NPS/003/005 – Technical Specification for LV PENDA ASSEMBLIES and TFX ASSEMBLIES

1. Purpose

The purpose of this document is to detail the technical requirements for Public Electricity Network Distribution Assemblies (PENDAs)* for use on Northern Powergrid's Low Voltage networks.

* Formerly referred to as: fuseboards, fusepillars, fusecabinets and feeder pillars.

This document supersedes the following documents, all copies of which should be destroyed;

Document Reference	Document Title	Version	Published Date
NPS/003/005	Technical Specification for LV PENDA ASSEMBLIES and TFX ASSEMBLIES	6.0	May 2020

2. Scope

This specification covers the technical requirements for PENDAs (Public Electricity Network Distribution Assemblies) * for use on the Low Voltage distribution networks of Northern Powergrid.

* Formerly known as: LV boards, fuse boards, fuse pillars, fuse cabinets and feeder pillars.

The relationships between PENDAs and historical designations are:

i. PENDA-I: - Substation cable distribution board – Indoor, wall/ground mounted fuseboard.

ii. PENDA-CCO: - Substation cable distribution pillar – outdoor, ground mounted pillar.

iii. PENDA-TMO: - Substation cable distribution cabinet – outdoor, transformer mounted fuse cabinet.

iv. TFX-Fusebox: – outdoor, transformer mounted cabinet (without transformer links).

v. PENDA-CCO-(Feeder Pillar): - Street furniture cable distribution/feeder /feeder /feeder pillar, without Incoming transformer units – outdoor, ground mounted feeder pillar.

The following appendices form part of this technical specification:

- Appendix 1 - Addendum to Supplier Requirement
- Appendix 2 - Summary of Variants
- Appendix 3 - Logistical requirements
- Appendix 4 - Self-Certification Conformance Declaration
- Appendix 5 - Technical Information Check List

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.

2.1. Table of Contents

3. Technical Requirements

3.1. General

The equipment shall comply with the latest version of Energy Networks Association Technical Specification ENA TS 37-2 Public Electricity Network Distribution Assemblies, unless varied by this specification; in which case this specification shall take precedence.

The equipment shall also comply with the latest versions of BS EN 61439-1 and BS EN 61439-5 Low Voltage Switchgear and Controlgear Assemblies and all other relevant IEC International Standards, British Standard Specifications or equivalent Euro-Norms, and Energy Networks Association Technical Specifications (ENA TS) at the time of supply, except where varied by this standard.

3.2. Variations to ENA TS 37-2

The following are intended to highlight or are additional requirements to ENA TS 37-2, therefore the Clause numbers in this section relate to ENA TS 37-2 and are represented in *italics*:

1 - Scope:

Requirements for the addition of a 1600kVA transformer to ENA TS 35-1

3.1.207 – Fuse carrier

Fuse carriers shall NOT be made of porcelain

6.1 – Assembly designation marking

Name plate to also include:

(vi) Normal current rating of the outgoing distributor units (cable feeder ways).

8.1. – Mechanical design

PENDAs and TFX-Fusebox ASSEMBLIES that have doors shall be capable of opening fully to 180^0 AND be provided with either:

- door stays to allow the door to be held open in the 90^0, 135^0, 180^0 positions and include an emergency push release on the stay to release the door to full 180^0 position, or
- door stays to allow the door to be held open in the 90^0 and 180^0 positions and include an emergency push release on the stay to releases the door to full 180^0 position, or
- door stays to allow the door to be held open in the 90^0 and include an emergency push release on the stay to releases the door to full 180^0 position.

PENDAs with more than 6 outgoing fuseways shall have the option to be equipped with a centrally hinged folding (bifold) door or with two doors.

8.2 - Degree of protection provided by an Assembly enclosure

All PENDAs shall be insulated, shielded type units designed to prevent inadvertent access to live parts.

The option for an un-switched metal clad heater, rated between 100W and 150W, shall be provided.

8.3 – Creepage and clearance distances

Clause 8.3 of ENA TS 37-2 applies to both Indoor and Outdoor ASSEMBLIES.

8.5.3.a – Outgoing distributor units

Facilities for padlocking outgoing distributor units in the open position shall be provided as standard.

The option shall be provided for all outgoing distributor ways to have current sensing elements factory fitted to the outgoing phases and neutral. These shall conform to clause 3.2.13.2 of Northern Powergrid NPS/ 007 / 021 – Technical Specification for Secondary Distribution Substation Monitoring Systems.

Suitable current sensors such as Split core Current Transformers or Rogowski Coils shall be supplied Class 1 accuracy up to normal full fault rating.

The secondary output wiring for all of these current sensors, including those associated with the Maximum Demand Indicators (8.5.3d) shall be terminated into an accessible test block/marshalling point within the PENDA incorporating shorting / sliding links, as necessary.

The location of this marshalling point shall be chosen with due consideration for retro-fit accessibility and shall not require the PENDA to be taken out of service when required to be used.

The secondary output wiring for all of these current sensors, including those associated with the Maximum Demand Indicators (8.5.3d) and the Voltage Terminal circuit associated with the Busbars (3.3.3) shall be terminated into an accessible test block/marshalling point within the PENDA incorporating shorting / sliding links, as necessary.

8.5.3. a. a – Outgoing Distributor Units – Standard range

Distributor units on TFX-Fusebox ASSEMBLIES shall be designed to accommodate:

- Fuse carriers fitted with 92mm terminal centre fuse links to BS HD 60269-2, BS 88-2 and
- Modern fault management and smart grid equipment with 92mm centres.

8.5.3. a. b. 1 – 400A Fuseway

400A distributor units shall have 92mm fuse centres.

8.5.3.a.b.9 – Circuit Breaker

The Circuit Breaker shall be rated and tested for “Isolation (isolation function) for safety purposes” in accordance with BS EN 60947-1 and BS EN 60947-2

8.5.3.d – Maximum Demand Indicators (MDIs)

The incoming way of the PENDA shall be supplied equipped with a method for measuring, displaying and recording the Maximum demand (load) that has occurred on each Phase of the PENDA. This shall be achieved by:

- Basic Thermal Demand Indicators driven by class 1 current transformers or,
- Electronic Maximum demand measuring device.

This device may be a multi-channel input device or three single channel input devices, but in any case, all three input phases shall be measured and indicated. This device shall indicate and record from current sensing elements with an accuracy of Class 1 up to normal full-scale deflection.

It is NOT necessary to equip PENDA CCO-(Feeder Pillar) with MDIs

The PENDA shall be arranged to allow the retrofitting of a further measuring instrument(s) for metering or monitoring as detailed in Clause *8.5.3*

Connections between any instrument CTs and the maximum demand indicator(s) shall be via a readily accessible test block or marshalling box that permits the existing metering/measuring device to be removed while the PENDA is live without open-circuiting the CTs and permits either a like-for-like replacement or the ready installation of connections to a new instrument. Suppliers shall take into consideration the operability of the test block/marshalling point in terms of its proximity and position to incoming / outgoing cables that will be connected. These must not interfere with or limit the use of the test block/marshalling point by blocking access.

The connections and any links available shall be supplied set in a position that puts the indicator into circuit so that it will measure and display by default.

The PENDA shall be arranged so that the removal of the device and/or the retro fitting of another device shall not compromise the IP rating of the PENDA.

8.5.3.e 13A switched socket

All PENDAs shall be supplied equipped with a user 230VAC 13A double socket outlet conforming to 18th Edition BS7671. Socket RCDs are not acceptable. Protection shall be provided by a Passive (latching) RCD in the format of an upstream 2 pole, 30mA RCBO suitably rated for the socket outlet. This circuit arrangement shall be capable of isolation by removal of a fuse-link.

The user socket 13A outlet circuit shall be provided in such a way that permits the existing RCD and socket arrangement to be removed while the PENDA is live and replaced with a like-for-like or equivalent device without affecting the IP rating of the primary equipment and without requiring access to live parts.

The requirement for provision of 13A sockets does NOT apply to TFX fuse boxes.

8.8 – Terminals for external conductors

PENDAs and TFX-Fuse boxes shall also be designed to accommodate the following cable types:

a) Incoming Transformer Unit Cables:

For incoming cables from the transformer, the design shall have 4 x 10mm fixing points, provision for earthing the earth screen wires at the ASSEMBLY and shall also be able to accommodate cable arrangements that are multiples of:

i. 1-core armoured stranded Copper 800mm² to BS 5467, Table 4.

ii. 1 core sectoral Aluminium XLPE insulated up to 480mm² to BS7889, Table 4.

iii. 3-core 185mm^2 waveform cable to BS7870 3.40 (all cores connected together) and terminated in a single lug. An arrangement shall be available to terminate the screen wires to the neutral busbar.

To allow the on-site selection of cable types the PENDAs shall be manufactured with termination arrangements as detailed in Appendix 9.

b) Outgoing Distributer unit Cables:

i. 300mm² 3-core combined Neutral Earth (CNE) and 4-core Separate Neutral Earth (SNE) Waveform to BS7870 3.40.

c) All outgoing distributer units shall be supplied and fitted with suitable range taking mechanical shear bolt clamps for terminating the solid aluminium phase cores of the 3 and 4-core cables, the solid aluminium neutral core on a 4-core cable and the copper stranded neutral/earths within the 3 and 4-core cables.

d) PENDA's that incorporate customer ACB's shall have the same number of connection points on each phase AND on the Neutral bar to facilitate full size Neutral as per ICP/IDNO/Customer requirements to BS 7671:2018

8.102 – Ease of operation and maintenance

All PENDAs: CCO, CCO- (Feeder Pillar), TMO and TFX housings:

(a) Shall be intruder resistant.

(b) Shall have factory fitted option(s) for higher security rated units.

(c) Shall be security upgradeable on site, preferably without having to make the PENDA dead.

Units rated as outdoor shall have, at least, the following locking features:

On the primary door (the first one to open) -

(d) Facilities for a Northern Powergrid high security padlock (halfway up the door) this can be achieved by a hasp and staple arrangement or can be integral to a door handle.

(e) This padlock facility shall have a padlock protector that prevents direct physical attack on the padlock hasp and upper body and provides protection from the elements – see Appendix 7.

(f) Two 8mm Tri Head locks (one at the door top and one at the bottom), both of these shall be recessed and shall be covered/ protected by a two-hole cover – see Appendix 7.

On the second door, if present -

(g) Two, internally mounted, tower bolts (one at the door top and one at the bottom)

8.102.1 – Reserve Power

PENDA-Is, PENDA-CCOs, PENDA-CCO-(Company Network Feeder Pillar)s and PENDA-TMOs shall be equipped to allow the connection of external devices, such as mobile generators, via temporary leads equipped with Industry standard single pole power connectors POWERLINE, ITT VEAM type connectors that are compatible with Northern Powergrid's generator leads.

There shall be four primary connection sockets per set, and these shall be colour coded Brown (L1), Black (L2), Grey (L3) and Blue (N).

It is NOT necessary to equip the following PENDAs with mobile generator connections.

- TFX-Fusebox
- PENDAs fitted with LV metering CBs and which do NOT have any outgoing distributor units
- PENDA -CCO (Feeder Pillar)s for customer / IDNO point-of-connection (POC)

PENDA-Is, PENDA-CCOs, PENDA-CCO-(Company Network Feeder Pillar)s and PENDA-TMOs with 800A busbar ratings shall be equipped with one set of generator connections to allow one cable connection per phase and one neutral cable connection.

PENDA-Is, PENDA-CCOs, PENDA-CCO-(Company Network Feeder Pillar)s and PENDA-TMOs with busbar ratings of 1250A or above shall be equipped with two sets of generator connections to allow two cable connections per phase and two neutral cable connections.

The PENDA shall be designed and manufactured to allow the door(s) of the PENDA to be closed and locked whilst generator leads are connected and in service. This arrangement shall not affect the degree of protection offered (IP33 according to BS EN 60529).

PENDA-Is, PENDA-CCOs and PENDA-TMOs shall be supplied equipped with two sets of three phase and neutral test sockets suitable for 4mm test plugs as described in ENA TS 37-2;

Binding post types are NOT acceptable.

Test sockets shall be compatible with fully shrouded retractable 4mm 600V Cat II rated test leads.

PENDA-CCO-(Feeder Pillar)s for customer / IDNO point-of-connection (POC) shall be supplied equipped with one set of these test sockets. PENDA-CCO-(Company Network Feeder Pillar)s shall have two sets.

The areas around all of these test sockets shall be insulated for a minimum distance of 13mm from the outside edge of the test socket in order to reduce the risk of a short circuit during lead insertion/removal, connection of crocodile clips, etc.

To allow current measurements to be made on each phase of each feeder the design of the ASSEMBLY shall allow for the safe and practical use of a clip-on ammeter.

8.201.c.2 – Security Padlock

An additional high security anti-tamper lock cloaking device in accordance with NPg Drawing Ref C9993354 shall be provided as an option on **PENDA-CCO (Feeder pillar)s** to provide additional shielding against lock tampering in vulnerable situations.

10.9.101. b – Fuse Carriers - Handle wedge operating mechanisms

The design of the thumbscrews must ensure that when in position, the whole fuse ASSEMBLY cannot be dismantled, even when the thumbscrews are released to their full extremities.

10.10 Verification of temperature-rise limits

For outdoor ASSEMBLIES, manufacturers shall demonstrate (by test or technical justification/ calculation) that the influence of solar radiation up to a level of 1000W/m² has been taken into account in the testing of outdoor equipment and that this will not cause damage and not affect the performance of the ASSEMBLIES.

3.3. Additional Items

3.3.1. Use of circuit energisation and fault location equipment

PENDA-Is, PENDA-CCOs PENDA-TMOs and PENDA-CCOs- (Company Network Feeder Pillar) shall be designed and constructed to allow the use of modern devices for circuit energisation and fault location on the outgoing feeder ways and this shall be possible with the PENDA door(s) closed and locked. Please refer to Appendix 2 for more details.

For Northern Powergrid the circuit energisation and fault location equipment that the PENDA shall accommodate currently includes the following:

KELVATEC:

BIDOYNG

WEEZAP

REEZAP MODULAR

GATEWAY (PENDA design shall allow the aerial to be mounted outside the PENDA)

EA Technology

ALVIN

Preferably the unit should also be able to accommodate:

KELVATEC:

REEZAP Faultmaster

3.3.2. Phase Reversal Kit

Northern Powergrid operates HV Distribution networks at 11kV and 20kV. These do not share the same phase rotation. To standardise the LV Phase relationships between these for the purposes of LV interconnections between 11kV and 20kV substations, there is a requirement to transpose the L1 BROWN (old RED) and L3 GREY (old BLUE) before the incoming transformer unit disconnector on ASSEMBLIES to be used at Northern Powergrid 20kV substations.

The ASSEMBLY, when equipped with a phase reversal kit, shall be fully rated and tested to at least the same rating as the associated ASSEMBLIES and shall not be compromised by the fitting of this kit.

ASSEMBLIES fitted with a phase reversal kit shall be no larger than the standard unit

PENDA-Is, PENDA-CCOs and PENDA-TMOs shall be capable of being:

- Supplied with a phase reversal kit fitted, or
- Retrofitted with a phase reversal kit.

The phase reversal kit shall include a label, suitable for attaching to the PENDA, which clearly identifies the ASSEMBLY as having L1 and L3 Phase Reversed.

ASSEMBLIES with factory fitted phase reversal kits shall have this label factory fitted at the time that the kit is fitted.

3.3.3. Metering Bulk LV Supplies to Northern Powergrid Customers.

Customers requiring LV supplies in the range 300kVA – 1700kVA may have metered supplies provided via a low voltage circuit breaker (LV CBs) integrated in a PENDA.

These PENDAs shall include features to allow compliance with the relevant Code of Practice; either 5 (CoP5) or 3 (CoP3) of the UK Balancing and Settlement Code for the Electricity Industry in Great Britain.

Northern Powergrid Network Product Specifications:

- NPS/002/031 applies to CoP5 products and,
- NPS/002/033 applies to CoP3 products.

These features shall include:

- Metering class CTs
- Metering fuses
- Terminal test block

The CT and metering fuse wiring shall terminate into an easily accessible terminal test block within the PENDA suitable for company test access that will remain accessible and operable even when all outgoing ways / cables are connected.

This test block shall be so positioned and constructed that should the need arise; a multi-core cable can be safely terminated whilst the main busbars and any outgoing ways are LIVE and in service without risk of inadvertent or accidental contact with live conductors.

There shall also be an option for an external LV metering marshalling panel terminal test block in a factory-fitted housing on the outside of the PENDA. It shall allow access to the terminals and installation of the outgoing metering wiring loom whilst the PENDA door is closed and secured.

The purpose of these LV metering terminal blocks is to provide an accessible termination point for metering wiring to a Metering Panel conforming to Northern Powergrid NPS/002/031 or NPS/002/033 as relevant.

The terminals shall be labelled and shall include:

- 6 x CT terminals (two for each of the three CTs):
    - These terminals shall be spring loaded or cage clamp design and shall have a shorting/disconnecting facility.
    - The wiring from the CTs in the PENDA shall be terminated into these terminals.
    - The CT S2 returns from each individual CT shall be wired in star connection to earth via a common sliding link that disconnects the earth for testing purposes
    - The PENDA shall be supplied with the CTs shorted

- 4 x metering voltage connection terminals individually fused at 2 amps in the phases and with an isolating link in the neutral.
    - L1, L2,L3, N.

Where the option for an additional LV Metering marshalling panel is specified, then the above terminals shall be extended or replicated within the marshalling panel with the following alterations:

- The CT S2 returns links (shorting) shall be in the outgoing side of the CT connections within the marshalling panel rather than the terminals within the PENDA
- A directly connected (<1Ω) earth terminal suitable for connecting 4 x 2.5mm^2 earth cables shall be available.

General Information

To minimise logistics options for the supplier and Northern Powergrid, the preferred CB normal current ratings for use in Northern Powergrid are: 800 A, 1250A, 1600 A, 2000 A and 2500 A.

These five CB ratings shall have continuous/overlapping ranges of protection.

The LV CBs shall be fully rated as suitable for “isolation (isolating function) for safety purposes” in accordance with BS EN 60947 1 and BS EN 60947 2.

PENDAs fitted with LV CBs shall, as default, also be equipped with a remote emergency shunt trip facility that has a range taking input. The range shall include 30V DC and 110V AC.

A suitably rated transformer LV disconnector that controls both the CB and the outgoing distributor units shall be provided.

Options shall be available for close coupled and free-standing PENDA versions, without any outgoing distributor ways. These ACB only units do NOT need to have transformer LV disconnectors, or generator sockets and 4mm test points, but shall have the other features of the PENDAS specified in this document.

3.3.4. Compatibility with a Secondary Distribution Substation Monitoring System

Northern Powergrid’s Smartgrid implementation program includes the retro-fitting of monitoring equipment onto LV substation assets for the purposes of measuring and collecting real-time data such as voltage, current and other calculated parameters such as power flow, power factor and harmonic distortion at a secondary distribution network level.

“IMP/001/017 – Standard for the Application of System Monitoring” defines the standard power system parameters that are to be monitored in order to aid the efficient design, planning and control of the electricity distribution system.

“NPS/007/021 – Technical Specification for Secondary Distribution Substation Monitoring Systems” provides details of the requirements of this system which may be retro-fitted to any **PENDA-I or PENDA-CCO or PENDA-TMO.**

Further to clause 8.5.3.a of this document (NPS/003/005), the PENDA shall be designed in such a way that where current sensing elements are not factory fitted on all outgoing distributor ways, that they can be retro-fitted on-site with the PENDA in its final location and cabled up. The supplier shall provide instructions and a method for gaining access to those internal parts and areas that would be required to retro-fit such a system.

Whilst the LV Monitoring control unit will be of a dimensional size that allows it to be accommodated within the PENDA cabinet/enclosure, this may not be possible due to other limiting factors. In this case, the LV monitoring unit will be attached to the outside of the PENDA cabinet/enclosure using integral magnetic holders on the monitoring unit. On outdoor substations where the PENDA is not within a building or enclosure, this will expose the LV monitoring unit to a risk of impact by objects thrown or propelled at it.

Suppliers shall therefore provide an optional Guard constructed of the same grade material and finish as the PENDA cabinet/enclosure that can be fixed to:

- either the right- or Left-hand side of a PENDA-CCO, and
- the Left-hand side of a PENDA-TMO

to provide a degree of mechanical protection.

The Guard does not need to fully enclose the LV Monitoring unit, but should be open at the top and bottom so as to create a "channel" with three sided protection to accommodate the monitor and cabling. The depth of the channel shall be a minimum of 200mm and maximum of 250mm and run the full height of the PENDA with an extended lip at the bottom to guide cabling under the PENDA.

Appendix 6 is an example diagram of this guard. The guard shall be able to be fitted and secured in place with the PENDA LIVE and in service without drilling or compromising the PENDA enclosure. It is therefore necessary to have fixings for the guard pre-manufactured into all PENDA-CCO and PENDA-TMO products in case a guard is needed in the future. The addition of guard fixings shall not compromise the PENDA IP Rating.

4. References

4.1. External Documentation

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 (ENATS) current at the time of supply in this respect the following documents are particularly relevant.

Reference	Title
BS 5467 : 2016	Electric cables. Thermosetting insulated, armoured cables for voltages of 600/1000 V and 1900/3300 V
BS 7671:2018	Requirements for Electrical Installations. IET Wiring Regulations – 18th Edition
BS 7870-3.40 : 2011	LV and MV polymeric insulated cables for use by distribution and generation utilities.
BS 7889 : 2012	Electric cables. Thermosetting insulated, unarmoured cables for a voltage of 600/1000 V
BS EN 60529 :1992 +A2 :2013	Specification for the degree of protection provided by enclosures (IP Code)
BS EN 60870-5-104:2006+A1:2016	Telecontrol equipment and systems. Transmission protocols. Network access for IEC 60870-5-101 using standard transport profiles
BS EN 60947-1 : 2007+A2:2014	Low-voltage switchgear and controlgear. General rules
BS EN 60947-2 : 2017	Low-voltage switchgear and controlgear. Circuit-breakers
BS EN 61439 - 1 : 2021	Low-voltage switchgear and controlgear assemblies. General rules
BS EN 61439 -5 : 2015	Low-voltage switchgear and controlgear assemblies. Assemblies for power distribution in public networks
BS HD 60269-2 : 2013, BS 88-2 : 2013	Low-voltage fuses. Supplementary requirements for fuses for use by authorized persons (fuses mainly for industrial application). Examples of standardized systems of fuses A to K
ENA TS 35-1 : Issue 7(2020)	Distribution Transformers (from 16kVA to 2000kVA)
ENA TS 37-2: Issue 5 (2012)	Public Electricity Network Distribution Assemblies
The UK Balancing and Settlement Code for the Electricity Industry in Great Britain	Balancing and Settlement Code (BSC) Published by OFGEM (ofgem.gov.uk).

4.2. Internal Documentation

Reference	Title
C9993354 Revision A	Hi Security Lock Cloaking device drawing
IMP/001/017	Standard for application of System monitoring – new ground mounted distribution substation monitoring and substations retrofitted with monitoring equipment
NPS/002/031	Technical Specification for Metering Base/Panel Unit for Connection to Heavy Duty Cut outs from 100-500Amps with Integral Current Transformers and LV Air Circuit Breakers in accordance with CoP5 up to 1MW
NPS/002/033	Technical Specification for Metering Base/Panel Unit for Connection to LV Metering Circuit Breakers in accordance with CoP3 up to a circuit capacity not exceeding 10MVA
NPS/007/021	Technical Specification for Secondary Distribution Substation Monitoring Systems

4.3. Amendments from Previous Version

Reference	Subject	Description
3.2 (8.102.1)	PENDA-CCO	Introduction of different types of PENDA-CCO in the form of an ICP/IDNO use type and a Company Network type to differentiate on required features.
3.2 (8.102.1)	Test sockets on PENDA-CCO Feeder Pillars	Amended instruction for 1 set of Test sockets to only apply to ICP/IDNO Feeder Pillars
3.3 (8.8 d)	Neutral connections	Reworded to require the same number of connection points on the Neutral as are available on each phase conductor (2/2. 3/3 etc)
3.3.3	Metering Bulk LV supplies	Amended and updated to align with current IMP version and also additional NPS for CoP 3 Metering units.

5. Definitions

Term	Definition
Circuit Breaker	Air Circuit Breaker (ACB) or Mould Case Circuit Breaker (MCCB)
CNE	Combined Neutral Earth
ENA TS	Energy Networks Association Technical Specification
PENDA - CCO	Free Standing Outdoor Ground Mounted Fusepillar
PENDA - I	Indoor Wall Mounted Fuseboard
PENDA - TMO	Outdoor Transformer Mounted Fusecabinet
PENDAs	Public Electricity Network Distribution Assemblies
SNE	Separate Neutral Earth
TFX-Fusebox	(Transformer Mounted Fusebox) Outdoor, transformer mounted (without transformer links).

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.

		Date
Liz Beat	Governance Administrator	09/11/2022

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:** Update will be dictated by contract renewal date or any significant changes in the specification or documents referenced
Should this document be displayed on the Northern Powergrid external website?		Yes

		Date
Alan MacDonald	Policy & Standards Engineer	10/11/2022

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.

		Date
Mark Marshall	Reliability Engineering Manager	24/11/2022
Malcolm Grisdale	Operational Technology Architect	24/11/2022
Michael Crowe	Technical Services Manager	10/11/2022
Warren Lacey	Engineer - Metering Systems	14/11/2022
Joe Helm	Policy & Standards Manager	18/11/2022

6.4. Authorisation

Authorisation is granted for publication of this document.

		Date
Paul Black	System Engineering Manager	21/12/2022

Appendix 1 – Addendum to Supplier Requirements

Items to be supplied with each and every PENDA and TFX-Fusebox

Copies of routine test results:

These shall include a listing of the results of micro-ohmmeter tests of the resistance between the incoming, transformer side, busbars and each of the outgoing contacts. This test shall be done at the end of all production procedures, but before any over voltage tests.

One copy to be supplied as a weatherproof, durable, hard copy attached to the unit being supplied and one copy to be supplied electronically.

Handling Instructions:

A weatherproof, durable, permanently fixed label with lifting/slinging arrangements with and without packaging shall be attached to the ASSEMBLY.

This label shall include, at least: gross weight, attachment/lifting points, recommended slinging arrangements and indication of centre of gravity.

If appropriate this label shall be repeated on the outside of the packaging.

Appendix 2 – Summary of Variants

Northern Powergrid will not require all of these to be standard contract items.
All variants are listed here because they are acceptable, and might be required in non-standard scenarios, for use on the Northern Powergrid networks.

Variant	Indoor Or Outdoor	Northern Powergrid Reference & Commodity code	Busbar Rating Amps (A)	Incoming Way (Tx circuit) Cable Entry	Disconnector (Tx) isolation links on Incoming Way	Number of Outgoing Distributor Ways	Generator Connections	LV CB WITH Metering CTs	Fault Location Equipment
PENDA-I Substation cable distribution board Wall mounted 1600 A, 7 or 8 way, with Tx Disconnector	Indoor	218596	1600 A	Top RHS	Yes – on RHS	7 (or 8)	2 sets		Clause 3.3.1
		218606	1600 A	Bottom RHS	Yes – on RHS	7 (or 8)	2 sets		Clause 3.3.1
		218603	1600 A	RHS Side	Yes – on RHS	7 (or 8)	2 sets		Clause 3.3.1
		218599	1600 A	LHS Side	Yes – on LHS	7 (or 8)	2 sets		Clause 3.3.1
PENDA-I Substation cable distribution board Wall mounted 1600 A, 5 or 6 way, with Tx Disconnector	Indoor	218595	1600 A	Top RHS	Yes – on RHS	5 (or 6)	2 sets		Clause 3.3.1
		218605	1600 A	Bottom RHS	Yes – on RHS	5 (or 6)	2 sets		Clause 3.3.1
		218601	1600 A	RHS Side	Yes – on RHS	5 (or 6)	2 sets		Clause 3.3.1
		218598	1600 A	LHS Side	Yes – on LHS	5 (or 6)	2 sets		Clause 3.3.1
PENDA-I Substation cable distribution board Wall mounted 1600 A, 9 or 10 way, with Tx Disconnector	Indoor	TBA	1600A	Bottom RHS	Yes – on RHS	9 (or10)	2 sets		Clause 3.3.1
		TBA	1600A	Bottom LHS	Yes – on RHS	9 (or 10)	2 sets		Clause 3.3.1
	Outdoor	218581	800 A	Not Applicable	Yes – on RHS	3 (or 4)	1 set		Clause 3.3.1

PENDA-TMO Substation cable distribution board Transformer mounted With Tx Disconnector		218582	1600 A	Not Applicable	Yes – on RHS	5 (or 6)	2 sets		Clause 3.3.1
		218583	1600 A	Not Applicable	Yes – on RHS	7 (or 8)	2 sets		Clause 3.3.1
		206449	1600 A	Not Applicable	Yes – on RHS	9 (or 10)	2 sets		Clause 3.3.1
PENDA-TMO – L1 & L3 PHASE REVERSED For Northern Powergrid 20kV network Substation cable distribution board Transformer mounted With Tx Disconnector	Outdoor	218625	800 A	Not Applicable	Yes – on RHS	3 (or 4)	1 set		Clause 3.3.1
		218626	1600 A	Not Applicable	Yes – on RHS	5 (or 6)	2 sets		Clause 3.3.1
		218627	1600 A	Not Applicable	Yes – on RHS	7 (or 8)	2 sets		Clause 3.3.1
		218635	1600 A	Not Applicable	Yes – on RHS	9 (or 10)	2 sets		Clause 3.3.1
PENDA-CCO-Customer / IDNO (Feeder Pillar) Street Furniture cable distribution board Free standing LV pillar	Outdoor	IDNOCCO-800-2	800A	Not Applicable	None	1	None		None
		IDNOCCO-800-4	800A	Not Applicable	None	3	None		None
PENDA-CCO-(Company Network Feeder Pillar) Street Furniture cable distribution board Free standing LV pillar	Outdoor	CCO800-4WAY	800 A	Not Applicable	None	3	1 set		Clause 3.3.1
		CCO1600-6WAY	1600 A	Not Applicable	None	6	2 sets		Clause 3.3.1
		CCO1600-8WAY	1600 A	Not Applicable	None	8	2 sets		Clause 3.3.1
PENDA-CCO Substation Cable Distribution board Free standing LV Pillar	Outdoor	218585	1600A	Bottom RHS	Yes – on RHS	5 (or 6)	2 sets		Clause 3.3.1
		218586	1600A	Bottom RHS	Yes – on RHS	7 (or 8)	2 sets		Clause 3.3.1
PENDA-TFX-Fusebox Transformer mounted	Outdoor	TFX800-2	800 A	Not Applicable	None	2	None		No

Appendix 2 – Summary of Variants (continued)

Variants with LV Circuit Breaker

Variant	Indoor Or Outdoor	Northern Powergrid Reference & Commodity code	Busbar Rating Amps (A)	Incoming Way (Tx circuit) Cable Entry	Disconnector (Tx) isolation links on Incoming Way	Number of Outgoing Distributor Ways	Generator Connections	LV CB WITH Metering CTs	Fault Location Equipment
PENDA-TMO Substation cable distribution board Transformer mounted With Tx Disconnector, LV CB and 2 outgoing ways	Outdoor	218617	1250 A	Not Applicable	Yes – on RHS	2	2 sets	800 A	Clause 3.3.1
		218618	2000A	Not Applicable	Yes – on RHS	2	2 sets	1250A	Clause 3.3.1
		218619	2000 A	Not Applicable	Yes – on RHS	2	2 sets	1600 A	Clause 3.3.1
		TMOCB2000-2	2500 A	Not Applicable	Yes – on RHS	2	2 sets	2000 A	Clause 3.3.1
		TMOCB2500-2	2500 A	Not Applicable	Yes – on RHS	2	2 sets	2500 A	Clause 3.3.1
PENDA-TMO Substation cable distribution board Transformer mounted With LV CB only	Outdoor	218614	800 A	Not Applicable	None	None	None	800 A	No
		218615	1250A	Not Applicable	None	None	None	1250A	No
		218616	1600 A	Not Applicable	None	None	None	1600 A	No
		TMOCB2000	2000 A	Not Applicable	None	None	None	2000 A	No
		218624	2500 A	Not Applicable	None	None	None	2500 A	No
PENDA-TMO – L1 & L3 PHASE REVERSED For Northern Powergrid 20kV network Substation cable distribution board Transformer mounted	Outdoor	218631	1250 A	Not Applicable	Yes – on RHS	2	2 sets	800 A	Clause 3.3.1
		218632	2000A	Not Applicable	Yes – on RHS	2	2 sets	1250A	Clause 3.3.1
		218633	2000 A	Not Applicable	Yes – on RHS	2	2 sets	1600 A	Clause 3.3.1

With Tx Disconnector, LV CB and 2 outgoing ways		TMOCBPR2000-2	2500 A	Not Applicable	Yes – on RHS	2	2 sets	2000 A	Clause 3.3.1
		TMOCBPR2500-2	2500 A	Not Applicable	Yes – on RHS	2	2 sets	2500 A	Clause 3.3.1
PENDA-TMO – L1 & L3 PHASE REVERSED For Northern Powergrid 20kV network Substation cable distribution board Transformer mounted With LV CB only	Outdoor	218628	800 A	Not Applicable	None	None	None	800 A	No
		218629	1250A	Not Applicable	None	None	None	1250A	No
		218630	1600 A	Not Applicable	None	None	None	1600 A	No
		TMOCBPR2000	2000 A	Not Applicable	None	None	None	2000 A	No
		218634	2500 A	Not Applicable	None	None	None	2500 A	No
PENDA-CCO (indoor) Substation cable distribution board Free standing pillar/cabinet With LV CB only	Indoor	218620	800 A	Bottom	None	None	None	800 A	No
		218621	1600 A	Bottom	None	None	None	1600 A	No
		CCOCB2000	2000 A	Bottom	None	None	None	2000 A	No
		CCOCB2500	2500 A	Bottom	None	None	None	2500 A	No

Appendix 2 – Summary of Variants (continued)

Miscellaneous Options and Variations

Option / Variance Description	Indoor Or Outdoor or Both	Northern Powergrid Reference	Busbar Rating Amps (A)
L1-L3 Phase reversal kit for retrofitting to Tx mounted PENDA TMOs	Both	PR-KT-TMO800	800 A
L1-L3 Phase reversal kit for retrofitting to Tx mounted PENDA TMOs	Both	PR-KT-TMO1250	1250 A
L1-L3 Phase reversal kit for retrofitting to Tx mounted PENDA TMOs	Both	PR-KT-TMO1600	1600 A
L1-L3 Phase reversal kit for retrofitting to Tx mounted PENDA TMOs	Both	PR-LT-TMO2000	2000 A
L1-L3 Phase reversal kit for retrofitting to Tx mounted PENDA TMOs	Both	PR-KT-TMO2500	2500 A
Emergency Remote Trip Button for use with LV CB shunt trip	Indoor	EMO-CB-TRIP	----
Higher security door/features for Tx mounted PENDA TMOs	Outdoor	HISEC-TMO	-----
Higher security door/features for free standing PENDA CCO	Outdoor	HISEC-CCO	-----
LV Monitoring - Current sensing on all outgoing phases and neutral on PENDA-I (5 or 6) ways	Indoor	LVMON-I-5/6	1600 A
LV Monitoring - Current sensing on all outgoing phases and neutral on PENDA-I (7 or 8) ways	Indoor	LVMON-I-7/8	1600 A
LV Monitoring - Current sensing on all outgoing phases and neutral on PENDA-TMO (3 or 4) ways	Both	LVMON-TMO-3/4	800 A
LV Monitoring - Current sensing on all outgoing phases and neutral on PENDA-TMO (5 or 6) ways	Both	LVMON-TMO-5/6	1600 A
LV Monitoring - Current sensing on all outgoing phases and neutral on PENDA-TMO (7 or 8) ways	Both	LVMON-TMO-7/8	1600 A
LV Monitoring - Current sensing on all outgoing phases and neutral on PENDA-TMO (9 or 10) ways	Both	LVMON-TMO-9/10	1600 A

Appendix 2 – Summary of Variants (continued)

Miscellaneous Options and Variations (continued)

Option / Variance Description	Indoor Or Outdoor or Both	Northern Powergrid Reference	Busbar Rating Amps (A)
LV Monitoring - Current sensing on all outgoing phases and neutral on PENDA-CCO8002WAY	Outdoor	LVMON-CCO2WAY	800 A
LV Monitoring - Current sensing on all outgoing phases and neutral on PENDA-CCO8004WAY	Outdoor	LVMON-CCO4WAY	800 A
LV Monitoring - Current sensing on all outgoing phases and neutral on PENDA-CCO8005WAY	Outdoor	LVMON-CCO5WAY	800 A
LV Monitoring - Current sensing on all outgoing phases and neutral on PENDA-CCO8006WAY (218585)	Outdoor	LVMON-CCO6WAY	1600 A
LV Monitoring - Current sensing on all outgoing phases and neutral on PENDA-CCO8007WAY	Outdoor	LVMON-CCO7WAY	1600 A
LV Monitoring - Current sensing on all outgoing phases and neutral on PENDA-CCO8008WAY (218586)	Outdoor	LVMON-CCO8WAY	1600 A
LV Monitoring - Current sensing on all outgoing phases and neutral on PENDA-CCO8009WAY	Outdoor	LVMON-CCO9WAY	1600 A
Heater option	Both	PENDA-HEATR	-----
Provision for supplying a PENDA with an isolating transformer for use at hot sites.	Both	PENDA-ISO-TX	-----

Appendix 3 - Logistical Requirements

To enable Northern Powergrid to store the product(s) in accordance with the manufacturer's recommendations the Tenderer should provide details of the recommended storage environment with respect to each tendered product.

Details should be provided where relevant in respect to the minimum and maximum exposure levels, frequency of exposure and duration of exposure of the packaged item with respect to;

*	Ambient temperature	*	Atmospheric corrosion
*	Humidity	*	Impact
*	Water	*	Vibration
*	Dust	*	Solar radiation

The Tenderer shall ensure that each item is suitably packaged and protection to maintain the product and packaging as "fit for service" prior to installation taking account of the potential for an outdoor storage environment. All packaging shall be sufficiently durable giving regard to the function, reasonable use and contents of the packaging. Where product packages tendered are made up of sub packages all the sub packages shall unless varied by this specification, be supplied securely packaged together. Where items are provided in bagged/boxed form the material from which the bags are manufactured shall be capable of sustaining the package weight and resisting puncture by the materials within. Tenderer shall submit at the time of tendering the details of the proposed packaging (i.e. materials composition and structure) to be used for each product. Where the Tenderer is unable to provide packaging suitable for outdoor storage then this should be stated at the time of tender.

Palletised goods shall be supplied on standard 1200mm x 1000mm pallets.

Clearly legible, easily identifiable, durable and unambiguous labelling shall be applied to each individual and where relevant multiple package of like products. Where products packages tendered are made up of sub packages each sub packages shall be marked. As a minimum requirement the following shall be included;

- Manufacturer's trademark or name
- Supplier's trademark or name
- Description of item
- Date of packaging and/or batch number
- Northern Powergrid product code
- Weight
- Serial Number

Appendix 4 - SELF CERTIFICATION CONFORMANCE DECLARATION

All PENDAs and TFX-fusebox shall comply with the latest issues of the relevant national and international standards, including ENA TS 37-2, BS EN 60439-1 and BS EN 60439-5. Additionally this technical specification is intended to amplify and/or clarify requirements relating to these Standards.

This self-declaration sheet identifies the clauses of the aforementioned standards relevant to Fuseboards, Fusepillars, Fusecabinets and Circuit Breakers (CB's) for use on Northern Powergrid distribution network. The manufacturer shall declare conformance or otherwise, clause by clause, using the following levels of conformance declaration codes.

Conformance declaration codes
N/A = Clause is not applicable/ appropriate to the product
Cs1 = The product **conforms fully** with the requirements of this clause
Cs2 = The product **conforms partially** with the requirements of this clause
Cs3 = The product **does not conform** to the requirements of this clause
Cs4 = The product **does not currently conform** to the requirements of this clause, but the manufacturer proposes to modify and test the product in order to conform.

Instructions for Completion

- **When Cs1 code is entered:**
  - **(i) State the reference of test reports, etc. that support this declaration AND**
  - **(ii) A summary of the compliance.**
- **When any other code is entered: state the reference of the test report(s), etc. that support this declaration AND a summary of the reason for non-conformance.**
- **Prefix each remark with the relevant 'BS EN' 'IEC' or 'ENATS' as appropriate to indicate which specification the comment is made against.**

Manufacturer:

Product Reference:

Related ASSEMBLY type(s):

Name and position/role (block capitals):

Signature & Date:

NOTE: A separate self-declaration shall be completed for each item or variant submitted, OR the products can be grouped together and a group declaration made for each group IF every self-declaration states clearly the range of products to which it applies.

Appendix 4 Continued

BS EN 61439-1/ BS EN 61439-5,				ENATS 37-2			NPS/003/005			ALL
BS EN 61439-1 and BS EN 61439-5 Clause / Sub-clause		**Requirement**	**Conformance code**	**ENATS 37-2 Clause / Sub- clause**	**Requirement**	**Conformance code**	**NPS/ 003/ 005 Clause**	**Requirement**	**Conformance code**	**Remarks** *__ALL__ rows to Include:* *Description of how compliance is achieved* *Description of why conformance is only part achieved* *Description of any non-conformance* *Reference to any type tests, including test certificate number*
1	1	Scope		1	Scope		(3.2) 1	Transformer range to include 1600kVA		
3	3	Terms and Definitions		3	Definitions		(3.1)	Compliance with ENATS 37-2, BS EN 60439 -1 & 5		
							(3.2) 3.1.207	Fuse carriers shall NOT be porcelain		
4	4	Symbols and Abbreviations								
5	4	Interface Characteristics								
5.2		Voltage ratings								
5.2.4		Rated impulse withstand voltage								
5.3		Current ratings								
5.3.3		Rated peak withstand current								
5.3.4		Rated short time withstand current								
5.3.5		Rated conditional short-circuit current								
5.4		Rated diversity factor								
6	6	Information			Information					
6.1	6.1	ASSEMBLY designation marking		6.1	ASSEMBLY designation marking		(3.2) 6.1	Name plate to include Normal current rating of the outgoing distributor units		
6.2	6.2	Documentation								
6.2.1		Information relating to the ASSEMBLY								
6.2.2	6.2.2	Instructions for installation, operation and maintenance		6.2.2	Instructions for installation, operation and maintenance					

BS EN 61439-1/ BS EN 61439-5,				ENATS 37-2			NPS/003/005			ALL
BS EN 61439-1 and BS EN 61439-5 **Clause / Sub-clause**		**Requirement**	**Conformance code**	**ENATS 37-2** **Clause / Sub- clause**	**Requirement**	**Conformance code**	**NPS/ 003/ 005** **Clause**	**Requirement**	**Conformance code**	**Remarks** ***ALL** rows to Include:* *Description of how compliance is achieved* *Description of why conformance is only part achieved* *Description of any non-conformance* *Reference to any type tests, including test certificate number*
6.3		Device and/or component identification								
	6.101			6.101	Circuit Identification					
7	7	Service Conditions								
7.1	7.1	Normal Service Conditions								
7.1.1		Ambient air temperature								
7.1.1.1		Ambient air temperature for indoor Installations								
7.1.1.2		Ambient air temperature for outdoor Installations								
7.1.2		Humidity conditions								
7.1.2.1		Humidity conditions for indoor installations								
7.1.2.2		Humidity conditions for outdoor installations								
7.1.3		Pollution degree								
7.1.4		Altitude								
7.2	7.2	Special Service Conditions								
	7.2 h)	Exposure to heavy vibration and shocks								
7.2 j)		exposure to conducted and radiated disturbances								
7.3		Conditions during transport, storage and installation								
8	8	Constructional requirements								

BS EN 61439-1/ BS EN 61439-5,				ENATS 37-2			NPS/003/005			ALL
BS EN 61439-1 and BS EN 61439-5 Clause / Sub-clause		**Requirement**	**Conformance code**	**ENATS 37-2 Clause / Sub- clause**	**Requirement**	**Conformance code**	**NPS/ 003/ 005 Clause**	**Requirement**	**Conformance code**	**Remarks** *__ALL__ rows to Include:* *Description of how compliance is achieved* *Description of why conformance is only part achieved* *Description of any non-conformance* *Reference to any type tests, including test certificate number*
8.1	8.1	Strength of materials and parts					(3.2) 8.1	Door Stay - held open in the 90^0, 135^0 and 180^0 positions and have emergency push release		
8.1.1	8.1.1	General		8.1.1	Strength of materials and parts					
8.1.2		Protection against corrosion		8.1.2	Protection against corrosion					
8.1.3		Properties of insulating materials								
	8.1.3.2.101	Verification of category of flammability								
8.1.4		Resistance to ultra-violet radiation								
8.1.5		Mechanical strength								
8.1.6		Lifting provision								
	8.1.6.101	Verification of mechanical strength								
	8.1.101	Thermal stability								
8.1.7		Lifting provision								
							(3.2) 8.2	Option for an un-switched metal clad heater (100W and 150W)		
8.2.2	8.2.2	Protection against contact with live parts, ingress of solid foreign bodies and liquids								
8.2.3		Assembly with removable parts								
8.3		Clearances and creepage distances		8.3	Clearances and creepage distances		(3.2) 8.3	Clause 8.3 of ENA TS 37-2 applies to both Indoor and Outdoor ASSEMBLIES		

BS EN 61439-1/ BS EN 61439-5,				ENATS 37-2			NPS/003/005			ALL
BS EN 61439-1 and BS EN 61439-5 Clause / Sub-clause		**Requirement**	**Conformance code**	**ENATS 37-2 Clause / Sub- clause**	**Requirement**	**Conformance code**	**NPS/ 003/ 005 Clause**	**Requirement**	**Conformance code**	**Remarks** *__ALL__ rows to Include:* *Description of how compliance is achieved* *Description of why conformance is only part achieved* *Description of any non-conformance* *Reference to any type tests, including test certificate number*
8.3.1		General								
8.3.2		Clearances								
8.3.3		Creepage distances								
8.4		Protection against electric shock								
8.4.1		General								
8.4.2		Basic protection								
	8.4.2.1	General								
	8.4.2.101	Earthing and short-circuiting means								
				8.4.2.3	Barriers or enclosures					
8.4.3		Fault protection								
	8.4.3.1	Installation conditions								
8.4.4		Protection by Total Insulation								
8.4.5		Limitation of steady-state touch current and charge								
				8.4.101	Hazard of potential rise of auxiliary supplies					
8.5	8.5	Incorporation of switching devices and components								
	8.5.3	Selection of switching devices and components		8.5.3	Selection of switching devices and components					
				8.5.3.a	Outgoing Distributor Units		(3.2) 8.5.3.a	Facilities for padlocking outgoing distributor units in the open position		

BS EN 61439-1/ BS EN 61439-5,				ENATS 37-2			NPS/003/005			ALL
BS EN 61439-1 and BS EN 61439-5 **Clause / Sub-clause**		**Requirement**	**Conformance code**	**ENATS 37-2** **Clause / Sub- clause**	**Requirement**	**Conformance code**	**NPS/ 003/ 005** **Clause**	**Requirement**	**Conformance code**	**Remarks** ***ALL** rows to Include:* *Description of how compliance is achieved* *Description of why conformance is only part achieved* *Description of any non-conformance* *Reference to any type tests, including test certificate number*
							(3.2) 8.5.3.a	Option for factory fit Current Sensing Instruments on all ways, busbars and Neutral		
							(3.2) 8.5.3.a	Secondary wiring accessible marshalling / connection point provided		
				8.5.3.a.a	Outgoing Distributor Units – Standard Range		(3.2) 8.5.3.a.a	Accommodates 92mm centres fuse links and Fault Locating Equipment		
				8.5.3.a.a.1	Fuseway					
				8.5.3.a.a.2	Fuse Switch Disconnector					
				8.5.3.a.b	Outgoing Distributor Units – Extended Range					
				8.5.3.a.b.1	400A Fuseway		(3.2) 8.5.3.a.b.1	400A distributor units shall have 92mm centres		
				8.5.3.a.b.2	800A Fuseway					
				8.5.3.a.b.3	1250A Fuseway					
				8.5.3.a.b.4	1600A Fuseway					
				8.5.3.a.b.5	400A Fuse Switch Disconnector					
				8.5.3.a.b.6	800A Fuse Switch Disconnector					
				8.5.3.a.b.7	800A Handle Fitted With a Link					
				8.5.3.a.b.8	Disconnector					

BS EN 61439-1/ BS EN 61439-5,				ENATS 37-2			NPS/003/005			ALL
BS EN 61439-1 and BS EN 61439-5 **Clause / Sub-clause**		**Requirement**	**Conformance code**	**ENATS 37-2** **Clause / Sub- clause**	**Requirement**	**Conformance code**	**NPS/ 003/ 005** **Clause**	**Requirement**	**Conformance code**	**Remarks** ***ALL** rows to Include:* *Description of how compliance is achieved* *Description of why conformance is only part achieved* *Description of any non-conformance* *Reference to any type tests, including test certificate number*
				8.5.3.a.b.9	Circuit Breaker		(3.2) 8.5.3.a.b.9	The Circuit Breaker shall be fully rated and tested for "Isolation (isolation function) for safety purposes"		
				8.5.3.b	Incoming Transformer Units					
				8.5.3.b.a	Standard Range					
				8.5.3.b.a.1	Disconnector					
				8.5.3.b.a.2	Handle Fitted With a Link					
				8.5.3.b.b.1	Disconnector					
				8.5.3.b.b.1	Circuit Breaker					
				8.5.3.c	Fuses For Auxiliary Supply					
				8.5.3.d	Maximum Demand Indicators		(3.2) 8.5.3.d	The device shall be driven by Class 1 Current Sensing Instruments		
							(3.2) 8.5.3.d	Instruments connection point is not blocked by outgoing cables.		
							(3.2) 8.5.3.d	Can be replaced or retro-fit added with PENDA live without compromising IP Rating		
				8.5.3.e	13A Switched Socket including Protective device		(3.2) 8.5.3.e	Non-RCD double socket. Protected by a Passive (latching) RCBO with isolating link.		

BS EN 61439-1/ BS EN 61439-5,				ENATS 37-2			NPS/003/005			ALL
BS EN 61439-1 and BS EN 61439-5 **Clause / Sub-clause**		**Requirement**	**Conformance code**	**ENATS 37-2** **Clause / Sub- clause**	**Requirement**	**Conformance code**	**NPS/ 003/ 005** **Clause**	**Requirement**	**Conformance code**	**Remarks** ***ALL** rows to Include:* *Description of how compliance is achieved* *Description of why conformance is only part achieved* *Description of any non-conformance* *Reference to any type tests, including test certificate number*
								Can be replaced or retro-fit added with PENDA live without compromising IP Rating		
				8.5.3.f	Auxiliary Terminals					
				8.5.3.g	Current Transformers					
				8.5.3.h	Metering Terminal Box					
8.5.4		Installation of switching devices and components		8.5.4	Installation					
8.5.5		Accessibility								
8.5.6		Barriers								
8.5.7		Direction of operation and indication of switching positions								
8.5.8		Indicator lights and push-buttons								
8.6		Internal electrical circuits and connections								
8.6.1		Main circuits		8.6.1	Main circuits					
8.6.2		Auxiliary circuits								
8.6.3		Bare and insulated conductors								
8.6.4		Selection and installation of non-protected live conductors to reduce the possibility of short-circuits								
8.6.5		Identification of the conductors of main and auxiliary circuits		8.6.5	Identification of the conductors of main and auxiliary circuits					
8.6.6		Identification of the protective conductor and of the neutral conductor of the main circuits		8.6.6	Identification of the protective conductor and of the neutral conductor of the main circuits					

BS EN 61439-1/ BS EN 61439-5,				ENATS 37-2			NPS/003/005			ALL
BS EN 61439-1 and BS EN 61439-5 **Clause / Sub-clause**		**Requirement**	**Conformance code**	**ENATS 37-2** **Clause / Sub- clause**	**Requirement**	**Conformance code**	**NPS/ 003/ 005** **Clause**	**Requirement**	**Conformance code**	**Remarks** ***ALL** rows to Include:* *Description of how compliance is achieved* *Description of why conformance is only part achieved* *Description of any non-conformance* *Reference to any type tests, including test certificate number*
8.7		Cooling								
8.8	8.8	Terminals for external conductors		8.8	Terminals for external conductors		(3.2) 8.8	Designed to accommodate all the cable types and connection requirements as detailed in NPS/003/005 (this document)		
	8.101	Marking as an obstacle to snow clearance								
	8.102	Ease of operation and maintenance		8.102	Ease of operation and maintenance		(3.2) 8.102	Conforms to all security requirements		
				8.102.1	Reserve Power		(3.2) 8.102.1	Suitable for leads equipped with ITT VEAM type connectors or equivalent		
				8.201	Specific Requirements					
				8.201.a	PENDAs		(3.2) 8.102	PENDAs with busbar ratings below 1250A shall be equipped with one set of generator connections PENDAs with busbar ratings 1250A or above shall be equipped with two sets of generator connections		

BS EN 61439-1/ BS EN 61439-5,				ENATS 37-2			NPS/003/005			ALL
BS EN 61439-1 and BS EN 61439-5 **Clause / Sub-clause**		**Requirement**	**Conformance code**	**ENATS 37-2** **Clause / Sub- clause**	**Requirement**	**Conformance code**	**NPS/ 003/ 005** **Clause**	**Requirement**	**Conformance code**	**Remarks** ***ALL** rows to Include:* *Description of how compliance is achieved* *Description of why conformance is only part achieved* *Description of any non-conformance* *Reference to any type tests, including test certificate number*
				8.201.a.1	PENDA-I		(3.2) 8.102	PENDA-Is with busbar ratings below 1250A shall be equipped with one set of generator connections PENDAs with busbar ratings 1250A or above shall be equipped with two sets of generator connections		
				8.201.a.2	PENDA-CCO		(3.2) 8.102	PENDA-CCOs with busbar ratings below 1250A shall be equipped with one set of generator connections PENDAs CCOs with busbar ratings 1250A or above shall be equipped with two sets of generator connections		
				8.201.a.3	PENDA-TMO		(3.2) 8.102	PENDA-TMOs with busbar ratings below 1250A shall be equipped with one set of generator connections PENDAs TMOs with busbar ratings 1250A or above shall be equipped with two sets of generator connections		
				8.201.b	TFXs		(3.2) 8.102	PENDAs need not be equipped with generator connections		

BS EN 61439-1/ BS EN 61439-5,				ENATS 37-2			NPS/003/005			ALL
BS EN 61439-1 and BS EN 61439-5 **Clause / Sub-clause**		**Requirement**	**Conformance code**	**ENATS 37-2** **Clause / Sub- clause**	**Requirement**	**Conformance code**	**NPS/ 003/ 005** **Clause**	**Requirement**	**Conformance code**	**Remarks** ***ALL** rows to Include:* *Description of how compliance is achieved* *Description of why conformance is only part achieved* *Description of any non-conformance* *Reference to any type tests, including test certificate number*
				8.201.c	Locking Facilities		(3.2) 8.102	Door(s) of the PENDA can be closed and locked whilst generator leads are connected		
				8.201.c.1	Safety and Operational Padlocks					
				8.201.c.2	Security Padlock			Optional high security anti-tamper lock cloaking device provided on Outdoor PENDA-CCO and TMO		
				8.201.d	Neutral & Earth Connections					
				8.201.d.1	PENDA’s					
				8.201.d.2	TFXs					
				8.201.e	Auxiliaries					
9		Performance Requirements								
9.1		Dielectric properties								
				9.1.3.1	Impulse Withstand Voltage of the Main Circuits					
9.2		Temperature rise limits								
9.3		Short-circuit protection and short-circuit withstand strength								
				9.3.1	General					
9.4		Electromagnetic compatibility								
10		Design verification		10	Design verification					

BS EN 61439-1/ BS EN 61439-5,				ENATS 37-2			NPS/003/005			ALL
BS EN 61439-1 and BS EN 61439-5 Clause / Sub-clause		**Requirement**	**Conformance code**	**ENATS 37-2 Clause / Sub- clause**	**Requirement**	**Conformance code**	**NPS/ 003/ 005 Clause**	**Requirement**	**Conformance code**	**Remarks** *__ALL__ rows to Include:* *Description of how compliance is achieved* *Description of why conformance is only part achieved* *Description of any non-conformance* *Reference to any type tests, including test certificate number*
10.1	10.1	General								
10.2		Strength of materials and parts								
10.2.1		General								
10.2.2		Resistance to corrosion								
	10.2.2.1	Test procedure								
	10.2.2.2	Severity Test A								
	10.2.2.4	Results to be obtained								
10.2.3		Properties of insulating materials								
	10.2.3.101	Dry heat test								
	10.2.3.102	Verification of category of flammability								
10.2.4		Resistance to ultra-violet (UV) radiation								
10.2.5		Lifting								
	10.2.6	Mechanical impact								
10.2.7		Marking								
	10.2.101	Verification of mechanical strength		10.2.101	Mechanical strength					
				10.201	Torque Tests on Thumbscrews					
10.3		Degree of protection of ASSEMBLIES								
10.4		Clearances and creepage distances								
10.5		Protection against electric shock and integrity of protective circuits								
	10.5.3.1	General								

BS EN 61439-1/ BS EN 61439-5,				ENATS 37-2			NPS/003/005			ALL
BS EN 61439-1 and BS EN 61439-5 **Clause / Sub-clause**		**Requirement**	**Conformance code**	**ENATS 37-2** **Clause / Sub- clause**	**Requirement**	**Conformance code**	**NPS/ 003/ 005** **Clause**	**Requirement**	**Conformance code**	**Remarks** ***ALL** rows to Include:* *Description of how compliance is achieved* *Description of why conformance is only part achieved* *Description of any non-conformance* *Reference to any type tests, including test certificate number*
10.6		Incorporation of switching devices and components								
10.7		Internal electrical circuits and connections								
10.8		Terminals for external conductors								
10.9	10.9	Dielectric properties		10.9	Dielectric properties					
	10.9.3.1	General								
				10.9.101.a	Complete ASSEMBLY					
				10.9.101.b	Fuse Carriers		(3.2) 10.9.101.b	Assembly cannot be dismantled in position		
				10.9.101.c	Disconnector Operating Poles and Contact Tightening Devices					
				10.9.101.d	Demountable Mechanisms					
10.10		Verification of temperature rise								
	10.10.1	General								
	10.10.2.2.1	General		10.10.2	Verification by testing with current					
				10.10.2.3.8	Results Obtained					
10.11		Short-circuit withstand strength		10.11	Short-circuit withstand strength					
	10.11.1	General								
				10.101	Switching Test Sequence For Disconnectors - (parallel connected LV supplies)					
				10.101.1	Temperature Rise Test		(3.2) 10.10	For Outdoor ASSEMBLIES - Solar radiation has been taken into account.		

BS EN 61439-1/ BS EN 61439-5,				ENATS 37-2			NPS/003/005			ALL
BS EN 61439-1 and BS EN 61439-5 **Clause / Sub-clause**		**Requirement**	**Conformance code**	**ENATS 37-2** **Clause / Sub- clause**	**Requirement**	**Conformance code**	**NPS/ 003/ 005** **Clause**	**Requirement**	**Conformance code**	**Remarks** ***ALL** rows to Include:* *Description of how compliance is achieved* *Description of why conformance is only part achieved* *Description of any non-conformance* *Reference to any type tests, including test certificate number*
				10.101.2	Making and Breaking Capacities					
11		Routine Verification		11	Routine Verification					
11.1		General								
11.2		Degree of protection of enclosures								
11.3		Clearances and creepage distances								
11.4		Protection against electric shock and integrity of protective circuits								
11.5		Incorporation of built-in components								
11.6		Internal electrical circuits and connections								
11.7		Terminals for external conductors								
11.8		Mechanical operation								
11.9		Dielectric properties								
		11.9.101.a		11.9.101.a	Disconnector Operating Poles and Contact Tightening Devices					
		11.9.101.b		11.9.101.b	Fuse Handle Wedge Operating Mechanisms					

NPS/003/005 – Technical Specification for LV PENDA ASSEMBLIES and TFX ASSEMBLIES

NPS/003/005 Clause	General Requirement	Detailed Requirement	Conformance code	Remarks *To Include:* *Description of how compliance is achieved* *Description of why conformance is only part achieved* *Description of any non-conformance* *Reference to any type tests, including test certificate number*
3.3.1	Designed to accommodate circuit energisation and fault management equipment on PENDA-I, PENDA-CCO, PENDA-TMO and PENDA-CCO(Feeder Pillar)	KELVATEC – BIDOYNG, WEEZAP, REEZAP MODULAR, GATEWAY, REEZAP Faultmaster EA Technology – ALVIN		
3.3.2	Phase Reversal Kit on 20kV PENDA-I, PENDA-CCO, PENDA-TMO ASSEMBLIES	Option of: • Supplied Fitted • Retro-fit kit Label identifying reversal		
3.3.3	Circuit Breaker controlled Bulk LV Metering PENDA ASSEMBLIES	CoP5 and CoP3 Features • Metering class CTs • Potential/Metering fuses • Terminal test block		
		Terminal Test Block Housing External to PENDA		
		Conformity to: NPS/002/031 - CoP5 NPS/002/033 – CoP3		
		Preferred normal current ratings of CB's are: • 800A • 1250A • 1600A • 2000A • 2500A Continuous / overlapping ranges of protection shall be offered		
		LV CB's fully rated for isolation in accordance with BS EN 60947-1 and BS EN 60947-2		
		PENDA's supplied with CB's shall include: • Rated transformer LV disconnector that controls both the CB and any additional distributor ways • A range taking shunt trip coil • Full Neutral connection capacity		

NPS/003/005 – Technical Specification for LV PENDA ASSEMBLIES and TFX ASSEMBLIES

NPS/003/005 Clause	General Requirement	Detailed Requirement	Conformance code	Remarks *To Include:* *Description of how compliance is achieved* *Description of why conformance is only part achieved* *Description of any non-conformance* *Reference to any type tests, including test certificate number*
3.3.4	**Compatibility with a Secondary Distribution Substation Monitoring System**	NPS/007/021 Compatibility for: PENDA-I		
		PENDA-CCO		
		PENDA-TMO		
		Instructions and Method for retro-fit access		
		Optional LV Monitor PENDA side guard for outdoor sites : • Full Height • Pre-manufactured fixings on both sides for future retro-fit • Can be retrofitted with PENDA Live and in-service		

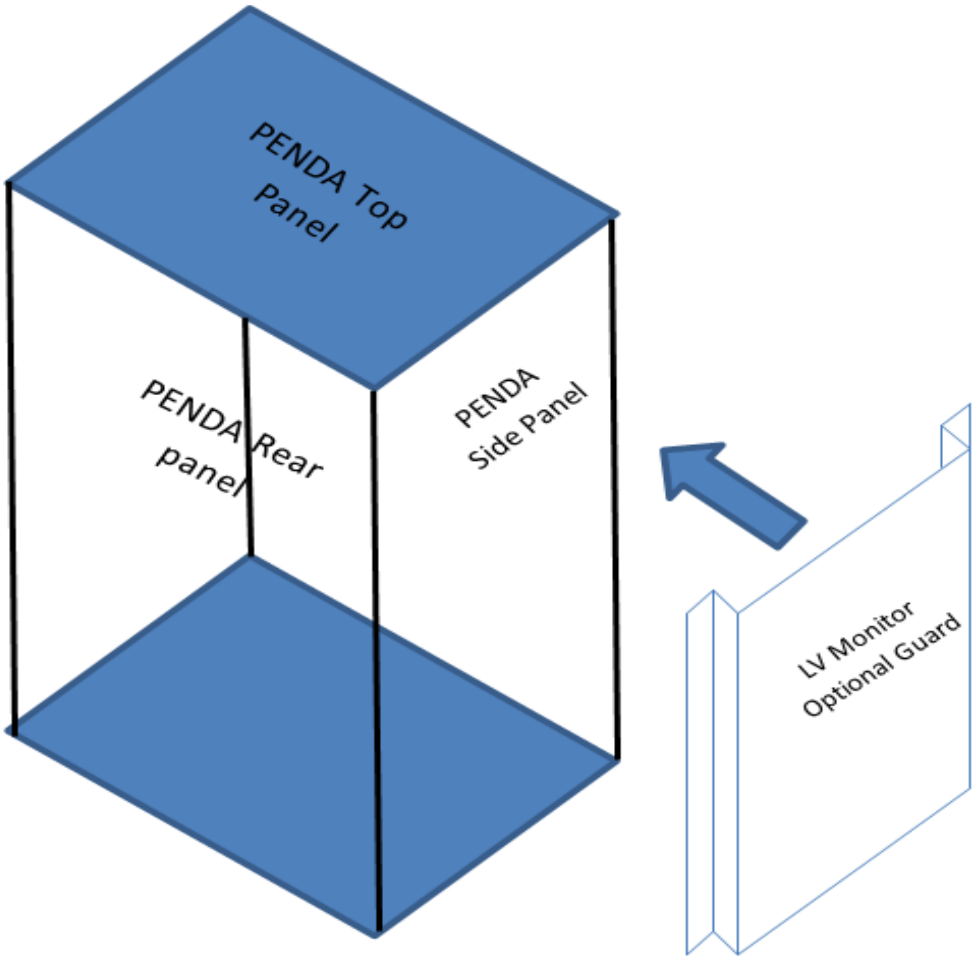
Appendix 5 - Technical Information Check List

The Following information shall be provided by the supplier for technical review by Northern Powergrid.

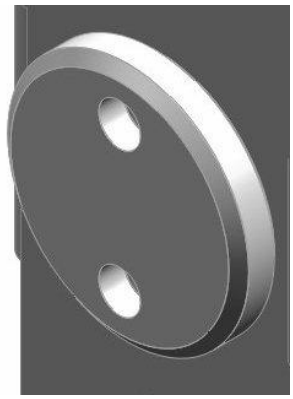
Additional information shall be provided if required.

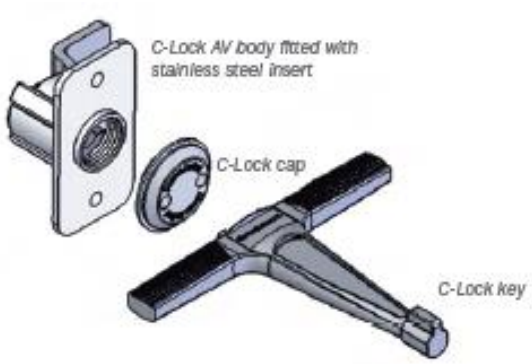
Requirements	Provided (Yes / No)
Full product descriptions, drawings and part/reference numbers	
Appendix 2 - Compliance with Logistical Requirements	
Appendix 3 – Completed self-certification conformance declaration	
Type test evidence – copies of test certificates, reports, etc. are required to support the self-declaration in Appendix 3	
Routine test Plan (sample)	
Packaging/delivery information	

Appendix 6 - LV Monitoring Unit Guard (example)

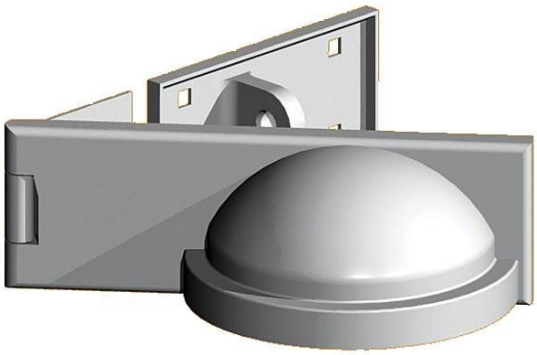


Appendix 7 – Locking





Covers over tri-lock recess: 'Lucy Style Lock' and C-Lock



Typical padlock protectors

HINGED LOCK COVER CLOSED WITH PADLOCK ACCESS FROM BELOW AND ANTI JEMMY STRIPS TOP AND SIDES

HINGED LOCK COVER OPEN SHOWING CLOAKED CYLINDER & PADLOCK HASPS ON DOOR AND COVER

THESE ARE OUTLINE REQUIREMENTS FOR THE MANUFACTURER.

THE LOCK CLOAKING DEVICE SHOULD BE MANUFACTURED FROM 3mm M.S. PLATE, GALVANISED TO BS729. THE SIZE OF WHICH SHOULD BE SUFFICIENT TO COVER THE CYLINDER AND TO BE LARGE ENOUGH FOR THE OPERATOR TO FIT A HI SECURITY PAD LOCK.

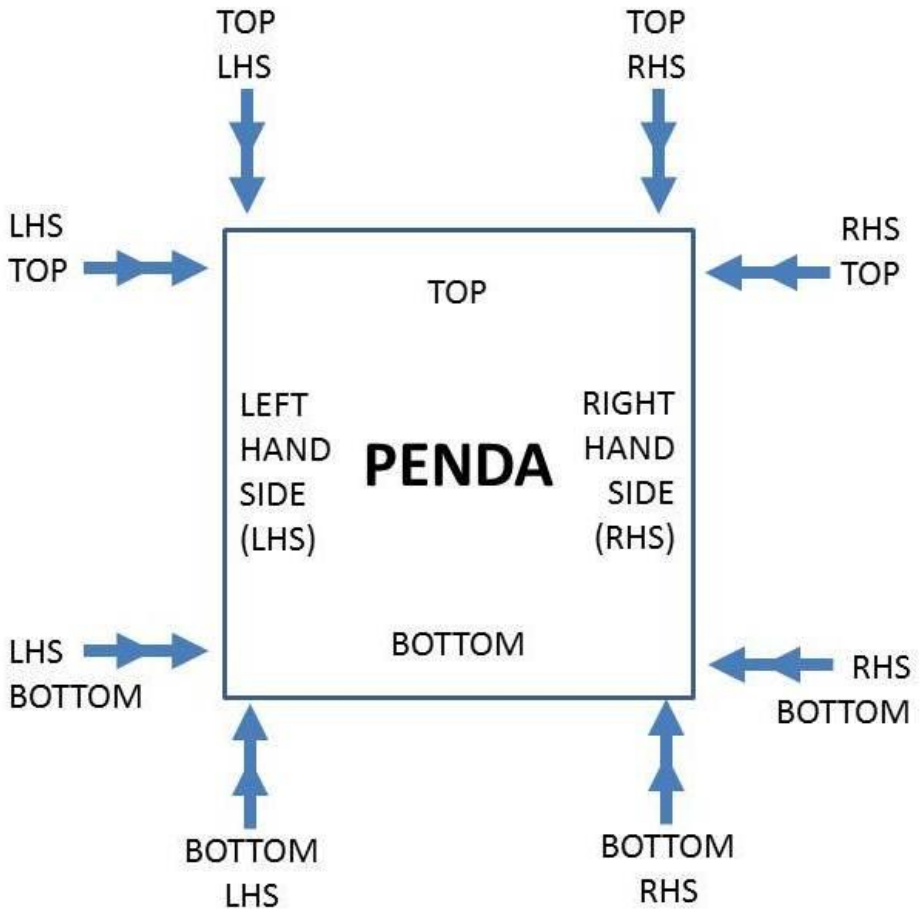
PREFERABLY WELDED CONSTRUCTION

USE DOME HEADED BOLTS FROM OUTSIDE WHEN FITTING TO DOORS.

Extract from Drawing C9993354

Appendix 8 – Cable Entry Points

The diagram below confirms which direction of approach and cable entry point that is meant when described elsewhere in this specification.



Appendix 9 – Incoming LV Cables (from Transformer to PENDA)

For incoming cables from a transformer; the design shall incorporate:

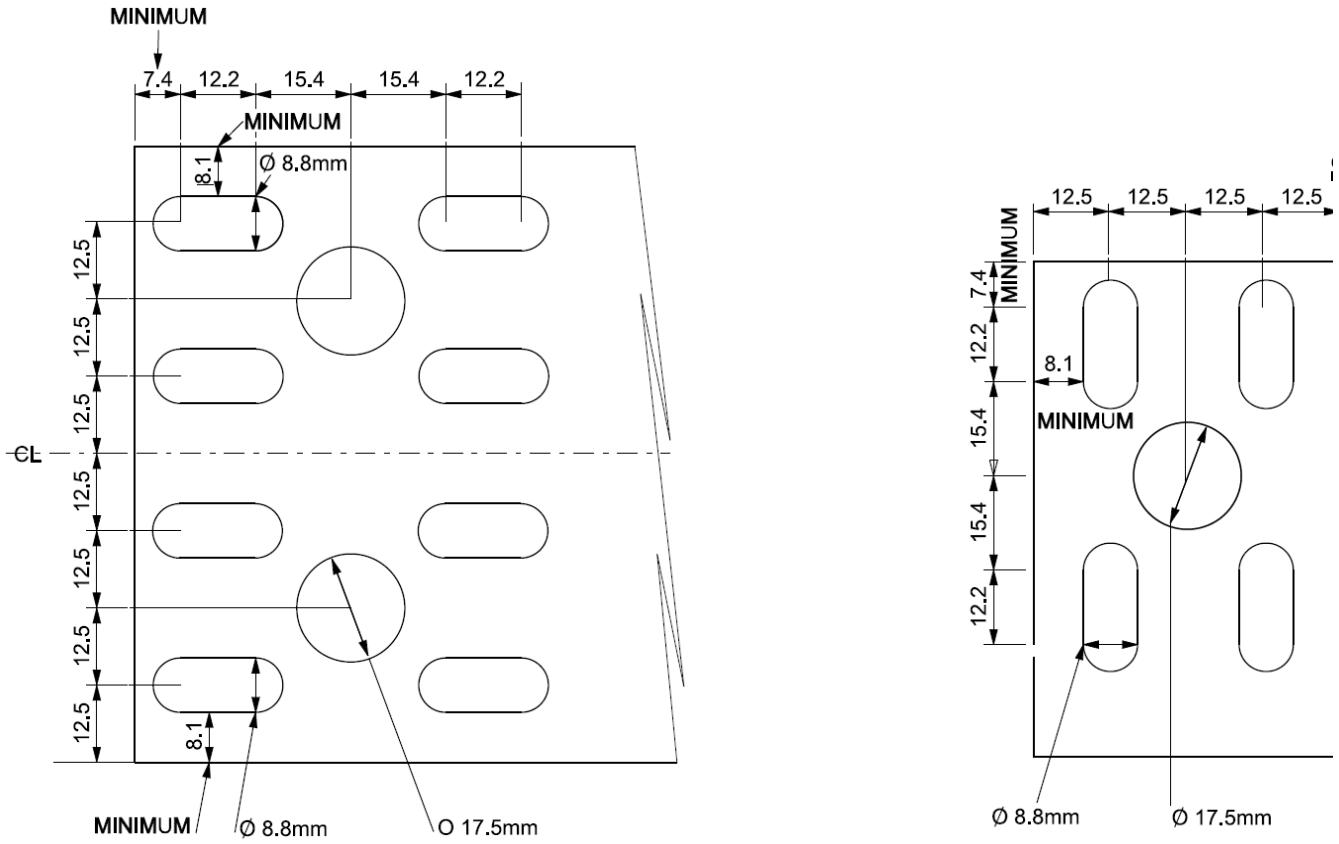
(a) One off or multiples of the five point fixing (one hole and four slot) arrangement shown on the second page of this Appendix

(b) Provision for earthing the cable earth screen wires (or Wf neutrals) at the ASSEMBLY

(c) Provision to support and allow entry of the cable types and numbers detailed in the matrix below:

PENDA - Incoming Cable Types from Transformer		Busbar Rating				
		800 Amps	**1250** Amps	**1600** Amps	**2000** Amps	**2500** Amps
		Number of Cables in Each Phase and in Neutral				
1-core armoured stranded Copper 800mm² to BS 5467, Table 4	Phase	1	2	2	3	3
	Neutral	1	1	2	2	2
1 core sectoral Aluminium XLPE insulated, up to 480mm² to BS7889, Table 4	Phase	1	2	2	3	4
	Neutral	1	1	2	2	2
3-core 185mm2 waveform cable to BS7870 3.40 All phase cores of the cable bunched (i.e. all three terminated by a single lug).	Phase	1	2	2	3	3
	Neutral	1	1	2	2	2
		Number of Five-Hole Termination Arrangements and Cable Clamps/Supports				
	Phase	1	2	2	3	4
	Neutral	1	2	2	3	4

Note: *The default is to for the neutral cables to have half the current rating of each phase. But, where network characteristics require it; the number of neutrals is increased to provide the same cross section and current rating as each phase.*



Typical Examples of Hole and Slot Arrangements

Sizes and relative positions of the hole and the four slots in each set of five are fixed. Minimum distances from the edges shall be observed, to allow enough room for the faces of the cable lug to be in contact with the busbar. Other dimensions are indicative, general arrangements only.