NPS/003/042 – Technical Specification for stand-alone Earthing Auxiliary Transformers and Auxiliary Transformers

1. Purpose

This specification details the technical requirements for stand-alone earthing auxiliary transformers and auxiliary transformers with a primary voltage of 66kV, 33kV 20kV or 11.5kV for use on Northern Powergrid's networks.

This is the first version of this document.

2. Scope

This specification covers the technical requirements for cable or busbar connected stand-alone earthing auxiliary transformers and auxiliary transformers. The specification also includes the requirement for suppliers to provide periodic inspection and maintenance information.

It will also be necessary to consider and include any project specific requirements as detailed in Appendix 1, Addendum to Supplier Requirements.

The following appendices form part of this technical specification:

Appendix 1	Addendum to Supplier Requirements – Technical Schedules
Appendix 2a	Self-Certification Declaration of Conformance with this document
Appendix 2b	Self-Certification Declaration of Conformance with ENA TS 35-1 Parts 1 and 2
Appendix 3	Pre-commission Testing, Routine Inspection and Maintenance Requirements
Appendix 4	Technical Information Check List
Appendix 5	Declaration of Manufacturers, Places of Manufacture, Test & Inspection

This specification does not cover tank-mounted auxiliary transformers, the specifications for which can be found in NPS/003/012 or NPS/003/021 for Continuous Emergency Rated and Continuous Maximum Rated transformers respectively.

2.1 Contents

3. Technical Requirements

3.1. Overview

The requirement is for cable or busbar connected stand-alone earthing auxiliary transformers and auxiliary transformers. Earthing transformers are typically used in the following scenarios:

- In the case of power transformers having a Yd vector group configuration, an earthing auxiliary transformer with vector group Zy provides a neutral connection for the network and auxiliary supply as well.
- For power transformers of vector group Yy, predominantly on the Northeast network at 66kV, an auxiliary and earthing transformer with vector group Dz allows a path for circulating current.

The earthing/auxiliary transformer will normally have a primary voltage of 66kV, 33kV, 20kV or 11kV and a no-load secondary voltage of 415V.

HV terminal arrangements are required to be outdoor bushings or separable connector terminations, depending on the specific site requirements. In the case of outdoor bushing connections, the transformer shall be protected from over-voltage transients by installing surge arrestors.

The LV terminals of the auxiliary transformer shall be connected to an LV fuseboard mounted on the auxiliary transformer.

Ground-mounted transformers shall not have unscreened HV cable outside the transformer tank and shall not have exposed LV conductors outside the transformer tank. HV busbars and associated live components shall exceed the minimum clearances stated in NSP/007/005 – Guidance on Substation Design: Electrical Design Clearances.

3.2. Technical Specification

3.2.1. General

Earthing/auxiliary transformers shall be of liquid-immersed type as defined in BS EN 60076-2. Where an earthing transformer is specified, the transformer shall meet the requirements of BS EN 60076-6 clause 10. Where the earthing transformer provides a supply to a local auxiliary load, BS EN 60076-1 applies with respect to that specific function.

The equipment shall be designed, constructed and tested in accordance with the following Energy Networks Association Technical Specifications unless varied by this specification in which case this specification shall take precedence:

- Energy Networks Association Technical Specification (ENA TS 35-1, Part 1 2014 – Distribution Transformers – Common clauses
- Energy Networks Association Technical Specification (ENA TS 35-1, Part 2 2014 – Distribution Transformers – Ground mounted transformers—not close-coupled

The equipment shall comply fully with current versions of all relevant IEC International Standards, British Standard Specifications or equivalent Euro-Norms, and Energy Networks Association Technical Specifications, except where varied by this standard.

The equipment must comply with, and allow the end user to comply with, all relevant Health & Safety legislation.

The earthing/auxiliary transformer insulating fluid system shall be fitted with a conservator, Buchholz relay, pressure relief device and breather. The insulating fluid shall comply with Northern Powergrid's specification NPS/003/019 Technical Specification for Electrical Insulating Fluids for use in Plant & Switchgear.

Technical documents referenced within this specification refer to the latest versions of the relevant International Standards, British Standard Specifications and all relevant Energy Networks Association Technical Specifications (ENA TS) current at the time of supply.

Any subsequent changes in the relevant International Standards, British Standard Specifications and Energy Networks Association Technical Specifications (ENA TS) which result in a variation from this specification shall be incorporated by suppliers, subject to a technical evaluation by Northern Powergrid Policy and Standards Section and instruction in writing.

If CTs are installed in the auxiliary transformer bushing turrets, then test bushings shall be provided to as shown in ENATS 35-3 figure 2.

3.2.2. Electrical Performance Requirements

Key performance requirements are stated in the table below (typical arrangements are stated here, but check site specific requirements in Appendix 1):

Electrical Characteristic	Requirement
Input voltage for equipment (Um)	To match the main transformer secondary voltage.
Output voltage	415V at no load.
Vector Group	ZNyn1/Znyn11 (with vector group changeover links) OR Dzn0
Rating	200kVA ONAN
Lightning Impulse Withstand	11kV – 95kV 20kV – 125kV 33kV – 170kV 66kV – 325kV
Power Frequency Test (1 min)	11kV – 28kV 20kV – 50kV 33kV – 70kV 66kV – 140kV
Tappings	Not required
Impedance Voltage (at 75°C)	4% of rated power (max)
30 second rated short-time current through neutral of HV winding	1500A

3.2.3. HV Terminal Arrangements

HV terminal arrangements shall be determined by the specific site requirements provided in Appendix 1.

Cable connections at 33kV and above shall be facilitated by separable plug-in cable terminations unless otherwise stated in Appendix 1.

Cable terminations below 33kV shall normally be by means of an air filled cable box unless otherwise stated in Appendix 1.

The terminations shall comply with:

- NPS/002/015 Technical Specification for 11kV and 20kV Joints and Terminations
- NPS/002/016 Technical Specification for 33kV Joints and Terminations
- NPS/002/017 Technical Specification for 66kV and 132kV Cable Accessories

The neutral point of the interconnected star winding shall be brought out of the tank through a bushing insulator and this point is either connected to earth directly or through a neutral earthing resistor.

Where a cable box termination is supplied, a separate cable box is required for the HV neutral.

3.2.4. LV Terminal Arrangements

The LV terminals of the transformer shall be connected to an LV fuseboard mounted on the transformer. This connection shall be arranged to minimise the risk of failure.

The LV fuseboard shall conform fully to Form 4 Type 2 requirements of BS EN 61439-2, Low-voltage switchgear and controlgear assemblies – Part 2: Power switchgear and controlgear assemblies.

All terminals and exposed live metalwork shall be shrouded.

The LV fuseboard shall be designed and constructed to be suitable for outdoor use. The fuseboard, its components (excluding insulating parts) and its mountings shall not require maintenance for a period of at least 30 years in a polluted / coastal environment according to EN ISO 12944-2 Category C4. The fuseboard housing shall have a padlockable access door/non-bolted cover; suitable for use with a padlock hasp of 3-6mm diameter.

The auxiliary transformer LV phase connections shall be terminated in the LV fuseboard onto three 300A cutouts. The cutouts shall be provided complete with fuse carriers with 82mm fixing centres suitable for BS 88-2:2013 type “J” fuses.

The body of the carrier shall be of suitable insulating material, and be so shaped as to allow a definite grip to facilitate the installation or removal of the fuses by hand, while providing an insulated barrier to all live parts.

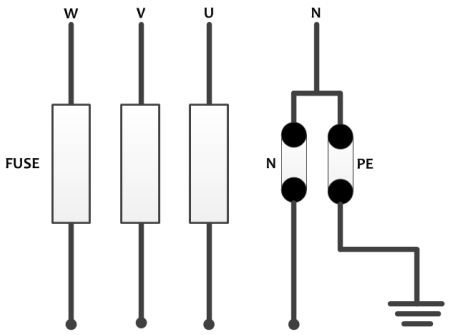
Fuse carriers shall be of wedge type, and shall be equipped with two thumbscrews for tightening in situ. The design of these thumbscrews must be such that, when in position, the whole fuse assembly remains intact when the thumbscrews are released to their full extremities. The thumbscrews shall be of insulating material with the same electrical performance as the fuse carrier; each of which shall be BS 88-2:2013 J type fuse links.

The auxiliary transformer LV fuses shall be ergonomically accessible from ground level and be mounted not less than 900mm and not more than 1800mm above ground level.

The auxiliary transformer LV neutral connections shall be terminated onto an arrangement with two independently removable, bolted links inside the LV fuseboard as shown in the diagram below:

(a) the outgoing side of one link shall be connected to a designated earth connection point on the auxiliary transformer.

(b) the outgoing side of one link shall be connected to the outgoing LV cable.



The underside of the LV fuseboard housing shall have a suitably positioned cable access hole, equipped with a compression gland for a 4-core armoured 120mm^2 cable that will be used to connect to the outgoing sides of the LV fuses.

The LV fuseboard shall be equipped with all necessary connections/lugs to allow termination of a 4-core armoured 120mm^2 cable used to connect to the outgoing sides of the LV fuses.

3.2.5. Variations and Clarifications to ENA TS 35-1.

The following variations, additions or clarifications to ENA TS 35-1 are referenced to the clause numbers used in ENA TS 35-1 Parts 1, or 2 2014:

ENA TS 35-1 Part 1 Common Clauses

5.2 Cooling Mode

Where transformers contain insulating fluid, this fluid shall comply fully with the current version of Northern Powergrid Specification NPS/003/019 – Specification for Electrical Insulating Fluids for use in Plant and Equipment.

The transformer shall not be equipped with cooling fans or pumps.

6 Requirements for transformers having a tapped winding.

No tapping is required.

6.6 Load loss and temperature rise

Transformers shall be optimised for lifetime costs which shall be calculated, by the supplier, using the methodology stated in IMP/001/103 – Code of Practice for the Methodology of Assessing Losses and the associated spreadsheet published on Northern Powergrid's website:

http://www.northernpowergrid.com/losses

11 Tests

A summary of the testing requirements and classification is given in Appendix 6 of this NPS document.

11.1.1 (Tests General, Insulation Levels for all other transformers

The Insulation levels for the transformer shall be as stated in clause 3.2.2 of this document. Note that the rated Lightning Impulse (LI) for 11kV equipment shall be at least 95kV (peak).

11.1.3 Type Tests

Unless existing test evidence is available and is formally accepted by Northern Powergrid, the full range of type tests required by ENA TS 35-1 shall be performed on, at least, the first unit of a given type and rating from a production facility.

11.1.4 Special Tests

Unless existing test evidence is available and is formally accepted by Northern Powergrid, a short-circuit withstand test in accordance with IEC 60076-1 Clause 11.1.4 shall be performed on, at least, the first unit of a given type and rating from a production facility.

14.2 Surface Finish

The surface finish colour shall be mid grey such as dark admiralty grey BS 381-632. Other colours will be considered, subject to formal agreement by Northern Powergrid.

4. References

The products described within this specification shall comply with all current versions of the relevant International Standards, British Standard Specifications and all relevant Energy Networks Association Technical Specifications (ENA TS) current at the time of issue.

4.1. External Documentation

Reference	Title
ENA TS 35-1 Part 1 Issue 6 2014 Part 2 Issue 6 2014	Distribution Transformers Part 1 Common Clauses Distribution Transformers Part 2 Ground mounted transformers-not close coupled
ENA TS 35-3 Issue 2 2014	Continuous Maximum Rated (CMR) system transformers (for use on systems up to and including 132kV)
BS EN 60076-1: 2011	Power transformers - General
BS EN 60076-2: 2011	Power transformers - Temperature rise for liquid-immersed transformers
BS EN 60076-6: 2008	Power transformers - Reactors
BS EN 61439-2:2011	Low-voltage switchgear and controlgear assemblies. Power switchgear and controlgear assemblies
BS EN ISO 12944-2:2017	Paints and varnishes. Corrosion protection of steel structures by protective paint systems
BS 88-2:2013	Low-voltage fuses Part 2: Supplementary requirements for fuses for use by authorized persons (fuses mainly for industrial application) — Examples of standardized systems of fuses A to K

4.2. Internal Documentation

Reference	Title
NPS/002/015	Technical Specification for 11kV and 20kV Cable Joints & Terminations
NPS/002/016	Technical Specification for 33kV Cable Joints and Terminations
NPS/002/017	Technical Specification for 66kV and 132kV Cable Accessories
NPS/003/019	Technical Specification for Electrical Insulating Fluids for use in Plant & Switchgear
IMP/001/103	Code of Practice for the Methodology of Assessing Losses

4.3. Amendments from Previous Version

Section	Subject	Amendments
n/a		

5. Definitions

Term	Definition
n/a	

6. Authority for Issue

6.1. CDS Assurance

I sign to confirm that I have completed and checked this document and I am satisfied with its content and submit it for approval and authorisation.

		Sign	Date
Andy Leggett	CDS Administrator	Andy Leggett	04/09/2018

6.2. Author

I sign to confirm that I have completed and checked this document and I am satisfied with its content and submit it for approval and authorisation.

Review Period - This document should be reviewed within the following time period.

Standard CDS review of 3 years?	Non Standard Review Period & Reason	
No	Period: 5 years.	Reason: Agreed for product specifications to align with the framework periods typically awarded.
Should this document be displayed on the Northern Powergrid external website?		Yes

		Sign	Date
Joseph Helm	Senior Policy and Standards Engineer	Joseph Helm	04/09/2018

6.3. Technical Assurance

I sign to confirm that I am satisfied with all aspects of the content and preparation of this document and submit it for approval and authorisation.

		Sign	Date
David Blackledge	Senior Policy and Standards Engineer	David Blackledge	05/09/2018
Sunil Shrestha	Specification and Design Engineer	Sunil Shrestha	05/09/2018

6.4. Approval

Approval is granted for publication of this document.

		Sign	Date
David Gazda	Policy and Standards Manager	David Gazda	15/10/2018

6.5. Authorisation

Authorisation is granted for publication of this document.

		Sign	Date
Greg Farrell	Head of System Strategy	Greg Farrell	24/10/2018

Appendix 1: Addendum to Supplier Requirements

(Project or Site Specific Requirements)

Description	Site Specific Requirement
Input voltage for equipment (Um)	
Vector Group	
Rating (kVA)	
Zero Phase Sequence Impedance of HV winding (Ω/phase)	66kV - 33kV - 20kV - 11kV -
Short Time Withstand Rating	
HV Terminal Arrangement	
LV Terminal Arrangement	

Appendix 2: Self-Certification Declaration of Conformances

Appendix 2a: Conformance with NPS/003/042

CLAUSE BY CLAUSE CONFORMANCE WITH Northern Powergrid Technical Specification NPS/003/042.

The manufacturer shall declare conformance or otherwise, clause by clause, using the following levels of conformance declaration codes.

Conformance declaration codes*

NA	Clause is not applicable or appropriate to the product
Cs1	the product fully conforms with the requirements of this clause
Cs2	the product partially conforms with the requirements of this clause
Cs3	the product does not conform with the requirements of this clause
Cs4	the product does not currently conform with the requirements of this clause, but the manufacturer proposes to modify and test the product in order to comply.

Instructions for completion

Entries shall be made in the remarks column for ALL clauses and sub-clauses.

This shall include an explanation of why it does conform (including reference to type tests) or why it does not conform.

Manufacturer:		
Product Reference:		
Name:	**Signature:**	**Date:**

Auxiliary Transformer Conformance with NPS/003/042 Declaration

Clause	Description	Specification of Product Offered	Remarks
3.2.2	Input voltage		
3.2.2	Output voltage		
3.2.2	Vector group		
3.2.2	Rating		
3.2.2	Lightning Impulse Withstand		
3.2.2	Power Frequency Test (1 min)		
3.2.2	Impedance voltage (at 75ºC)		
3.2.3	HV terminal arrangement		
3.2.4	LV terminal arrangement		
3.2.4	Form 4 Type 2 requirements of BS EN 60439-2		
3.2.4	Withstand 30 years in EN ISO 12944-2 Category C4		
3.2.4	Padlockable door suitable for padlock hasp of 3-6mm diameter		
3.2.4	Cutouts with fuse carriers with 82mm fixing centres suitable for BS 88-2:2013 type “J” fuse links		
3.2.4	Auxiliary transformer LV fuses ergonomically accessible from ground level		
3.2.4	LV neutral terminated onto an arrangement with two independently removable, bolted links		

Appendix 2b: Conformance with ENA TS 35-1 Parts 1 and 2

CLAUSE BY CLAUSE CONFORMANCE WITH ENA TS 35-1 Parts 1 and 2.

Transformers covered by ENA TS 35-1 shall comply with the latest issues of the relevant International and British Standards. ENA TS 35-1 is intended to amplify and/or clarify the requirements of those Standards.

This check sheet identifies the clauses in ENA TS 35-1 and the clauses of IEC 60076-1.

The manufacturer shall declare conformance or otherwise, clause by clause, using the following levels of conformance declaration codes.

Conformance declaration codes*

NA	Clause is not applicable or appropriate to the product
Cs1	the product fully conforms with the requirements of this clause
Cs2	the product partially conforms with the requirements of this clause
Cs3	the product does not conform with the requirements of this clause
Cs4	the product does not currently conform with the requirements of this clause, but the manufacturer proposes to modify and test the product in order to comply.

Instructions for completion

Entries shall be made in the remarks column for ALL clauses and sub-clauses.

This shall include an explanation of why it does conform (including reference to type tests) or why it does not conform.

Manufacturer:		
Product Reference:		
Name:	**Signature:**	**Date:**

ENA TS 35-1, Part 1 — Self-Certification Conformance Declaration

Clause/Sub-clause	Requirement	Conformance Code IEC 60076-1	Conformance Code ENA TS 35-1 Part 1	Schedule item	Remarks
1	Scope				
2	Normative references				
3	Terms and definitions		N/A	N/A	
3.1	General		N/A	N/A	
3.2	Terminals and neutral point		N/A	N/A	
3.3	Windings		N/A	N/A	
3.4	Rating		N/A	N/A	
3.5	Tappings		N/A	N/A	
3.6	Losses and no-load current		N/A	N/A	
3.7	Short-circuit impedance and voltage drop		N/A	N/A	
3.8	Temperature rise		N/A	N/A	
3.9	Insulation		N/A	N/A	
3.10	Connections		N/A	N/A	
3.11	Test classification		N/A	N/A	
3.12	Meteorological data with respect to cooling		N/A	N/A	
3.13	Types of transformer	N/A		Type of transformer offered	
4	Service conditions	N/A		N/A	

Clause/Sub-clause	Requirement	Conformance Code IEC 60076-1	Conformance Code ENA TS 35-1 Part 1	Schedule item	Remarks
4.1	General			N/A	
4.2	Normal service conditions		N/A	N/A	
5	Rating and general requirements		N/A	N/A	
5.1	Rated power		N/A	N/A	
5.1.1	General		N/A	N/A	
5.1.2	Preferred values of rated power	N/A		Rated power (kVA)	
5.1.3	Minimum power under alternative cooling modes		N/A	N/A	
5.1.4	Loading beyond rated power		N/A	Overload rating percentage	
5.2	Cooling mode		N/A	Liquid details	
5.4	Rated voltage and rated frequency		N/A	N/A	
5.4.1	Rated voltage		N/A	HV rated voltage (V) LV rated voltage (V)	
5.4.2	Rated frequency		N/A	Rated frequency (Hz)	
5.4.3	Operation at higher than rated voltage and/or at disturbed frequency		N/A	N/A	
5.5	Provision for unusual service conditions				
5.6	Highest voltage for equipment U_m and dielectric test levels				
5.7	Additional information required for enquiry				

Clause/Sub-clause	Requirement	Conformance Code IEC 60076-1	Conformance Code ENA TS 35-1 Part 1	Schedule item	Remarks
5.7.1	Transformer classification	N/A		N/A	
5.7.2	Winding connection and number of phases	N/A		Specify details if applicable	
5.7.3	Sound level	N/A		N/A	
5.7.4	Transport		N/A	N/A	
5.8	Components and materials		N/A	N/A	
6 6.1	Requirements for transformers having a tapped winding General—Notation of tapping range			N/A	
6.2	Tapping voltage—tapping current, etc		N/A	N/A	
6.3	Tapping power—full power tappings—reduced power tappings	N/A		N/A	
6.4	Specification of tappings in enquiry and order	N/A		N/A	
6.5	Specification of short-circuit impedance			Guaranteed Impedance (%) Impedance (%) for 33 kV transformers	
6.5.1	Single-phase transformer arranged to give a 3-wire supply	N/A		N/A	

Clause/Sub-clause	Requirement	Conformance Code IEC 60076-1	Conformance Code ENA TS 35-1 Part 1	Schedule item	Remarks
6.6	Load loss and temperature rise			Maximum no-load loss (W) Maximum load loss (W) or Peak Efficiency Index (PEI) % Regulation (EU) No 548/20: Tier 1 compliance? Tier 2 compliance? Loss capitalization values: No-load loss (£/kW) Load loss (£/kW)	
				Temperature rise Oil (°C) Windings (°C)	
6.6.1	Dual ratio transformers	N/A		N/A	
7	Connection and phase displacement symbols		N/A	N/A	
8	Rating plates		N/A	N/A	
8.1	General		N/A	N/A	
8.2	Information to be given in all cases		N/A	N/A	
8.3	Additional information to be given when applicable			N/A	

Clause/Sub-clause	Requirement	Conformance Code IEC 60076-1	Conformance Code ENA TS 35-1 Part 1	Schedule item	Remarks
9	Safety, environmental and other requirements		N/A	N/A	
9.1	Safety and environmental requirements		N/A	N/A	
9.2	Dimensioning of neutral connection	N/A		Dimensioning of neutral connection	
9.3	Liquid preservation system	N/A		N/A	
9.4	DC currents in neutral circuits			Level of d.c. currents (A)	
9.5	Centre of gravity	N/A		N/A	
10	Tolerances		N/A	N/A	
11	Tests		N/A	N/A	
11.1	General requirements for routine, type and special tests			N/A	
11.1.1	General			N/A	
11.1.2	Routine tests			N/A	
11.1.3	Type tests			Sound Power Level (dBA)	
11.1.4	Special tests			Special tests included in offer	
11.2	Measurement of winding resistance		N/A	N/A	
11.3	Measurement of winding ratio and phase displacement		N/A	N/A	
11.4	Measurement of short-circuit impedance		N/A	N/A	

Clause/Sub-clause	Requirement	Conformance Code IEC 60076-1	Conformance Code ENA TS 35-1 Part 1	Schedule item	Remarks
	and load loss				
11.5	Measurement of no-load loss and current		N/A	N/A	
11.6	Measurement of zero-sequence impedance(s) on 3-phase transformers		N/A	N/A	
11.8	Leak testing with pressure for liquid immersed transformers (tightness test)		N/A	N/A	
11.9	Vacuum deflection test for liquid immersed transformers		N/A	N/A	
11.10	Pressure deflection test for liquid immersed transformers		N/A	N/A	
11.11	Vacuum tightness test on site for liquid immersed transformers		N/A	N/A	
11.12	Check of core and frame insulation		N/A	N/A	
12	Electromagnetic compatibility (EMC)		N/A	N/A	
13	High frequency switching transients		N/A	N/A	
14	Transformer details	N/A		N/A	
14.1	Number of phases	N/A		N/A	
14.2	Surface finish	N/A		Finish colour offered	
14.3	Position and marking of terminals	N/A		N/A	

Clause/Sub-clause	Requirement	Conformance Code IEC 60076-1	Conformance Code ENA TS 35-1 Part 1	Schedule item	Remarks
14.4	Cooling	N/A		Method of liquid preservation	
14.5	Other fittings	N/A		N/A	
14.5.1	Plain breathing device	N/A		N/A	
14.5.2	Tapping switch handle	N/A		N/A	
14.5.3	Earthing terminals	N/A		N/A	
14.5.4	Lifting fittings	N/A		N/A	
15	Documentation	N/A		N/A	
15.1	Drawings	N/A		Electronic drawing format	
15.2	Assembly, operations and maintenance instructions	N/A		Electronic format for instruction manual	
15.2.1	Test data	N/A		N/A	

ENA TS 35-1, Part 2 — Self-Certification Conformance Declaration

Clause/Sub-clause	Requirement	Conformance Code IEC 60076-1	Conformance Code ENA TS 35-1 Part 2	Schedule item	Remarks
2	Normative references			N/A	
3	Terms and definitions			N/A	
3.1	PENDA-TMO			N/A	
3.2	TFX – fusebox			N/A	
4	Additional requirements for ground mounted transformers—not close-coupled	N/A			
4.1	General	N/A		Layout option for not close-coupled transformer	
4.2	Lifting and mechanical properties	N/A		N/A	
4.3	HV terminations	N/A		Type of termination provided	
4.3.1	General	N/A		N/A	
4.3.2	HV side face terminations	N/A		Termination option for side face	
4.3.2.1	HV cable box	N/A		Specification of cable box	
4.3.2.2	HV flange	N/A		Specification of flange Description of flange blanking plate	
4.3.2.3	HV separable connectors	N/A		Specification of termination	
4.3.3	HV top cover terminations	N/A		Specification of terminations Option for cable clamps	

Clause/Sub-clause	Requirement	Conformance Code IEC 60076-1	Conformance Code ENA TS 35-1 Part 2	Schedule item	Remarks
4.4	LV terminations	N/A		Type of termination provided	
4.4.1	General	N/A		N/A	
4.4.2	LV side face terminations	N/A		Bushing plate assembly or cast resin bushing assembly. Cable box fitted or not	
4.4.2.1	LV cable box	N/A		N/A	
4.4.3	LV top cover terminations	N/A		Metal enclosure specification	
4.5	Connection and phase displacement	N/A		Connection symbol	
4.7	Fittings	N/A		N/A	
4.7.1	General	N/A			
4.7.2	Combined drain and sampling valve	N/A		N/A	
4.7.4	Liquid level indication	N/A		Description of provision for external liquid level indicator	
4.7.5	Jacking lugs	N/A		–Height above ground 190mm ± 5mm	
4.7.6	Manual handling	N/A		Description of provision for manual handling	
4.7.7	Earthing terminals	N/A		N/A	
5	Tests for ground mounted transformers—not closed-coupled	N/A		N/A	
5.1	Dielectric test levels	N/A			

Appendix 3: Pre-commission Testing, Routine Inspection and Maintenance Requirements

Suppliers shall provide details of the recommended pre-commission testing and inspection required.
They shall also provide information regarding periodic inspection and maintenance requirements to be undertaken during the lifetime of their product.

Detailed inspection and maintenance instructions shall be also be provided.

Appendix 4: Technical Information Check List

The following information shall be provided by the supplier for technical review by Northern Powergrid.
Additional information shall be provided if requested.

Requirement	Provided (Y/N)
Full product descriptions and part number/reference	
Complete set of drawings for each variant	
Appendix 2a- Completed self-certification conformance declaration against NPS/003/042	
Appendix 2b - Completed self-certification conformance declaration against ENA TS 35-1	
Appendix 3 - Pre-commissioning testing/inspection requirements	
Appendix 3 - Recommended periodical inspection and maintenance requirements	
Appendix 5 – Declaration of Manufacturers, Places of Manufacture, Test & Inspection	
Copies of ISO 9001 certificate of accreditation for main manufacturing facility(s)	
Declaration of technical non-conformances against tech spec clauses	
Type test evidence (summary list and copies of all type test evidence)	
Routine test plan (example)	
Details of Insulating fluid type proposed and confirmation of compliance with NPS/003/019	
COSHH sheets	
UK DNO references/previous customers that have been supplied with these products.	
Copy of pricing schedule template populated with product codes/description	
Work at Heights provision – details of system(s) offered	

Appendix 5: Declaration of Manufacturers, Places of Manufacture, Test & Inspection

Item	Manufacturer's Drawing Number and/or Type Designation	Manufacturer	Place of Manufacture	Place of Testing & Inspection
Transformers complete HV Bushings or separable connectors LV Cable box Neutral Bushings Radiators Pipework Expansion Devices Oil valves Dehydrating Breather Gas and Oil Actuated Relay(s) Outdoor Marshalling/Control Box Temperature Indicating Devices Material for Anti-Vibration Mounting				
Any subsequent deviation from this declaration schedule shall be notified in writing as soon as possible for the Purchaser's approval.				