for transformer type. Annex A: Self-Certification Conformance Declaration is based on previous schedule items from cable connected transformers with significant revisions to capture new requirements and title heading changes. Annex B: New Schedule of Requirements has been created based on the previous Issus 5 schedule. All requirements relevant to Part 1 have been included. All items not relevant to the transformer type have been removed. Terminology has been amended to align with IEC 60076-1 and title changes. New items added to capture additional requirements. 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 Technical Specification (TS) 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 (ENFG). The approved abbreviated title of this engineering document is “ENA TS 35-1 Part 2”.

This document replaces and supersedes Technical Specification 35-1 Issue 5 2007.

This Technical Specification has been prepared by the Energy Networks Association.

ENA TS 35-1 is a suite of engineering documents that sets out ENA Member Company requirements for specification of distribution transformers. ENA TS 35-1 has been restructured as a multi-part document to provide better clarity for manufacturers of common requirements and specific requirements for particular types of distribution transformers.

ENA TS 35-1 comprises of the following parts.

- Part 1 – Common clauses.
- Part 2 – Ground mounted transformers—not close-coupled.
- Part 3 – Ground mounted transformers—close-coupled.
- Part 4 – Pole mounted transformers.

Parts 2 to 4 are specific to particular types of transformer and shall be read in conjunction with Part 1 to ascertain all relevant requirements.

Transformers covered by this Technical Specification shall comply with the International and British Standards listed. This Technical Specification amplifies and/or clarifies the requirements of IEC 60076 where alternative arrangements are permitted and where additional information is required. The Technical Specification shall be read, therefore, in conjunction with IEC 60076-1.

Part 1 of the Specification includes clauses applicable to all transformers, and clause numbering to the second level is in accordance with IEC 60076-1. The document structure within Part 1 has been designed to mirror that of IEC 60076-1 (Issued 2011). All references to IEC 60076-1 shall be to the year 2011 issue only.

Annex A of the document includes ‘Self Certification Conformance Declaration’ sheets to enable manufacturers to declare conformance or otherwise, clause by clause, with the relevant parts of the document. Manufacturers shall refer to the ‘Schedule of Requirements’ submitted by the purchaser as outlined in Annex B of Parts 2 to 4.

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1 Scope

This Specification applies to transformers in the range 16 kVA to 2 000 kVA for continuous service at 50 Hz, for highest voltage for equipment 7.2 kV, 12 kV, 24 kV and 36 kV[1].

This document is one of the following suite of documents governing the specification of distribution transformers.

- Common clauses (TS 35-1 Part 1).
- Ground mounted transformers—not close-coupled (TS 35-1 Part 2).
- Ground mounted transformers—close-coupled (TS 35-1 Part 3).
- Pole mounted transformers (TS 35-1 Part 4).

This document must be read in conjunction with Part 1 which presents requirements common to all transformer types.

This document applies to ground mounted transformers—not close-coupled[2], which are to be supplied with suitable fittings to allow connection to the HV and LV systems or equipment as specified by the purchaser.

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

Clause 2 of ENA TS 35-1 Part 1 [N1] is applicable along with the following additions.

BS 2562:1979, *Specification for cable boxes for transformers and reactors packaging*

BS EN 50180:2010, *Bushings above 1 kV up to 52 kV and from 250 A to 3,15 kA for liquid filled transformers*

BS EN 50181:2010, *Plug-in type bushings above 1 kV up to 52 kV and from 250 A to 2,50 kA for equipment other than liquid filled transformers*

IEC 60214-1:2003, *Tap-changers – Part 1: Performance requirements and test methods*

BS EN 60529: 1992+A2: 2013, *Degrees of protection provided by enclosures (IP code)*

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[1] Equipment voltage above 24 kV is considered for use on pole mounted transformers only.

[2] Ground mounted transformers—not close-coupled were previously referred to as “cable connected transformers”.

Other publications

[N1] ENA TS 35-1, *Distribution transformers, Part 1 Common clauses*

[N2] ENA TS 12-11, *Dry cable terminations in HV switchgear for service at rated voltages 12, 24 and 36 kV*

[N3] ENA TS 41-36, *Switchgear for service up to 36 kV (cable and overhead conductor connected)*

3 Terms and definitions

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

The definitions of ENA TS 35-1 Part 1 [N1] are applicable.

4 Additional requirements for ground mounted transformers—not close-coupled

4.1 General

Ground mounted transformers—not close-coupled, shall be configured to one of the following layout options as specified by the purchaser[3].

a) Opposite side HV and LV connection depicted in Figure 2.

b) Same side HV and LV connection depicted in Figure 3.

c) Top cover terminations depicted in Figure 5.

Limiting dimensions for the transformer layout options are also indicated in Figures 2 and 3.

4.2 Lifting and mechanical properties

Lifting fittings shall be provided, to suit slings or shackles, of adequate design to facilitate lifting in a reasonably upright position:

a) with or without HV and LV cable boxes (see 4.3 and 4.4);

b) with top terminations (see 4.3.2).

Any appropriate pair of lifting fittings shall be capable of supporting (with a factor of safety of at least two) the combined weight of the transformer and cable boxes (if fitted), when filled with liquid to the service level.

The transformer tank with its cover removed shall be capable of containing the liquid immersed windings without physical distortion.

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[3] Layout options allow interchangeability with purchaser's existing equipment.