NPS/002/029 - Technical Specification for Industrial Service Units with Integral Metering Current Transformers

1. Purpose

The purpose of this document is to detail the requirements of Northern Powergrid (the Company) in relation to the technical requirements for Industrial service units with integral metering current transformers (ISUM) for three phase systems operating at voltages up to 400V.

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

Document Reference	Document Title	Version	Published Date
NPS/002/029	Technical Specification for Industrial Service Units with Integral Current Transformers	3.1	Dec 2020

2. Scope

This document refers to the specification requirements of the Company with respect to ISUMs used to provide power supplies to commercial and industrial premises with loads between 100 and 500 amps per phase.

The ISUM shall include, pre-installed:

- an integral heavy duty cut-out,
- a removable link fitted for the neutral / earth,
- metering current transformers (CTs) and all associated wiring,
- metering voltage fuses, neutral link and all associated wiring,
- a terminal test block including shorting links for the CTs to be fitted to the front of the ISUM, and
- a base plate installed on the front door of the ISUM to facilitate the mounting of the meter.

This document also covers any pre-commissioning testing that can be completed prior to delivery of the ISUM to the company.

ISUMs are to be suitable for internal wall mounting in public locations, but shall only allow access to internal components by appropriately authorised persons.

Suppliers shall provide details of any periodic inspection and maintenance information requirements in Appendix 5.

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

The following appendices form part of this technical specification:

- Appendix 1 – Product Requirements,
- Appendix 2 - Logistical Requirements,
- Appendix 3 - Self Certification Conformance Declaration,

- Appendix 4 - Addendum to Supplier Requirements,
- Appendix 5 – Pre-commission Testing, Routine Inspection and Maintenance Requirements,
- Appendix 6 - Technical information check list,
- Appendix 7 – List of Example Meter Types,
- Appendix 8 – Metering Equipment Wiring Diagram – Typical Layout,
- Appendix 9 – CT, Metering Voltage Fuses and Neutral Link – Labelling,
- Appendix 10 – Typical CT Metering Equipment Commissioning Record, and,
- Appendix 11 – CT Metering Unit Label.

2.1. Table of Contents

3. Technical Requirements

Industrial service units with integral metering current transformers (ISUMs) shall meet the requirement of BS EN 61439 (parts 1 and 2) and those options selected within this standard, unless specified otherwise.

3.1. Industrial Service Unit Enclosure

The ISUM shall be finished in a subtle colour e.g. BS 381C - Shade 632.

The unit shall have a hinged door arrangement which shall normally be fitted to the left side of the unit, but have the facility to hinge from the right if required.

All internal live terminals shall be intruder resistant, and provide protection to IP41B in accordance with IEC BS EN 60529. The inner panel shall be secured with captive screws, which shall be capable of being sealed in the closed position using standard galvanised sealing wire of maximum diameter of 2mm.

The construction of the assembly shall be such that the possibility of deliberate damage and the removal of fastenings from the outside are minimised. The assembly shall be intruder resistant, and provide protection to IP41B in accordance with BS EN 60529. Ferrous metallic parts shall be protected against corrosion, sufficient to pass the tests set out in sub clause 10.2.2 of BS EN 61439-5 and 8.1.2 and BS EN 61439-1 (severity test A).

All metalwork that forms part of the enclosure construction shall be suitably earth bonded as required.

All fastenings, nuts, bolts etc, shall have corrosion-proof locking features.

Typical dimensions for the industrial service unit enclosure are nominally:

- Height = 915mm.
- Width = 500mm for the main enclosure and width = 530mm where an external earth bolt is located to the side of the main enclosure.
- Depth = 240mm for the main enclosure and depth = 335mm where a terminal test block cover is located to the front of the main enclosure.

3.2. Fixing

The unit shall be suitable for wall mounting by means of a mounting bracket using a minimum of 2 x M8 fixing bolts. A further 2 x M8 fixing bolts located towards the bottom of the enclosure shall secure the unit to the wall. All fixing holes shall be punched proud of the enclosure to allow for installation to an uneven wall surface. The upper two fixing holes in the enclosure shall be designed to allow for hanging on the wall bracket with 10mm tolerance to allow for uneven surfaces. All fixing bolts shall be located such that easy access is achievable. When installed the fixing bolts shall only be accessible from inside the enclosure.

3.3. Front Access

Heavy duty cut-out, CTs, metering voltage fuses and neutral link - Access to internal components of the ISUM shall be a single hinged door, which shall normally be hinged on the left-hand side and opening to a minimum of 180^0. Additionally, a captive arm shall be installed to hold the door in place at 180^o and 135^o nominally. However, if the need arises at the time of installation it shall be capable of being changed to hinging on the right hand side. Under these circumstances the metering wiring loom shall be capable of being easily re-routed and secured without disconnection from the CTs, metering voltage fuses, neutral link and terminal test block. The panel or door shall be secured with captive screw, which shall be capable of being sealed in the closed position using standard galvanised sealing wire of maximum diameter of 2mm.

Terminal test block – Access to the terminal test block which is located on the front door of the ISUM shall be achieved via a cover (made of the same material as the main enclosure) which shall be hinged at the

bottom. The cover when in the closed position shall be capable of being sealed using standard galvanised sealing wire of maximum diameter of 2mm.

3.4. Cable Enclosure Entry / Exit

Incoming power cable and outgoing customer cables shall enter the enclosure at the bottom and top of the unit, respectively.

To aid the installation of the incoming cable a removable gland plate complete with a cable cleat suitable for 3 or 4 core PVC covered cables ranging in size from 95mm^2 to 300mm^2 shall be provided. The cable cleat shall be so located to provide the terminating distance specified in BS 5372 or greater, and shall provide adequate support to the cables both in normal service and when subject to the short circuit duty.

Outgoing single core cables (up to 2 x cables per termination) in the range 35mm^2 to 185mm^2 for stranded copper conductor or 35mm^2 to 150mm^2 for tri-rated copper conductor shall exit the enclosure via a hardwood or similar material top plate.

This plate shall be removable to enable fitting of cable trunking if so required.

3.5. Fuse-ways Within the Cut-out

Fixed contacts shall be accurately positioned and securely located so as to prevent misalignment during normal use. Each phase shall include a means of ensuring the fuse link is correctly aligned with the fixed contacts when closing the circuit.

Operation and alignment of the fuse links and fixed contacts shall be achieved by ensuring the fuse handle can be inserted in the distributor unit by a hinged action pivoted on the lower contact, and withdrawn by snatch action. Appropriate contact shall be made on insertion of the fuse handle so that current can be safely carried prior to tightening of the contact tightening thumbscrews. The level of protection shall meet the requirements of IP2X of BS EN 60529 with all fuse links/handles inserted or by suitably insulated contact covers, to be provided, when withdrawn. Where fuse links/handles or contact covers are not in place, maintenance of IPXXB is not mandatory, but the design shall be such that it meets the requirements of BS EN 50274 and minimises the possibility of inadvertent contact with live conductors by the operator.

Access shall be provided for the use of test probes. They shall be able to make contact with the top and bottom fuse link terminals when fuse carriers are installed and top and bottom contacts when the fuse carrier is removed.

3.6. Fuse Carriers

Each phase of the fuse way shall be capable of independent operation. The fuse carriers shall be of a through grip shrouded type, manufactured from a suitable insulating material that provides a secure connection to the fuse link by means of wedge connections and insulated contact tightening thumbscrews. The design of the thumbscrews must ensure that when in position, the whole fuse assembly cannot be dismantled when the thumbscrews are released to their full extremities. The fuse carrier shall be suitable for accommodating J-type fuse links with 92mm fixing centres in accordance with BS HD 60269-2:2013, BS 88-2:2013.

Fuse links are **not** to be supplied with fuse carriers.

The following additional tests shall be carried out on the fuse carriers:-

The test shall be carried out on each design of fuse carrier including its wedge mechanism, if any.

The test shall be made at an ambient temperature between 15°C and 25°C.

The test voltage of 3.75 kV (rms.) shall be applied for one minute between:

Both of the fuse carrier terminals without the fuse link being fitted.

One of the fuse carrier terminals and metal foil which is wrapped around surfaces of the insulating material of the fuse carrier, including thumbscrews, if any, which can be touched during live replacement or withdrawal of fuse carriers. For this test, a fuse link of the largest dimensions intended for the fuse carrier shall be fitted.

Following the high voltage test, the fuse carrier shall complete a humid atmosphere test as detailed in sub-clause 8.2.4.2 of BS EN 60269 – Part 1, the insulation resistance at the conclusion of the test shall be measured; the insulation resistance measured shall not be less than 5 Megohms.

Mechanical strength - the following additional test shall be carried out - Torque tests on thumbscrews: the test shall be carried out on six random samples of the insulating thumbscrew, each complete with a wedge operating screw, to confirm the mechanical strength of the thumbscrew. Each wedge operating screw shall in turn be placed in a vice and a torque applied in a clockwise direction to the insulated thumbscrew using a torque spanner adapted as necessary. Each insulated thumbscrew shall withstand a torque of 12Nm, without fracturing or turning on the shank of the wedge operating screw.

Verification of short circuit withstand strength - short time withstand tests shall be under-taken with the minimum number of distributor units to be fitted in service and, in the case of short-circuit withstand ratings verified using prospective short circuit current, the supply voltage shall be equal to 1.1 times the rated operational voltage.

3.7. Incoming Cable Terminations

The phase cores of the incoming cable shall connect to the relevant fuse way by means of range taking mechanical connectors which are to be supplied and fitted by the supplier. The connectors shall be suitable for terminating 3 and 4 core sector shaped solid aluminium cores in the range 95mm^2 - 300mm^2 and to ensure the correct tightening torque is applied to the termination, the connector shall have range taking shear bolts. The head of the shear bolt shall be in the range 17mm - 19mm and no specialist tooling shall be required to carry out the connection. The shear bolt shall be double headed to allow removal via the second head if required, after the first head has been sheared.

3.8. Outgoing Cable Terminations

The phase cores of the outgoing cable which will normally be 35mm^2 to 185mm^2 for stranded copper conductor or 35mm^2 to 150mm^2 for tri-rated copper conductor and shall connect to the relevant outgoing fuse way by means of range taking mechanical shear bolt connections. The shear bolt shall be double headed to allow removal via the second head if required, after the first head has been sheared.

Suitable clearance shall be provided between phases/phase barriers to permit 2 x outgoing cables per termination in a 'side by side' connector arrangement.

The cable terminals on each outgoing fuse unit/circuit shall be separately shrouded to a minimum of IP3X. Should shrouds from one outgoing circuit be removed to gain access to its cable terminations, protection in accordance with IPXXB shall be maintained to all live parts, including bus bars and cable terminals of adjacent circuits.

3.9. Neutral / Earth

The neutral / earth bar shall be electro-tin plated copper or brass and capable of connecting cables suitable for SNE (PE) or PME (PEN) earthing by removable links, and no earthing facility where required. The removable earth links shall be clearly marked/labelled. Facility shall be provided for terminating sector shaped solid aluminium neutral core in the range 95mm^2 - 300mm^2, where a 4c cable is installed, and the stranded copper neutral / earth conductors of a 3c cable shall all be terminated by means of range taking mechanical connectors. Additionally, a range taking connector suitable for stranded copper core up to 95mm^2 shall be provided for when a 'token' earthing conductor is installed. To ensure the correct tightening torque is applied to the termination, the connector shall have range taking shear bolts. The head of the shear bolt shall be 13mm for the earth connection, and in the range 17mm - 19mm for the neutral connection. No specialist tooling shall be required to carry out the connection.

The outgoing connection to the neutral/earth shall be by means of a range taking mechanical shear bolt connector. The shear bolt shall be double headed to allow removal via the second head if required, after the first head has been sheared.

Facility shall also be provided for convenient connection of the CT star point to the neutral bar via an M6 fixing.

The external earth bolt located on the outer body of the enclosure shall be installed and captive to ensure that a secure connection can be achieved without entering the ISUM. Facility shall also be made to allow the bolt to be reversed for situations where this earth connection is not to be made available. This shall ensure that no open holes are left in the ISUM body.

3.10. Metering Requirements

3.10.1. Current Transformer (CT)

CTs shall be in the ratio of 500/5 to BS EN 61869-2. The CTs shall be a minimum standard of accuracy to class 0.5s, with a burden rating of 7.5VA.

The CT pole faces shall be labelled to determine polarity (P1 and P2) and the secondary circuits labelled with S1 and S2. They shall display a unique serial number, CT ratio, burden rating, accuracy class and manufacturer for each CT.

CTs shall be pre-installed in the ISUM and securely held in position with P1 facing the incoming mains cable connections. They will be installed in such a manner that the customer's conductors (tails) can be connected without having to be inserted through the CT.

They shall also be installed to facilitate testing or replacement of the CTs as required.

3.10.2. Metering Voltage Fuses, Neutral Link and Associated Wiring

Three black fuse bases and carriers with 10A fuse links to BS HD 60269-2:2013, BS 88-2:2013 shall be mounted on a removable support rail with appropriate phase identification. A matching white neutral link shall be provided and connected.

The incoming side of the metering voltage fuses and neutral link shall be connected to the outgoing (upper) main fuses and neutral connection(s) with 2.5mm^2 stranded copper conductors with double PVC Insulation for each phase and neutral. They shall be coloured grey.

The outgoing side of the metering voltage fuses and neutral link shall be connected to the terminal test block with 2.5mm^2 single core copper PVC insulated flexible cables and comply with the requirements of BS 6231 for each phase. They shall be marked as phase colours of brown, black, grey and neutral colour of blue.

The wiring loom shall be inserted within a suitable protective sleeve and be capable of being easily re-routed and secured without disconnection from the CTs, metering fuses, neutral link and terminal test block as defined in section 3.3 - Front Access.

The wiring loom labelling for the metering voltage fuses and neutral link will be standard numbering in accordance with ENA TS 50-19. See Appendix 9 – CT, Metering Voltage Fuses and Neutral Link - Labelling.

3.10.3. CT Metering Associated Wiring

All wiring which connects the CTs to the incoming side of the terminal test block shall be 2.5mm^2 single core copper PVC insulated flexible cables and comply with the requirements of BS 6231. They shall be coloured black. The CT star point earth return cable which is connected between the connector block, which is located on but insulated from the DIN rail, and the main neutral bar shall be 2.5mm^2 single core copper PVC insulated flexible cable (coloured green/yellow).

The wiring loom shall be inserted within a suitable protective sleeve and be capable of being easily re-routed and secured without disconnection from the CTs, metering voltage fuses, neutral link and terminal test block as defined in section 3.3 - Front Access.

The wiring loom labelling for the CTs shall be standard numbering in accordance with ENA TS 50-19. See Appendix 9 – CT, Metering Voltage Fuses and Neutral Link - Labelling.

3.10.4. Terminal Test Block

The terminal test block shall be secured on the outside of the ISUM hinged door as described in section 3.3 – Front Access.

Both the CT, metering voltage fuse and neutral link wiring shall terminate into the terminal test block.

The terminal test block shall consist of:

- **CT connections -** 2 x terminals labelled for each of the 3 x CTs and include the functionality to short circuit each of the individual CTs at the terminal test block. The wiring from the CTs shall be connected to these terminals. The CT secondary circuits shall be connected to earth (via the main neutral bar) on the 'return' connection (S2 of the CT) at the terminal test block. This shall be achieved by the use of 2.5mm^2 single core copper PVC insulated flexible cables (coloured black) and combined/connected via a connector block which is located on but insulated from the DIN rail. See Appendix 8 – Metering Equipment Wiring Diagram – Typical Layout for further detail.
- **Connections for meter supplied by others –** The outgoing side of the terminal test block shall have shorting loops (coloured white) installed across each CT, which shall be removed once the meter is connected as described in Appendix 8 - Metering Equipment Wiring Diagram – Typical Layout.
- **Voltage connections -** The wiring from the metering voltage fuses and neutral link shall be connected to the incoming connections of the voltage terminals. 4 x metering voltage connection terminals (3 phase and neutral) wired to 6 x secondary fused/linked voltage connections for 3 phase and neutral with an additional phase connection (off L1) and neutral connection (off neutral) for the meter communications equipment respectively. The secondary phase connections shall be fused at 2 amps with a link in the neutral secondary connections.
- **CT earth connections –** This shall be achieved via the use of a connector which is located on but insulated from the DIN rail and is suitable for connecting 4 x 2.5mm^2 earth cables.

The terminals that form the terminal test block will be tested and approved to BS EN 60947-7-1. All wiring integral to the design/construction of the terminal test block shall be 2.5mm^2 single core copper PVC insulated flexible cables (unless otherwise stated) and comply with the requirements of BS 6231.

All wiring integral to the design/construction of the terminal test block shall be standard numbering in accordance with ENA TS 50-19. See Appendix 9 – CT, Metering Voltage Fuses and Neutral Link - Labelling.

All metal DIN rails/support brackets shall be suitably earth bonded.

See Appendix 8 for a typical metering equipment wiring diagram layout.

3.10.5. Metering Base/Mounting Plate

The front panel of the ISUM shall have a mounting plate that is pre drilled to accept the meters identified in Appendix 7 - List of example meter types.

The ISUM shall be suitably sized to accept metering equipment to be installed on the front panel in line with the requirements of Balancing and Settlement Code (BSC) Code of Practice (CoP) 5. Meters shall be fitted to the front panel of the ISUM with provision of appropriate access for cabling between the meter and terminal test block.

3.10.6. CT Calibration Tests

CT calibration certificates shall be produced to demonstrate compliance with the BS EN 61869-2 and/or (as appropriate) BS EN 61869-3 and/or (as appropriate) BS EN 61869-4 accuracy and measurement range requirements, as appropriate for the measurement transformer's class index.

The accuracy test results shall include a measurement uncertainty evaluation which shall be determined to a confidence level of 95% or greater in accordance with the UKAS Directive M3003.

A single hard copy of the calibration certificate showing the above requirements and test results will be provided within the ISUM. Additionally, options should be made available to capture this information in an electronic format.

3.10.7. CT Commission Tests

The CTs shall be tested, including primary injection, to determine their accuracy to the requirements of BSC CoP4, to confirm:

- That the current transformers are of the correct ratio and polarity and correctly located to record the required power flow;
- The relationships between voltages and currents are correct and that phase connections are standard at the terminal test block; and
- The burdens on the CTs are within the correct limits.

A single hard copy of the test certificate showing the above requirements and test results and additional detail shown in Appendix 10 will be provided within the ISUM. Additionally, options should be made available to capture this information in an electronic format.

See Appendix 10 - Typical CT Metering Equipment Commissioning Record.

3.10.8. CT Metering Unit Label

The unit shall be delivered with a CT metering unit label in line with the requirements of MOCOPA, Appendix 2, section A2.3. See Appendix 11 - CT Metering Unit Label.

The individual CT identification and specification labels shall be placed relative to each CT inside the unit and be easily visible.

3.11. General

3.11.1. The Main Current Carrying Components

The main current carrying components other than those made of aluminium or aluminium alloy shall be electro-tin or electro-silver plated.

3.11.2. Creepage and Clearance Distances

The unit shall be designed to ensure that adequate clearances are provided to permit a live unit with the door(s) open does not compromise any of the designed test values.

For connections in air, the clearance and creepage distance shall not be less than 25mm between conductors and 19mm from conductor to earth as defined in ENA TS 37-2, section 8.

4. References

The industrial service unit shall comply with the relevant International Standards, British Standard Specifications and all relevant Energy Networks Association Technical Specifications (ENATS) current at the time of tendering, except where varied by this standard. In respect the following documents are particularly relevant.

4.1. External Documentation

Reference	Version / Date	Title
BS 5372	1997	Dimensions of cable terminations for multi-core extruded solid dielectric insulated distribution cables of voltages 600/1000V and 1900/3300v having copper or aluminium conductors
BS 6231	2006	Electric cables – Single core PVC insulated flexible cables of rated voltage 600/1000 V for switchgear and controlgear wiring
BS EN 50274	2002	Low-voltage switchgear and controlgear assemblies. Protection against electric shock. Protection against unintentional direct contact with hazardous live parts
BS EN 60269-1:2007 +A2:2014 BS 88-1:2007+A2:2014	2007	Low-voltage fuses —Part1: General requirements
BS EN 60529	1992	Degrees of protection provided by enclosures (IP Codes)
BS EN 60947-7-1	2009	Low-voltage switchgear and controlgear - Part 7-1: Ancillary equipment - Terminal blocks for copper conductors
BS EN 61439-1	2011	Low-voltage switchgear and controlgear assemblies. Part 1: General rules
BS EN 61439-2	2011	Low-voltage switchgear and controlgear assemblies. Part 2: Power switchgear and controlgear assemblies
BS EN 61439-5	2015	Low-voltage switchgear and controlgear assemblies. Part 5: Assemblies for power distribution in public networks
BS EN 61869-2	2013	Instrument transformers - Part 2: Additional requirements for current transformers
BS EN 61869-3	2011	Instrument transformers Part 3: Additional requirements for inductive voltage transformers
BS EN 61869-4	2014	Instrument transformers Part 4: Additional requirements for combined transformers
BS HD 60269-2:2013, BS 88-2:2013	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
BSC CoP 4	12.0/Jun 2019	Code of Practice for the Calibration, Testing and Commissioning Requirements of Metering Equipment for Settlement Purposes
CoP 5	15.0/Jun 2019	Balancing and Settlement Code, Code of Practice 5, Code of practice for the metering of energy transfers with a max demand of up to (and inc) 1MW for settlement purposes
ENA TS 37-2	2012	Public electricity network distribution assemblies
ENA TS 50-19	1.0/2004	Standard numbering for small wiring (for switchgear and transformers together with their associated relay panels)
MOCOPA	4.8 Jun 2020	Meter Operation Code of Practice Agreement

The supplier shall provide with the tender full technical details of the equipment offered and shall indicate any divergence from these standards or specifications.

4.2. Internal Documentation

Reference	Version / Date	Title
IMP/001/010	7.0/Nov 2018	Code of Practice for Standard Arrangements for Customer Connections
IMP/001/911	6.0/Nov 2018	Code of Practice for the Economic Development of the LV System
NPS/002/005	5.1/Jul 2019	Technical Specification for Industrial Service Units
NPS/002/030	2.1/Jul 2019	Technical Specification for Heavy Duty Cutouts with Integral Current Transformers
NPS/002/031	3.1/Dec 2020	Technical Specification for Metering Base/Panel Unit for Connection to Heavy Duty Cut-outs from 100-500 Amps with Integral Current Transformers and LV Air Circuit Breakers in accordance with CoP5 up to 1MW

4.3. Amendments from Previous Version

Reference	Title
General	# Specification document title updated to……. NPS/002/029 - Technical Specification for Industrial Service Units with Integral Metering Current Transformers …… to align with more closely with the product function.
2.0 Scope	# Section updated to provide reference to neutral link.
3.6 Fuse Carriers	# Reference removed to fuse carriers with 82mm fixing centres as the standard design employed is J-type with 92mm fixed centres.
3.8 Outgoing Cable Terminations	# Section stated that 'the cable terminals on each outgoing fuse unit/circuit shall be separately shrouded to a minimum of IP31B'. IP31B has been revised to IP3X.
3.9 Neutral / Earth	# The neutral bar can be made of copper as well as brass. Copper added for document consistency. # Clarification provided on the types of cable that can be terminated at the neutral / earth position. # Clarification provided on the shear bolt head size for both the earth and neutral connections.
3.10.1 Current Transformer (CT)	# The CT minimum standard of accuracy revised from class 0.5 to class 0.5s to align with currently supplied product.
3.10.2 Metering Voltage Fuses, Neutral Link and Associated Wiring	# Removal of manufacturer's product reference with respect to fuse links and carriers (GEC 32).
3.10.4 Terminal Test Block	# Update added to confirm that the…. 'CT secondary circuits shall be connected to earth (via the main neutral bar) on the 'return' connection (S2 of the CT) at the terminal test block'…… Additional words added above are (via the main neutral bar).
4.3 Amendments From Previous Version	# Section updated to reflect latest changes.
5.0 Definitions	# Section updated.
Appendix 3 – Self Certification Conformance Declaration	# Section updated to align with updates in the body of the document.
Appendix 8 – Metering Equipment Wiring Diagram – Typical Layout	# Diagram title updated to align with more closely with the product function.

5. Definitions

Term	Definition
CT	Current transformer
DIN	Deutsches Institute Fur Normung (German Institute for Standardisation)
ENA TS	Energy Networks Association Technical Specifications
ISUM	Industrial service unit with integral metering current transformers
LV	Low voltage
PME	Protective multiple earthing
PVC	Poly vinyl chloride
SNE	Separate neutral and earth
The Company	Northern Powergrid
TTB	Terminal test block

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	09/03/2021

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
Paul Hollowood	Policy and Standards Engineer	10/03/2021

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
David Gazda	Senior Policy and Standards Engineer	XX/XX/XX
Michael Crowe	Technical Services Manager	30/03/2021
Steve McDonald	General Manager West Yorkshire	11/03/2021
Warren Lacey	Metering Specialist	10/03/2021
Mick Emsley	Policy and Standards Manager	10/03/2021

6.4. Authorisation

Authorisation is granted for publication of this document.

		Date
Greg Farrell	Head of System Engineering	27/04/2021

Appendix 1 – Product Requirements

Description	Commodity Code
Industrial service unit including metering (ISUM) 500A, for up to 300mm^2 waveform cable. Supplied with hinged front cover, shear bolt connectors, prewired CTs, front mounted metering base/panel unit with test terminals and meter fixing plate.	044958

Supporting evidence of compliance with type tests shall be submitted with the completed tender document.

Manufacturers may provide alternative tenders for items not complying with the above specification. This shall be clearly stated together with detailed descriptions of any variation from the specification, together with drawings and test results.

The supplier shall provide with the tender full technical details of the equipment offered and shall indicate any divergence from these standards or specifications.

Appendix 2 – Logistical Requirements

To enable the Company to store the product(s) in accordance with the manufacturer's recommendations the Tenderer shall provide details of the recommended storage environment with respect to each tendered product. Details shall be provided where relevant, in respect of 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 protected to enable storage in an outdoor environment whilst maintaining the product and packaging as "fit for service" prior to installation.

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.

In order to maximise storage space all palletised goods shall be supplied in standard returnable box pallets with the following specification. Where applicable, suppliers shall also indicate the maximum number of units of each product that are storable per box pallet.

- Size - 1200mm (w) x 1000mm (d) x 750mm (h)
- Weight (empty) – Up to 33kg
- Load Capacity – Up to 450kg
- Maximum Stacking Capacity – 10 High

Suppliers shall also include details of the type of material used to manufacture the box pallets.

The Company will give consideration to innovative alternatives to this specification.

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
- Shelf Life

Tenderer shall submit at the time of tendering a sample of the proposed labelling for each product package type.

Appendix 3 – Self Certification Conformance Declaration

Industrial service units (ISUMs) with integral metering CTs shall comply with the latest issues of the relevant national and international standards, including IEC 61439. 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 Industrial Service Units (ISUMs) with integral metering CTs for use on the Company 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 the supplier shall provide evidence to confirm conformance.
- When any other code is entered the reason and supporting evidence for non - conformance shall be entered.
- Prefix each remark with the relevant 'BS EN' 'IEC' or 'ENATS' as appropriate.
- Provide technical data sheets and associated drawings for each product.

Manufacturer / Supplier:

Manufacturer / Supplier Product Reference:

Northern Powergrid Product Reference (Commodity Code):

Details of the Product Type: (e.g. Voltage, Conductor Type and Size)

Name:

Signature:

Date:

NOTE: One sheet shall be completed for each type of cable offered.

NPS/002/029 - Technical Specification for Industrial Service Units with Integral Metering Current Transformers				
Clause/Sub-clause	**Clause / Requirements**	**Conformance Code**	**Evidence Reference**	**Remarks / Comments**
3.1 Industrial Service Unit Enclosure	BS 381C - Shade 632 or equivalent			
	In line with nominal enclosure dimensions			
3.2 Fixings	4 x M8 (internal) “key hole” Type			
3.3 Front Access	Single hinged 180º LHS opening door (door also suitable for RHS fixing) Pre-drilled to accept meter and/or meter panel.			
	Secured by captive screws & apposite for sealing with 2mm wire			
3.4 Cable Enclosure Entry / Exit	Top and bottom entry			
	Bottom entry suitable for 3 or 4c cables 95mm^2 – 300mm^2 to BS 7870 - 3.40 with removable gland plate and cable cleat			
	Incoming cable terminating distance to BS 5372 or larger			
	Top entry suitable for up to 2 x 1c cables per termination 35mm^2 to 185mm^2 via hard wood (or similar) plate (which is removable for installation of trunking if required)			
3.5 Fuse-Ways Within the Cut-out	Shall ensure fuse link is correctly aligned with the fixed contacts			
	Insertion of fuse link by hinged pivot action on the lower contact			
	Removal of fuse link by snatch action			
	Designed so on insertion of the fuse carrier current can be safely carried prior to tightening thumbscrews			
	IP2X rating to BS EN 60529 with fuse carriers inserted or if removed replaced with suitable temporary shielding			
	Provision suitable of temporary shielding			
	Without fuse carriers or contact covers in place preferably IPXXB to BS EN 60529 and meets requirements of BS EN 50274 to minimise the possibility of contact with live conductors by the operator			
	Access for test probes to top and bottom contacts with fuse carriers in or out			

NPS/002/029 - Technical Specification for Industrial Service Units with Integral Metering Current Transformers				
Clause/Sub-clause	**Clause / Requirements**	**Conformance Code**	**Evidence Reference**	**Remarks / Comments**
3.6 Fuse Carriers	Supplied without fuse links			
	Capable of independent operation, "through" grip shrouded type and made from insulated material with wedge type connections and insulated tightening thumbscrews			
	Suitable for BS 88-2 J-type fuse links with 92mm fixing centres			
	Over voltage & IR Tests			
	Mechanical Strength			
	Short circuit Withstand			
3.7 Incoming Cable Terminations	Shear bolt type, range taking mechanical connectors suitable for solid sector shaped aluminium conductors 95 - 300mm^2			
	Bolt head : 17 - 19mm			
3.8 Outgoing Cable Terminations	2 x range taking mechanical connectors per termination suitable for 1c stranded or tri-rated copper conductors 35 - 185mm^2 or tri-rated copper conductors 35mm^2 to 150mm^2			
	Complete with fixings (connector pressure pads, connector gauze)			
	Suitable spacing for "side by side" connection of outgoing cables			
	Shrouded to min IP3X (IPXXB if shrouding removed)			
3.9 Neutral / Earth	The removable earth links shall be clearly marked/labelled			
	SNE (PE) or PME (PEN) earthing by removable links, and no earthing facility where required			
	As NPS/002/005: 3.8, but also suitable for stranded copper conductors in the range indicated			
	As NPS/002/005: 3.9			
	1 x M6 CT star point to the neutral bar, with fixings			
3.10.1 Current Transformer (CT)	To meet the requirements of 3.10.1			
3.10.2 Metering Voltage Fuses, Neutral Link and Associated Wiring	To meet the requirements of 3.10.2			
	Three black fuse bases and carriers with 10A fuse links to BS HD 60269-2:2013, BS 88-2:2013 & phase identification			
	"Matching" white neutral link			
	Fuses / links mounting on removable cross member			

NPS/002/029 - Technical Specification for Industrial Service Units with Integral Metering Current Transformers				
Clause/Sub-clause	**Clause / Requirements**	**Conformance Code**	**Evidence Reference**	**Remarks / Comments**
	Outgoing connections front top entry			
3.10.3 CT Metering Associated Wiring	To meet the requirements of 3.10.3			
3.10.4 Terminal Test Block	To meet the requirements of 3.10.4			
3.10.5 Metering Base/Mounting Plate	To meet the requirements of 3.10.5			
3.10.6 CT Calibration Tests	To meet the requirements of 3.10.6			
3.10.7 CT Commission Tests	To meet the requirements of 3.10.7			
3.10.8 CT Metering Unit Label	To meet the requirements of 3.10.8			
3.11.1 Main Current Carrying Components	Electro-tin or Electro-silver plated (other than those of aluminium or aluminium alloy)			
3.11.2 Creepage and Clearance Distances	Min 25mm between conductors and 19mm from conductor to earth as defined in ENA TS 37-2			

BS EN 61439-1 Low-voltage switchgear and controlgear assemblies. Part 1: General rules				
Clause/Sub-clause	**Clause / Requirements**	**Conformance Code**	**Evidence Reference**	**Remarks / Comments**
5.2.1 Rated Voltage of Assembly	600/1,000V			
5.2.2 Rated Voltage of Circuit of Assembly	600/1,000V			
5.2.3 Rated Insulation Voltage	Manufacturer to state/confirm			
5.2.4 Rated Impulse Withstand Voltage	6kV			
5.3.1 Rated Current of Assembly	500A			
5.3.2 Rated Current of Circuit Assembly	500A			
5.4 Rated Diversity Factor (RDF)	1.0 (3Ø outgoing circuit)			

5.3.4 Rated short-time withstand Current of Circuit of Assembly	Based on potential fault energy let-through of: 630A HRC LV current-limiting fuse-links with the performance and testing requirements of BS EN 60269 – 1: 2007+A1:2009, with the rated current prefixed with the letter "g" as detailed in BS EN 60269 – 1 Section 5.7.1 installed at the LV PENDA at the source substation with 35.5kA fault level AND HRC LV current-limiting fuse-links with the performance and testing requirements of BS EN 60269 – 1: 2007+A1:2009, with the rated current prefixed with the letter "g" as detailed in BS EN 60269 – 1 Section 5.7.1. installed in the ISUM.			
5.5 Rated Frequency	50Hz			
7.1.1 Ambient Air Temperature	≤ 40ºC Av over 24hr ≤ 35ºC			
7.1.2 Humidity	≤ 50% at 40ºC			
7.1.3 Pollution Degree	2			

BS EN 61439-1 Low-voltage switchgear and controlgear assemblies. Part 1: General rules				
Clause/Sub-clause	**Clause / Requirements**	**Conformance Code**	**Evidence Reference**	**Remarks / Comments**
8.1.2 Protection against Corrosion	According to 10.2.2 (severity test A)			
	10.2.2 of BS EN 61439-5			
8.1.3.1 Thermal Stability	According to 10.2.3.1			
8.1.3.2 Resistance to Heat and Fire	According to 8.1.3.2.1, 8.1.3.2.2 and 8.1.3.2.3			
8.1.5 Mechanical Strength	Withstand stresses in service, during short circuit conditions and according to 10.13			
8.1.6 Lifting Provision	According to 10.2.5			
8.2.1 Protection against Mechanical Impact	According to 10.2.6			
8.2.2 Degree of Protection	IP41B to BS EN 60529			
	According to 10.3			

8.2.3 Degree of Protection of Removable Parts	Fuseways - IP2XB to BS EN 60529 (if removed to BS EN 50274 & minimises inadvertent contact with live conductors by operator)			
	Outgoing Cable Ways – IP31B to BS EN 60529 (IPXXB if removed)			
8.3.2 Clearances	NPS/002/005: 3.13.2			
	According to 10.4			
8.3.3 Creepage	See NPS/002/005: 3.13			
	According to 10.4			
8.4.1 Protection against Electric Shock	Min IP2X to IEC 60529, otherwise IPXXB.			
8.4.3.2.2 Earth Continuity	Exposed conductive parts interconnected and connected to PE / earth conductor			
	According to 10.5.2			
8.4.3.2.3 Faults in External Circuits (Through Faults)	Conductors within assembly to withstand thermal and dynamic stresses			
	According to 10.5.3			
8.4.5 Operating and Service Conditions	Accessibility in Service by Authorised persons according to 8.4.6.2			

BS EN 61439-1 Low-voltage switchgear and controlgear assemblies. Part 1: General rules				
Clause/Sub-clause	**Clause / Requirements**	**Conformance Code**	**Evidence Reference**	**Remarks / Comments**
8.5 Switching Devices and Components	Selection, installation and accessibility according to 8.5.3, 8.5.4 and 8.5.5			
	Barriers according to 8.5.6			
	According to 10.6.1			
8.6 Internal Electrical Circuits and Connections	Main circuits in accordance with 8.6.1			
	Auxiliary circuits in accordance with 8.6.2			
	Conductors in accordance with 8.6.3 and 8.6.4			
	According to 10.7			
8.7 Cooling	Natural Cooling			
8.8 Terminals (Incoming and Outgoing Circuits)	According to 10.8 (see NPS/002/005: 3.8, 3.9 and 3.10)			

9.1 Dielectric Properties	Power frequency withstand in accordance with 9.1.2 and Tables 8 & 9			
	According to 10.9.2			
	Impulse withstand: 6kV			
	According to 10.9.3			
9.2 Temperature Rise	According to Table 6			
	According to 10.10			
9.3 Short Circuit	Assemblies to withstand thermal and dynamic stresses resulting from short circuit currents specified			
	According to 10.11			
9.4 EMC Compatibility	According to J.9.4, Environment A (immunity & emissions for assemblies not incorporating electronic circuits)			
	According to 10.6.2			

Appendix 4 – Addendum to Supplier Requirements

No information added.

Appendix 5 – 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 6 – 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.

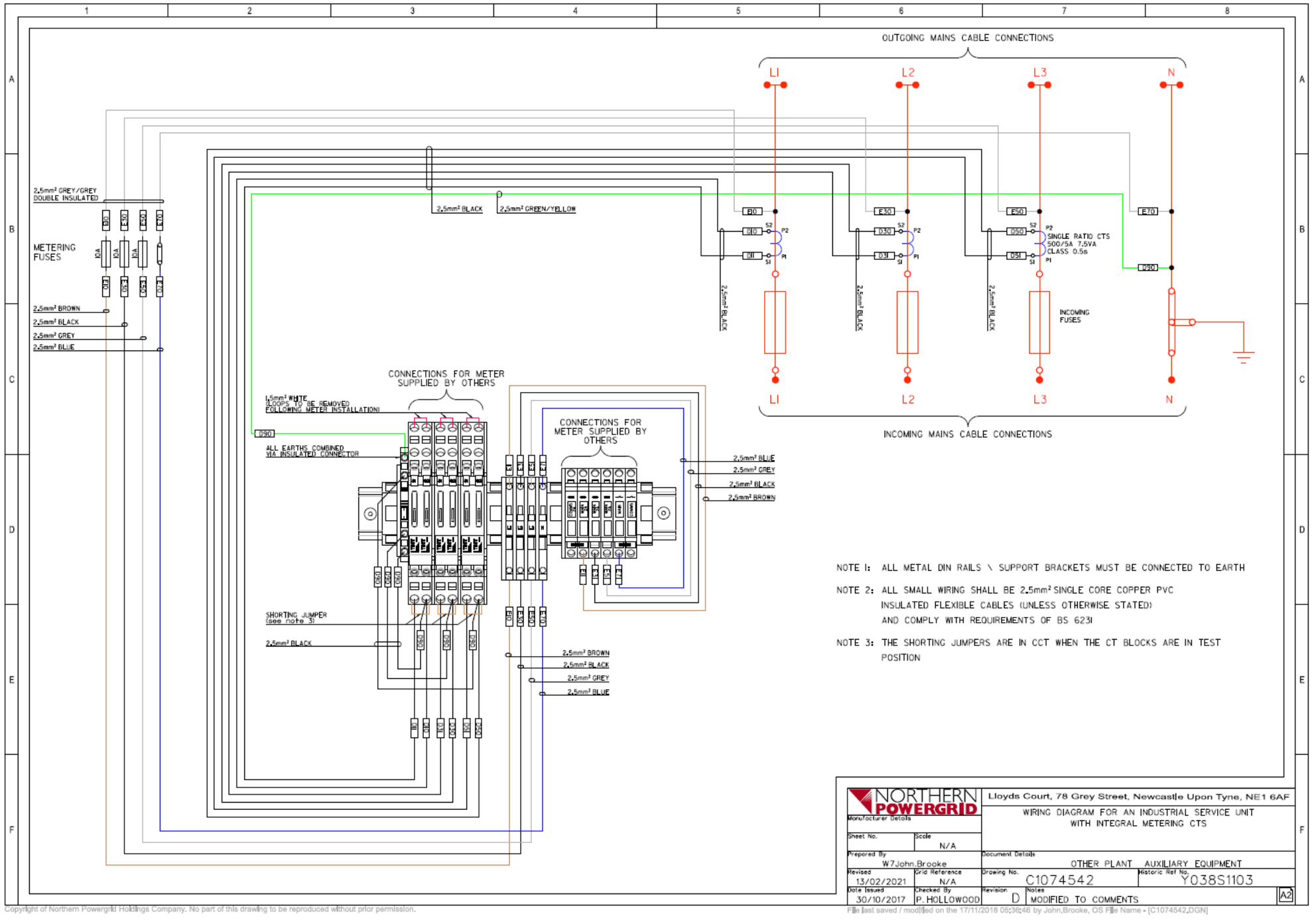
Requirement	Provided (Y/N)
Full product descriptions and part number/reference	
Appendix 3 – completed self-certification conformance declaration	
Complete set of drawings for each variant	
Type test evidence	
Routine test plan (example)	
Pre-commissioning testing/inspection requirements	
Recommended periodical inspection and maintenance requirements	
Packaging/delivery information	

Appendix 7 – List of Example Meter Types

The following details the types of meters that may by employed with the ISUM described within this document:

- Secure Premier Meter
- Elster A1700 Meter
- Elster A1120/40 Meter
- EDMI MK 10A

Appendix 8 – Metering Equipment Wiring Diagram – Typical Layout



Appendix 9 – CT, Metering Voltage Fuses and Neutral Link - Labelling

Voltage Conductor		
Voltage Conductor	**Between mvf/neutral and ttb voltage link**	**Between ttb voltage link and ttb fuse/neutral**
L1	E10	E11
L2	E30	E31
L3	E50	E51
Neutral	E70	E71

CT Output Conductor	
CT Output Conductor	**Between S1 on CT and ttb**
L1	D11
L2	D31
L3	D51

CT Return Conductor	
CT Return Conductor	**Between S2 on CT and ttb**
L1	D10
L2	D30
L3	D50

Combined CT Return Conductor
Between S2 on CTs and ttb where CT return conductors are combined
D70

CT Earth Conductor
D90

- Key:
- mvf = metering voltage fuse
- ttb = terminal test block

Appendix 10 - Typical CT Metering Equipment Commissioning Record

Location Name & Address

MPAN (import)

MPAN (export)

ISUM serial number	-

Current Transformer details

	L1	L2	L3
Make			
Serial number			
Selected ratio	500 / 5	500 / 5	500 / 5
Burden rating	7.5 VA	7.5 VA	7.5 VA
Class	0.5s	0.5s	0.5s
P1 pole facing DNO system (polarity flick test)	Yes / No*	Yes / No*	Yes / No*

Primary injection test

	L1	L2	L3
Measured primary current	A	A	A
Expected secondary current	A	A	A
Measured secondary current	A	A	A
CT current associated with same phase voltage	Yes / No*	Yes / No*	Yes / No*
Full load CT burden to terminal test block (V/I x 25)	VA	VA	VA

Number of supply phases	1 / 2 / 3*
Standard supply phase sequence (L1, L2, L3)	Yes / No*
CT shorting links left closed at terminal test block	Yes / No*
Service fuse rating	A
CT location (ISUM / CT chamber / other (please specify)	ISUM
Meter voltage fuse rating (ISUM)	10 A
Local meter voltage fuse rating (terminal test block)	2 A

*Delete where appropriate
New installed metering equipment as per BSC CoP5

Test instruments

	Voltmeter	Ammeter	Injection set	Other
Serial number				

Name..... **Signature**..... **Date**.....

Name..... **Signature**..... **Date**.....

To be completed by Northern Powergrid

Appendix 11 – CT Metering Unit Label

CT Metering Label Current Transformer Information							
CT	**Phase**	**Manufacturer**	**Serial Number**	**Single/Dual/Multi (Ratios Available)**	**Rating (VA)**	**Class**	**CT Ratio Connected**
CT	L1						
CT	L2						
CT	L3						
Distributor Company: Northern Powergrid			**Installation/Commissioning Engineer**:			**Date**: / /	