



Technical Specification 35-1

Issue 6 2014

Distribution transformers

Part 3 Ground mounted transformers—close-coupled

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**Operations Directorate
Energy Networks Association
6th Floor, Dean Bradley House
52 Horseferry Rd
London
SW1P 2AF**

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Amendments since publication

Issue	Date	Amendment
6	2014	<p>Major revision to make ENA TS 35-1 a multi-part specification. The new Part 3 document is based on the requirements from the previous Issue 5, Clause 16 'Transformer fittings for unit substation transformers' and Clause 17 'Tests for unit substation transformers'. The document structure follows the recommendations in ER G0.</p> <p>This issue includes the following principal technical changes.</p> <p>Foreword and Scope have are aligned to Part 1 document.</p> <p>Clause 2: Normative references are included where they have not been used in Part 1.</p> <p>Clause 3: Definition for PENDA-TMO (formerly LV distribution fuse cabinet) added from TS 37-2.</p> <p>Clause 4: The previous Issue 5 Clauses 16, 16.1, 16.2 and 16.3 have been moved to new Clauses 4.1 - 4.4. The layout options for close-coupled transformers have been amended to allow HV and LV connection on opposite sides of the transformer Further requirements added for the option of fitting HV and LV cable boxes. New option for fitting HV separable connectors has been added. Terminology for LV distribution fuse cabinet has been changed to LV PENDA-TMO and TFX – fusebox.</p> <p>Clause 4.5: New clause added to capture requirements from previous Issue 5 for Clauses 6.1 for connection and phase displacement symbols.</p> <p>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.</p>

		<p>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.</p> <p>Clause 5: New clause includes Table 2B from Issue 5 and Clause 5.2 captures the previous requirement from Issue 5 Clause 17.</p> <p>Figures: Some figures from Issue 5 referred in Part 3 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 changes for transformer types.</p> <p>Annex A: Self-Certification Conformance Declaration is based on previous schedule items from unit substation transformers with significant revision to capture new requirements and title heading changes.</p> <p>Annex B: New Schedule of Requirements has been created based on the previous Issue 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.</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 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 3”.

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.

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 kV¹.

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—close-coupled, which are to be supplied with HV and LV switchgear close-coupled².

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 50532:2010, *Compact equipment assembly for distribution substations (CEADS)*

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)*

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

² Ground mounted transformers—close-coupled were previously referred to as “unit transformers”.

Other publications

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

[N2] ENA TS 41-36, *Switchgear for service up to 36 kV (cable and overhead connected)*

[N3] ENA TS 37-2, *Public electricity network distribution assemblies*

[N4] ENA TS 12-11, *Dry cable terminations in HV switchgear for service at rated voltages 12, 24 and 36 kV*

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 with the following additions.

3.1

PENDA-TMO

(public electricity network distribution assembly – transformer mounted outdoor)³. outdoor public electricity distribution assembly which is suitable for fixing to the low voltage flange of a ground mounted distribution transformer

3.2

TFX – fusebox

assembly suitable for, outdoor installation and fixing to the low voltage flange of a distribution transformer⁴

NOTE: These assemblies include one or two outgoing distribution units that are directly connected to the LV terminals of the transformer. A separate incoming transformer unit is not included. Fuseboxes may be used with single, split phase or three phase transformers.

4 Additional requirements for ground mounted transformers—close-coupled

4.1 General

Ground mounted transformers—close-coupled, shall be configured to one of the following layout options as specified by the purchaser.

- a) Opposite side HV and LV as depicted in Figure 2 option A.
- b) Opposite side HV and LV as depicted in Figure 2 option B.
- c) Opposite side HV and LV as depicted in Figure 2 option C.
- d) Same side HV and LV coupling depicted in Figure 3.

³ PENDA-TMO as defined in ENA TS 37-2 [N3] was previously referred to as an LV distribution fuse cabinet.

⁴ TFX – fusebox as defined in ENA TS 37-2 [N3].