Harlaxton Energy Networks Limited

Electricity Metering Manual of Procedure

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Revision Log for Electricity Metering Manual of Procedure

Revision Log	
1.0	First Issue of Initial Document
1.1	Annual review – July 2017
1.2	Annual review – July 2018
1.3	Annual review – July 2019
1.4	Annual review – July 2020

1 GENERAL REQUIREMENTS

1.1 Overview

Harlaxton Energy Networks Limited (the Company) is regulated by the Office of Gas and Electricity Markets (Ofgem) under primary legislation of the **Electricity Act 1989** as amended by the **Utilities Act 2000**, the **Competition Act 1998** and through the granting of an Electricity Distribution Licence.

The Company has a duty under the **Act** to develop and maintain an efficient, co-ordinated and economical system of electricity distribution and to facilitate competition in the supply and generation of electricity.

All new additions and modifications to the Company's distribution system must comply with the requirements of the **Harlaxton's Design Manual** which provides for an adequate standard of network performance and reliability consistent with the obligations under the **Act**.

The requirements of the **Network Design Manual** also apply to any assets to be adopted by the Company under **Competition in Electricity Connections**.

The connection to and ongoing operational interface with customer's installations must comply with the requirements of this **Electricity Metering, Manual of Procedure (the Manual)**.

To assist with the continued development of the provision of effective standards of service and to meet our statutory and regulatory obligations, the Company is committed to ensure that any electricity metering initiatives developed through consultation with other interested parties e.g. the Office of Gas and Electricity Markets (Ofgem), ELEXON the Balancing and Settlement Code Company for Great Britain and the secretariat of the Meter Operation Code of Practice Agreement (MOCOPA®), are proactively pursued and appropriate decisions made to implement any changes deemed appropriate.

If any instances occur where the specific requirements of this **Manual** cannot be complied with, or it is desired for a specific reason to depart from the published content, then written permission must be obtained without exception from:

The Network Standards Manager,
Harlaxton Energy Networks Limited,
Toll Bar Road,
Marston,
Grantham,
Lincolnshire,
NG322HT.

1.2 Introduction

This Manual has been prepared to provide general guidance and to outline the internal and external processes and procedures associated with electricity metering administered by the Company for connection to our distribution system.

The content considers all matters relating to the application, operation and control, quality of service, operational performance measures and also outlines the requirements and administrative processes to resolve technical difficulties and problems associated with the management of all types of electricity metering.

The Company presently operates under the requirements of a distribution licence covering a combined geographical area. Where possible, the content of this manual is a consolidation of information and specific requirements applicable to the whole of the Company and any differences have been identified where applicable.

2 INTERPRETATION

2.1 Company Publications

All publications are available from our website at http://www.harlaxtonenergynetworks.co.uk

2.2 External Publications

Copies of the following publications can be obtained from the HMSO website at http://www.legislation.hmso.gov.uk.

1. The Electricity Act 1989, (as amended).
2. The Utilities Act 2000, (as amended).
3. The Balancing and Settlements Code (BSC) under the secretariat of ELEXON.
4. The Electricity Safety, Quality and Continuity Regulations 2002 (as amended).
5. The Electricity at Work Regulations 1989.
6. The Electricity (Standards of Performance) Regulations 2005.
7. The Quality of Service Regulatory Instruction and Guidance v.5.0 (March 2005).

8. The Distribution Code can be obtained from website http://www.ofgem.gov.uk/dso/index.htm.

9. The Connection and Use of System Code and the Grid Code can be obtained from website http://www.nationalgrid.com/uk.

10. Connection and Distribution Use of System Agreement (DCUSA).

11. Any other relevant legislation.

3 GLOSSARY OF TERMS

The following glossary of terms is included to clarify certain references used within this and other Harlaxton Energy Networks publications and they are not exhaustive and any other cognate expressions should be construed accordingly.

Act	The Electricity Act 1989.
Apparatus	All equipment, in which electrical conductors are used, supported or of which they may form part.
Authorised Person	A person who has sufficient training and experience in a specified activity and has been tested competent and nominated to undertake specific duties.
Authorised Supply Capacity (ASC)	The electrical capacity or load measured in kVA (kilo-volt amperes) or MVA (Mega-volt amperes) and authorised by the Company for connection to the Distribution System, forming part of an Electricity Connection Agreement.
Balancing and Settlement Code or BSC	The Balancing and Settlement Code dated 14 August 2000, including all party service lines and BSC procedures (as therein defined) made under it.
CODE OF PRACTICE FIVE (COP 5)	Code of Practice for the metering of energy transfers with a maximum demand of up to (and including) 1MW for settlement purposes.
CODE OF PRACTICE THREE (COP 4)	Code of Practice for the calibration, testing and commissioning requirements of metering equipment for settlement purposes.
CODE OF PRACTICE THREE (COP 3)	Code of Practice for the metering of circuits with a rated capacity not exceeding 10MVA for settlement purposes. (1MW to 10MVA).
CODE OF PRACTICE TWO (COP 2)	Code of Practice for the metering of circuits with a rated capacity not exceeding 100MVA for settlement purposes. (10MVA to 100MVA).
Company	Harlaxton Energy Networks Limited.
Competition in Electricity Connections	A generic term where a customer can request Contestable Works to be carried out by their appointed approved contractor, for the provision of an electricity connection(s).
Connection Agreement	An agreement between the customer and the Company setting out terms and conditions with which each are bound concerning the provision and use of the connection to the Company's distribution system.
Connection	Any physical connection whatsoever that gives, implies or confirms mechanical or electrical continuity with any plant or apparatus

	installed by the customer to the Company's distribution system irrespective of energised state.
Current Transformer Operated (CTO)	In the context of this Manual, current transformer operated metering equipment driven by secondary current, but can be referred too as Current Transformer (CT) metering (being the more common terminology).
Customer	In the context of this Manual, the person requesting the electricity connection under the terms of Section 16 of the Electricity Act 1989 as amended by the Utilities Act 2000.
Distributing Main	Has the meaning given to it in the Electricity Safety, Quality and Continuity Regulations 2002 (as amended).
Distribution Safety Rules (DSR)	A governing set of safety rules to be followed when working on the Electricity Distribution Licence holder's distribution system.
Distribution System	The Company's system for the distribution of electricity as defined in the Electricity Distribution Licence.
Distribution Network or System Operator (DNO or DSO)	In the context of this Manual the Company, which is regulated by the Office of Gas and Electricity Markets (Ofgem) under primary legislation of the **Electricity Act 1989** as amended by the **Utilities Act 2000**, the **Competition Act 1998** and through the granting of an Electricity Distribution Licence, owns and operates a distribution system and undertakes all activities associated with the distribution of electricity.
Electricity Connections Agreement	An Agreement between the Company and the End User Customer specifying the arrangements and Authorised Supply Capacity (ASC) for connection to the distribution system at the Point of Supply (PoS).
Electricity Supply	The supply of electricity to be provided by the Supplier to the End User at any Exit Point under the terms of the Agreement between the Supplier and the End User for the supply of electricity.
End User	In relation to a Metering Point or the Supply Terminals, any person being supplied with electricity at that Metering Point or the Supply Terminals.
Exit Point (s)	The Metering Point or the Supply Terminals of a connection at which a supply of electricity may flow between the distribution system and the Customer's Installation upon energisation.
Fault	A failure or abnormality in performance of electrical apparatus owned by the Company.

Half Hourly (HH) Meter	A Meter which provides measurements on a Half Hourly basis for Settlement purposes.
High Voltage (HV)	Has the meaning given to it in the Electricity Safety, Quality and Continuity Regulations 2002 (as amended).
Licence	The Company's Electricity Distribution Licence granted under Section 6(1) (c) of the Electricity Act 1989.
Licence Condition 13 Statement	The statement that the Company is obliged to publish under the terms of their Electricity Distribution Licence, governing electricity connections to the distribution system of the Company entitled Connection Charging Methodology Statement.
Low Voltage (LV)	Has the meaning given to it in the Electricity Safety, Quality and Continuity Regulations 2002 (as amended).
Meter	A device for measuring Active Energy or Reactive Energy.
Metering Point	The point at which an Electricity Supply is or is intended to be measured.
Non-Half Hourly (NHH) Meter	A Meter which provides measurements other than on a Half Hourly basis for Settlement purposes.
Point of Connection (PoC)	The point on the Company's distribution system where the Customer's service line will be connected for the purpose of network supply and system continuity.
Point of Supply (PoS)	The demarcation point between the Company's distribution system and the Customer's system/ electrical installation which will also be the point of isolation between both systems.
Supplier (Electricity Supplier)	A person who is the holder of a licence to supply electricity under Section 6 of the Electricity Act 1989 or is exempted from holding such a licence under the Act.
The Regulations	In this context The Electricity Safety, Quality and Continuity Regulations 2002 (as amended).
Supply Terminals	Has the meaning given to it in the Electricity Safety, Quality and Continuity Regulations 2002 (as amended).
Underground Cable	Has the meaning given to it in the Electricity Safety, Quality and Continuity Regulations 2002 (as amended).
Use of System Agreement	An agreement between the Company and any other person for the Use of the distribution system.

Whole Current (WC) In the context of this Manual a meter driven by actual load current passing through the meter for kWh (kilo-watt hour) recording purposes.

4 OBLIGATIONS

4.1 Distribution Licence

The Electricity Distribution Licences granted by the **Office of Gas and Electricity Markets (Ofgem)** under the terms of the **Utilities Act 2000**; contain both standard and special licence conditions. The special licence conditions contain important requirements relating to price control and quality of service. There are specific mandatory conditions associated with the granting of a new licence and those are identified in the relevant sections below where applicable.

As a consequence of changes to the **Electricity Act 1989** as amended by the **Utilities Act 2000** which introduced distribution as a separate activity requiring authorisation, **The Office of Gas and Electricity Markets** (**Ofgem)** can grant new Electricity Distribution Licences authorising individual companies to distribute electricity for the purpose of giving a supply to any premises.

4.1.1 Distribution Network Operator (DNO)

4.1.1.1 Statutory Obligations

The Company is regulated by the Office of Gas and Electricity Markets (Ofgem) under primary legislation of the **Electricity Act 1989** as amended by the **Utilities Act 2000**, the **Competition Act 1998** and through the granting of an Electricity Distribution Licence.

4.1.1.2 Regulatory Obligations

The Company response time to any person seeking a new, increased or reduced capacity connection prior to the installation of electricity metering equipment, will be in accordance with the **Electricity Act 1989 - Standard Conditions of the Electricity Distribution Licence**, the **Electricity (Standards of Performance) Regulations 1993** and the **Electricity (Standards of Performance) (Amendment) Regulations 1995 and 1998** or any amendment or re-enactment in force at any time.

4.1.1.3 Licence Conditions

The Company has specific obligations under **Chapter 4 – Arrangements for the Provision of Services** of its **Licence,** these are:

<u>Condition 13 & 14 – Charging Methodologies for Use of System and Connection</u>

Condition 13.1(a) of the Licences requires us to have in force a **Use of System Charging Methodology** and **Condition 14.1(a)** requires a statement to be produced

which sets out the basis on which charges will be made for the utilisation of the distribution system by Electricity Suppliers to supply electricity to End User customers.

Condition 13(b) of the Licence requires us to produce a **Connection Charging Methodology** and **Condition 14(b)** requires a statement to be produced for each of our licensed areas, which sets out the basis on which charges will be made for making an electricity connection to the distribution system for End User customers.

Both statements have been submitted to and the **Connection Charging Methodology** statement incorporates the terms and conditions under which any person entitled to apply, may apply for a new, increased or reduced connection to our distribution system.

It also incorporates the principles for **Competition in Electricity Connections** supported by relevant Company publications.

A copy of the Statements can be obtained from the Company on request or visit our website at www.harlaxtonenergynetworks.co.uk

In addition to the above requirements, the Company also has obligations to comply with the following **Conditions** relating to Metering Services: -

Condition 16 – Requirements to Offer Terms for the Connection of Metering Equipment to the Company's distribution system e.g. cut-out, which is normally termed a "Connection Agreement".

Where large capacity low or high voltage connections are required, then a "Connection Agreement" will be required between the Company and the End User customer. This outlines the End User customer's rights to be and remain connected and use the Company's distribution system. It will also outline any specific requirements of the Company in this respect e.g. it will include references to Authorised Supply Capacity (ASC) and a Site Responsibility Schedule for compliance with any operational interface requirements etc.

Condition 17 – Requirements to Offer Terms for the Provision of Metering Point Administration Services and **Condition 18 – Provision of and Charges for Metering Point Administration Services** to administer the interface and process requirements between the Company and the Electricity Supplier associated with the electricity connection to the distribution system.

5 ELECTRICTY METERING

5.1.1 Company Obligations

Condition 17 – Requirements to Offer Terms for the Provision of Metering Point Administration Services and **Condition 18 – Provision of and Charges for Metering Point Administration Services Conditions** outlined in **Section 4.1.1.3 – Licence Conditions** of this Manual, are also directly related to the Balancing and Settlement Code (BSC) provisions.

Under the BSC the Company also has a responsibility to provide a service called a **Metering Point Administration Service (MPAS)** under the terms and conditions of the **Master Registration Agreement (MRA)**.

The arrangements are administered through our **MPAS** Operations.

The following is an outline of the general activities:-

- There is a requirement for a central point of contact for internal and external customers e.g. Electricity Suppliers, Meter Operators and End User Customers.

- Each metered electricity connection has to be given a **Metering Point Administration Number (MPAN)** also referred to as a Supply Number. This is provided by our Company after acceptance of our Formal Offer and Terms and Conditions for the provision of an electricity connection.

- All metering points connected to our distribution system including, New Connections, New Registrations, Changes of Electricity Supplier and Agent appointments have to be recorded.

  The details are recorded on our **Metering Point Registration System (MPRS)** and our Internal Asset Databse (AD) and this is essential to enable the Electricity Supplier to register against an issued **MPAN**.

- Customers have to be able to change their Electricity Supplier if required and for such changes to be registered.

- A number of industry Stakeholders including **ELEXON** (who manage the Balancing and Settlement Code), have to be advised which Electricity Supplier has liability for a metering point for Settlement purposes.

- There has to be control over the electronic and/or paper data flows processes for customers e.g. requests for Connection, Disconnection, MPAN's etc.

- There is a BSC procedure to retain essential documentation e.g. Current Transformer (CT) and Voltage Transformer (VT) manufacturers certificates and metering test forms for high voltage electricity connections.

- An Audit process has to be provided to ensure compliance at the Point of Supply (PoS) and this is administered by the Revenue Protection Department of the Company. This is detailed in the HEN43 document, "Commissioning of Metering Systems for Distribution."

5.1.2 Requirement for an Electricity Metering Manual of Procedure

The correct administration of the process outlined in **Section 5.1.1 – Company Obligations** above, enables our Company to control the **Distribution Use of System (DUoS)** charges levied on Electricity Suppliers in association with the use of our distribution system to supply End User customers.

To support the process the Company also has obligations associated with the provision and ownership of certain parts of the electrical metering installation at the Point of Supply (PoS).

This is determined as the interface between our distribution system assets e.g. cut-out for Whole Current (WC) metering or, Test Terminal Block (TTB) for Current Transformer Operated (CTO) metering and the appropriate meter installation undertaken by an appointed Meter Operator (MO) employed by the Electricity Supplier.

The correct installation of the wiring and equipment associated with **Electricity Metering** is therefore **essential** to ensure that the Company meets its overall obligations and minimises the financial and technical risks and liabilities related to the activity.

This Manual has therefore been produced to support and ensure compliance with the Company's overall obligations.

5.1.3 Approval of Metering Providers

The Meter Operation Code of Practice Agreement (MOCOPA®) is a voluntary agreement between a Distribution Network Operator (DNO) and a Meter Operators (MO) in the UK. The agreement enables an MO to install and connect meters to the distribution system and covers safety, technical and other interface issues.

The requirements apply to the provision, installation, maintenance and testing of all types of meters installed by MOs i.e. WC and CT/VT operated half hourly and non-half hourly meters.

The Code incorporates industry best practice and sets out the duties and obligations of both parties through a set of specific guidelines. Compliance gives confidence to all parties operating in the electricity supply market, that metering equipment is being provided, installed and maintained to adequate standards of safety, to appropriate technical requirements and in such a way as not to introduce barriers to movement by End User customers between Electricity Suppliers, nor introduce inequitable cost penalties to any participants in these markets.

The installation of metering and associated equipment which is to be connected to the Company's distribution system **should** be carried out by an MO operating under the terms of the Meter Operation Code of Practice Agreement (MOCOPA®) agreement.

Further details can be obtained from website www.mocopa.org.uk

5.1.4 Company Authorisation

Where the operatives and/or agents of an Electricity Supplier/Meter Operator need to remove/replace the Company's low voltage cut-out fuses to undertake their metering duties, or the appointed ELEXON Technical Assurance Agents (TTA) need to carry out periodic audit duties, then specific sanction will be provided subject to the following conditions.

The Company's Safety, Health and Environment Team will sanction the relevant organisation to undertake the tasks subject to the following:-

- The organisation **must** be a MOCOPA® affiliate.
- The organisation **must** apply to the Company for sanction and provide all relevant details on request.
- The organisation **must** have a separately recognised Safety Management System and have an established training function to ensure compliance with the Company's requirements.
- The organisation **must** keep accurate training records of all operatives and/or agents authorised to undertake the relevant work.

Applications for sanction should be sent to:-

Operational Safety Manager,
Harlaxton Energy Networks Limited,
Toll Bar Road,
Marston,
Grantham,
Lincolnshire,
NG322HT.

5.1.5 Installation Requirements

5.1.5.1 General Arrangements

The general arrangement for **HV** and **LV** type connections is shown below: -

HV

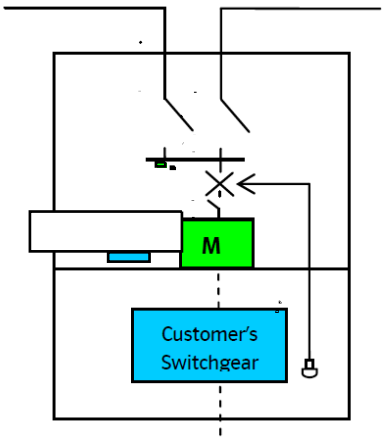


Figure 1

LV

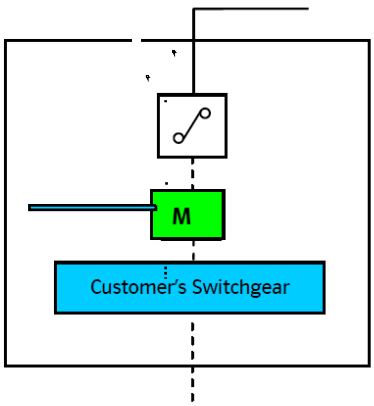


Figure 2

The general arrangements for the location **Electricity Metering** is outlined above.

5.1.5.2 Metering Wiring Installations

It will be the responsibility of the End User customer to procure and fund the provision and installation of suitable wiring and associated metering equipment that **must** conform to the requirements of this Manual.

Where the End User customer requests that the Company undertakes all work to provide an electricity connection, then this will normally include the provision of the relevant wiring installation up to the interface as described in **Section 5.1.2 – Requirements for an Electricity Metering Manual of Procedure** of this Manual.

Where the provision of an electricity connection is requested under the terms of Competition in Electricity Connections, then the End User customer's Independent Connections Provider (ICP) will be responsible for making the necessary arrangements. The wiring installation will be adopted by the Company subject to satisfactory installation on completion of the works.

In **all** circumstances, the final installation of the meter and associated equipment will be undertaken by the customer's Electricity Supplier and/or Meter Operator (MO).

5.1.5.3 Secure Enclosures

The provision of suitable secure enclosures and/or buildings to house necessary switchgear and metering equipment, **must** conform to existing Company specifications and procedures e.g. Network Design Manual.

Where a connection is required at LV, HV or EHV, suitable protection and/or isolation facilities should be provided at the Point of Supply (PoS).

For LV connections this requirement will be met by the cut-out and for HV this will normally be the Ring Main/Metering Unit or metering circuit breaker.

With regard to all metering installations and in particular, the location of the metering equipment, there is a requirement under normal circumstances for the End User customer to have general access for meter reading purposes etc. Therefore, in these situations the meter **will** be located on the customer's side of any physical boundary that may be installed within the suitable secure enclosures and/or building and sufficient space will be required to accommodate all of the equipment and also provide sufficient working space for operatives to undertake installation work and commissioning tests as required.

5.1.5.4 LV Enclosures

Outdoor Meter Boxes

New and re-serviced domestic housing electricity connections shall be installed in outdoor meter boxes mounted into an external wall on the front or side elevation of the property, in front of any fence or gates to allow unrestricted access to Company equipment from the Public Highway.

The meter tails to the consumer unit shall not exceed 3 metres in length and the Meter Operator may install a 100 amp isolator in the meter tail wiring after the meter within the meter box, to provide isolation facilities for the End User customer's consumer unit/fuse board.

The following meter box positions are **not** permitted: -

- at the rear of the property (unless authorisation has been saught)
- at the side of the property behind fences or gates.
- within a coal, dustbin or refuse store, garage, porch.
- under windows unless minimum installation height can be achieved.

The box shall be installed at a:-

- maximum height of 1800mm from ground level to the top of the box – to enable access without ladders or steps.

- minimum height of 450mm from ground level to the bottom of the box – to reduce the risk of water entering the box as a result of flooding or fire fighting activities.

These requirements are necessary for the following reasons:-

- Cables, fuses and meters generate heat during normal operation which must be properly dissipated to ensure the equipment does not overheat and catch fire. Outdoor meter boxes designed and manufactured to ENATS 12-03 have thermal characteristics that enable the service termination equipment to be operated safely. The thermal performance of indoor service positions may be compromised by occupiers storing items close to the equipment resulting in overheating.
- Service cables are directly connected to high energy distribution mains protected by substation fuses with up to 630 amp rating and designed to have a maximum fault clearance time of 100 seconds. The protection of fixed wiring complying with BS7671 – Requirements for Electrical Installations inside buildings, ensures fault clearance times of less than 5 seconds. By placing the service cut-out fuse in a meter box outside the building the Company is able to provide the same level of protection inside the building up to the consumer unit as afforded by BS7671.
- An outdoor service position ensures that at the time of installation and during subsequent building work and occupation, the risk of tradesmen or occupiers being injured by live high energy equipment is as low as is reasonably practicable.

To provide access to service equipment:-

- To enable regular meter reading by the Meter Operator to reduce the incidence of estimated billing.
- To reduce the hazards to meter operatives and all personnel involved in electricity distribution. The injuries that occur whilst inside private dwellings include, slips trip & falls, dog attacks, assault by occupiers and removing the need to enter dwellings reduces these hazards.

The following meter boxes to ENATS 12-03 are approved for use by Harlaxton Energy Networks Limited:

From left to right:

1. **Small Flush Fitting Box.**
2. **Slim-line Flush Fitting Box.**
3. **Small Surface Mount Box.**
4. **Large Flush Fitting Box (not shown).**

1. Small Flush Fitting Box.

Used for single phase services.

This is designed to fit into the outer leaf of a cavity wall in a space 7 bricks high by 1½ bricks wide. The overall outside dimensions are approximately 600mm high by 410mm wide. This box will accommodate a single phase cut-out, time-switch, two rate meter and isolator.

Knock-outs are provided for service cable entry via the cavity or the wall surface. Cavity entry is not permitted by Harlaxton Energy Networks Limited.

2. Simline Flush Fitting Box.

Used for single phase services.

This is designed to fit into the outer leaf of a cavity wall in a space 9 bricks high by 1 brick wide. The overall outside dimensions are approximately 830 mm high by 275 mm wide. This box will only accommodate a single phase cut-out and a single meter with built in tele-switch and isolator.

When opting for slim-line boxes the developer must ensure that the intended meter operator can provide this type of meter.

Knock-outs are provided for service cable entry by the cavity or the wall surface. Cavity entry is not permitted by Harlaxton Energy Networks Limited.

3. Small Surface Mounted Box.

Used for single phase services.

Similar to Item 1 but designed to fit on the surface of walls without a cavity. The overall outside dimensions are approximately 600 mm high by 400mm wide. The box projects about 235mm from the surface of the wall. This box will accommodate a single phase cut-out, time-switch, two rate meter and isolator.

Knock-outs are provided for service cable entry via the wall surface only.

4. Large Flush Fitting Box. (Similar to Small Flush Fitting Box No photo available)

Used for three phase services.

This is designed to fit into the outer leaf of a cavity wall in a space 9 bricks high by 2 bricks wide. The overall outside dimensions are 790 mm high by 565 mm wide. This box will accommodate a three phase cut-out, time-switch, two rate meter and isolator.

Knock-outs are provided for service cable entry via the cavity only. For the time being cavity entry is permitted by Harlaxton Energy Networks Limited until such time as the standard design is altered to allow wall surface entry.

Indoor Meter Positions

Where it can be demonstrated that the Local Planning Authority will not permit an outdoor meter box by virtue of the building being listed, or in a conservation area, a service position inside a property may be permitted. Harlaxton Energy Networks acceptance of any proposal will be subject to the following conditions:-

- The design of the indoor service position shall ensure that at the time of installation and during subsequent building work and occupation, the risk of tradesmen or occupiers being injured by live high energy equipment is as low as is reasonably practicable.
- The service cable shall be routed inside the building by the shortest and most direct route possible and shall be ducted. The internal end of the duct shall be sealed immediately after cable installation to prevent the ingress of natural gas.
- The service equipment shall be installed on a brick or block-work wall and where reasonably practicable this will be an external wall.
- In timber framed buildings a suitable brick or block-work wall may not be available. In these cases a steel sheet (min 1mm thick) shall be fixed behind the service cable, cut-out and meter which shall be earthed. *This it to protect persons drilling through the wall from electric shock*.
- The customer shall provide accommodation for the cable, cut-out and meter in a meter cabinet extending from floor level. The free air space inside the cabinet should equal or exceed that of an out-door meter box and ventilation shall be provided to enable the heat generated by the service cable, cut-out fuse and meter to be safely dissipated. Local Fire Regulations may require a heat run tests to be carried out on the proposed design.

  The service cable above the floor must not be obscured by panelling of any type or routed behind the backs of any cupboards or fitments. The cable may be covered with a cable guard or capping which is easily identified as cable protection. *There have been fatal accidents where persons have drilled through panelling into live service cables.*

  The standard fibre glass outdoor meter box **shall not be used indoors** as it does not comply with the appropriate British Standards for fire resistance and fume emissions. The developers shall provide a meter box that complies with fire regulations and any local by-laws.

The following service positions are **not** permitted:-

- Inside a coal store, dust bin or refuse store, cellar, lavatory, kitchen or bathroom.
- Over doorways.
- On a partition wall made of plasterboard, drywall or similar material.
- Under stairs where headroom is less than 2m.

- Any location where it is not possible to comply with the current edition of BS7671 - Requirements for Electrical Installations.

The following table is an extract from the Company's Network Design Manual showing the

Examples of Meter Tail Sizes

Service Cable Size Wavecon Cable	Service Cable Current Rating	Cut-Out Fuse Size	Number and Size of Meter Tails per phase (Suggested)				Minimum Size of Main Earthing Conductor (Suggested)	Min Size of Equipotential Bonding Conductor
			PVC BS7671 Table 4D1A		XLPE BS7671 Table 4E1A			
Aluminium Phase (Copper Neutral)	Amps	Amps	Method 1 Clipped Direct (mm^2 cu)	Method 3 Trunking (mm^2 cu)	Method 1 Clipped Direct (mm^2 cu)	Method 3 Trunking (mm^2 cu)	From Cut-Out to Customer's Main Earth Bar	i.e. water, gas, oil, frame
35 mm^2 (22 mm^2)	100/90	100	1 x 35	1 x 35	1 x 35	1 x 35	16 mm^2	10 mm^2
95 mm^2 (60 mm^2)	201	200	1 x 70	1 x 95	1 x 50	1 x 70	35 mm^2	16 mm^2
185 mm^2 (116 mm^2)	292	315	1 x 150	1 x 240	1 x 95	1 x 150	70 mm^2	35 mm^2
300 mm^2 (116 mm^2)	382	400	1 x 185	1 x 400	1 x 150	1 x 240	95 mm^2	50 mm^2

NOTES
Two tails per phase are not permitted as they will not pass through metering CT's.

The Customer's electrical contractor should refer to the current edition of BS7671 'Requirements for Electrical Installations' to confirm that these sizes are adequate for the proposed method installation.

5.1.5.5 HV Enclosures

The requirements for HV Enclosures may vary dependant on the customer's switchgear and metering installation which will be dependant on their Authorised Supply Capacity (ASC) and the specific connection details are contained within the Company's Network Design Manual.

Under normal circumstances where a HV Ring Main/Metering Unit is required this will be installed in a GRP housing unless, the customer prefers to construct a suitable building for this purpose. For the latter arrangement, physical separation of the Company's HV switchgear and the actual meters and associated equipment will be required i.e. separate rooms.

For a GRP arrangement, the Company will not permit the meters and associated equipment being installed inside the housing for safety and operational reasons. This therefore requires the provision of a suitable external enclosure/cabinet to house the meters and associated equipment that is accessible to the customer to read the meters and **must** also allow access by their Electricity Supplier and appointed Meter Operator as necessary.

It is a Company requirement in association with the customer, that where a HV Ring Main/Metering Unit or Metering Circuit Breaker is installed then an HV Emergency Trip Button facility **must** be provided. Where the metering Voltage Transformer (VT) auxiliary tripping supply is utilised, the pilot cable and Emergency Trip Button **must not** interfere with the metering installation and care must be taken to ensure that it should also be located in a suitable position to avoid accidental operation.

It is **essential** that where enclosures/cubicles are provided that appropriate keys are exchanged between all parties as required.

The following photographs show typical examples of a suitable GRP Housing together with free standing or externally mounted metering enclosures/cabinets.

It should be noted that to avoid the future replacement of the enclosure/cabinet and associated internal wiring, that where it is anticipated that an End User Customer may wish to increase their Authorised Supply Capacity (ASC) and exceed the Code 5 metering requirements, it is recommended that the Code 3 enclosure/cubicle is fitted in the first instance. This is required to provide the additional space requirements as for Code 3 metering a Main and Check Meter have to be fitted.

GRP HV Switchgear Housing complete with external Free-Standing Code 5 Metering Cubicle

Internal view of Free Standing Code 5 Metering Cubicle showing, Code 5 Meter and HV Emergency Trip Button

External view of GRP Housing attached Code 5 or Code 3 Metering Cubicle

Internal view of GRP Housing attached Code 5 or Code 3 Metering Cubicle showing Code 5 Meter

6 INTERNAL PROCESS REQUIREMENTS

The following section outlines the requirements to meet the Company's obligations as outlined in **Section 4 – OBLIGATIONS** of this Manual the "paper trail" associated with the installation of LV and HV Electricity Metering.

6.1.1 Electricity Metering Validity Process

To ensure compliance with Company's obligations the following is the basic sequence of requirements contained within this section of the Manual that **must** be followed:-

1. **Section 6.1.2 – Process Flow**.

2. **Section 6.1.3 – Electricity Supply Notification Process (HEN08 Form) –** "Notification for New/Modified Electricity Supply" and "Notification to Confirm Installation Dates of New/Modified Electricity Supply".

3. **Section 6.1.4 – CTO Metering Installation and Commissioning (HEN43) -** on-site pre and post commissioning testing requirements.

4. **Section 6.1.4.1 – Manufacturer's VT/CT Certificates**.

5. **Section 6.1.4.2 – Electricity Supplier/Meter Operator Obligations.**

6. **Section 6.1.4.3 – General Obligations.**

The overall requirements are detailed in the following process flow and individual responsibilities listed for the relevant internal/external service providers are:-

Harlaxton Energy Networks (HEN), Operations and Asset Management (O & AM) or, Energy Services (ES) Administration Teams – has the responsibility to process the customer enquiry above 70kVA capacity connections i.e. CT Metering threshold and to ensure that when the Project Delivery File is produced that this includes the relevant HEN08 form and the process is instigated.

Project Manager (PM) - has responsibility to arrange for the installation of all cables, plant and equipment to provide electricity connection(s) and notify the relevant internally and/or externally "approved" CT Fitters to undertake the CT and wiring installation work. Where work is carried out by Independent Connection Providers (ICPs) under Competition in Electricity Connections, they will be responsible for ensuring that the CT Fitter inspects the CT and wiring installation work prior to adoption by the Company.

Independent Connections Provider (ICP) – has responsibility under Competition in Electricity Connections if required, to undertake the CT and wiring installation work and to submit to the Company the appropriate form as outlined in **Section 6.1.4 - CTO Metering and**

Commissioning Record (HEN47), after initial installation, testing and commissioning work has been carried out.

It should be noted that the Company **will** still require the CT and wiring installation work to be inspected by the CT Fitters to check the initial installation, testing and commissioning work is satisfactory prior to adoption, unless the ICP and/or their appointed agent is accredited to undertake this work and is affiliated to MOCOPA®.

Harlaxton Energy Networks (HEN), Operations and Asset Management, Registration and Services Administration Team – has responsibility to process the relevant forms and to ensure the registration process under the requirements of **Section 5.1.1 – Company Obligations** of this Manual are met.

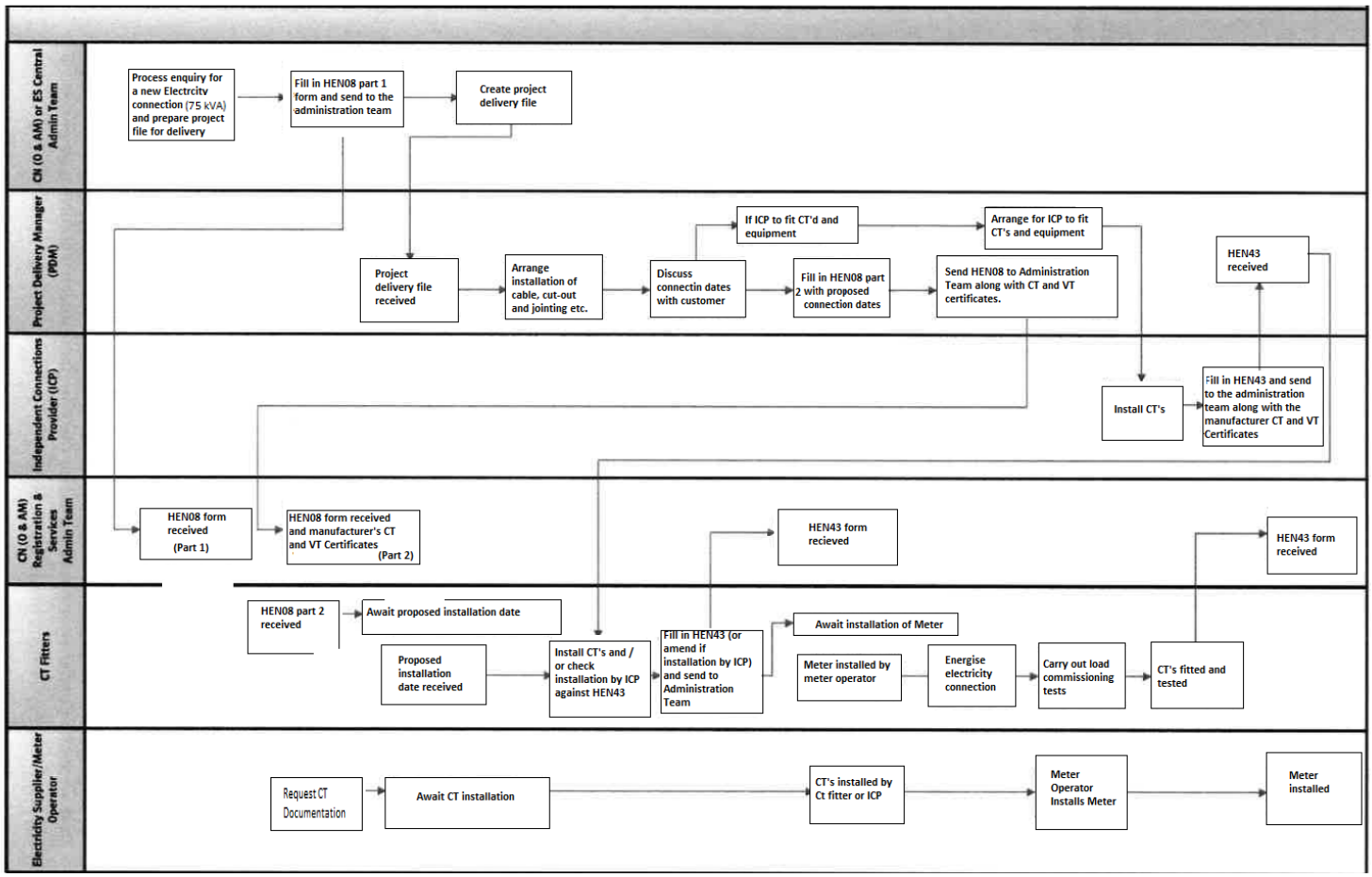
CT Fitters – have responsibility under the direction of the Company outlined above, to install and/or inspect and carry out pre and post commissioning testing of the metering installation prior to the Electricity Supplier and their appointed Meter Operator fitting the appropriate meters.

Electricity Supplier/Meter Operator – has responsibility to install the final meters and commission the installation in conformance with ELEXON requirements.

The information obtained from following the overall process is **essential** to ensure the Company's compliance obligations.

6.1.2 Process Flow

Harlaxton Energy Networks Limited CT Metering Equipment Process.



6.1.3 Electricity Supply Notification Process (HEN08 Form)

The following section outlines the Company requirements for the completion of relevant HEN08 form in association with the notification to interested parties connected with the requirements to process an Electricity Supply application.

These are for normal applications requiring a Metering Point Administration Number (MPAN) for ELEXON Balancing and Settlements purposes and those specifically related to Embedded Networks, where this requirement does not apply.

Notification for New/Modified Electricity Supply

HARLAXTON ENERGY NETWORKS LIMITED

Application for an Electricity Connection

Please note all relevant sections of this form must be completed or your application will remain on hold or be returned to you.

Section 1 – Applicant (please provide full applicant details)			
Applicant:			
Street Name:			
Town:			
City / County:		Postcode:	
Contact Details			
Telephone Number:		Mobile Number	
Email Address:			

Section 2 – Type of Quotation			
Type of Quote required	Full		Budget	

Section 3 – Type of Supply							
Please indicate the type of supply required				New		Additional	
Temporary		IDNO		POC		ICP	

Section 4 – Site Information (please provide full site details)							
Proposed Number of dwellings / Connections							
Property Type (flat / house / Industrial unit)							
Site Name / Development:							
Street Name:							
City / County:				Postcode:			
Does the Site have Planning Permission?			Yes			No	
Does the Site have Existing connections?			Yes			No	
Heating Type	All Electric		Gas		Oil / Other		

Section 4 – Generation				
Will generation equipment be installed?	Yes		No	
If Yes, then the Harlaxton Energy Networks Electricity Generation Form will need to be completed and submitted with this Application.				

Section 5 – Electrical Load details (all relevant fields need to be completed)			
Type of Electric Heating – Give loadings per property			
Off peak Storage Heaters		Off peak wet storage system	
Instantaneous wet central heating		Water heating	
Electric Shower		Cooking	
Swimming Pool		Heat Pumps	
Motors			
Total single phase motors (in kW)			
Largest single phase motor (in kW)		Type of starting	
		Starting Current	
Total 3 phase motors (in kW)			
Largest 3 phase motor (in kW)		Type of starting	
		Starting Current	
Welding Equipment			
Total welding equipment (in kVA)		Maximum Current drawn	
Largest single welder (in kVA)		Maximum Current drawn	

Section 6 – Unmetered Supplies					
Please give the loads for all Unmetered Supplies					
Total No of lighting columns		Power required for each column		Load of additional unmetered supplies	
Total load required for unmetered supplies (in kVA)					

Section 7 – Total Load for Site	
Maximum Load for site (in kVA)	

Section 8 – Declaration			
I acknowledge that in making this application I will be liable for any charges that arise in relation to this application			
I confirm that the following has been included with this application:			
Site Location Plan			
Site Layout Plan			
I confirm that I have completed all sections which are relevant to my connection. I acknowledge that if I have not supplied the required information my application this form will be returned to me and will not be processed until the required information has been provided.			
Print Name:		Signature:	
Company:		Date:	

Please Contact
Harlaxton Energy Networks Limited
Tel: +44 (0) 844 800 1813

6.1.4 CTO Metering Installation & Commissioning (HEN43)

The following section outlines the Company requirements for the completion of the relevant form as shown at the end of the section, in association with the pre and post commissioning requirements for Current Transformer Operation (CTO) metering installations.

It is not intended to include the specific testing criteria within this section as this is fundamental to the obligations of individual installers to ensure relevant competencies to undertake on-load and/or approved injection testing as required.

CTO Metering Installation & Commissioning Record Part A

This part of the form is to establish the pre-commissioning testing requirements associated with CTO metering installations.

1. **MPAN Name, Address etc.**

- **MPAN No** - insert allocated MPAN number which is essential for all installations.
- **New/Upgrade/Other** - means New connection, Upgrade existing connection e.g. LV to HV or HV increase and Other means replacing switchgear asset etc.
- **Name, Address & Post Code** – complete as required.
- **Substation Name/Number/Location Details/Site Contact Details/Switchgear Manufacturer/Switchgear Type/Metering Unit Serial Number** – complete all fields as required.

2. **Voltage/Current Transformers**

    - **Manufacturer** – complete as required.
    - **Combined CT's** – indicate multi-purpose Yes/No.
    - **Ratio's Available** – single/dual/multi ratio needs identifying e.g. **Voltage Ratios** - 11,000/6,600/110 or 11,000/110 etc.
      Current Ratios - 100/50/25/5 or 600/5 0r 600/1 etc.
    - **Connected Ratio** – **must** be completed. This is the selected ratio for use by the Meter Operator to programme the meter for commissioning/billing purposes. This value is to be confirmed during the Current Transformer Injection Tests procedure.
    - **VT Class** – 1.0 or 0.50 etc.
    - **VT Rating** – 100VA or 50VA etc.
    - **CT Class** - 0.5 or 0.5S or 0.2 or 0.2S etc.
    - **CT Rating** – 10.0VA or 7.5VA or 5.0VA etc.
    - **Serial No L1/L2/L3** – complete as required.

3. Current Transformer Injection Tests

- **Primary Injection Current (Amps)** – confirmed by checking installed nameplate to confirm CT details e.g. 5A or 1A secondary CT's in use.

High Ratio:

- **High Ratio Secondary Current (Amps)** – calculate and confirm ratio in use.
- **Secondary Wiring Connections Used** – confirm the ferrule numbering and CT selection link positions used e.g. D110 and D10 or D210 or D10. Check manufacturer's drawings to confirm details.
- **Ratio Calculated** – carry out primary injection test using approved test equipment and record secondary output and also confirm ratio by calculation.

Low Ratio:

- **Low Ratio Secondary Current (Amps)** – calculate and confirm ratio in use.
- **Secondary Wiring Connections Used** – confirm the ferrule numbering and CT selection link positions used e.g. D110 and D10 or D210 or D10. Check manufacturer's drawings to confirm details.
- **Ratio Calculated** – carry out primary injection test using approved test equipment and record secondary output and also confirm ratio by calculation.
- **Ratio Connected to Test Terminal Block** – confirm actual ratio connected. If this ratio is the final value from the initial primary injection test, then no further testing is required.
- **Polarity Correct (Yes/No)** – confirm direction of current flow i.e. polarity by using a standard "flick test".
- **Circuit Resistance CT Leads (Ohms)** – check resistance of leads from Test Terminal Block i.e. D11 to D10 for L1, L2 and L3. This value must be deducted from the total continuity value for the complete installation.
- **Insulation Resistance** (Meg Ohms) – check insulation resistance of the installation wiring to earth, using an approved instrument. The minimum test voltage to be applied is 1KV with the main installation earth removed as appropriate.

Don't forget to discharge the circuit and reinstate the main earth after testing!

4. Voltage Transformer Injection Tests

- **Voltage Transformer Ratio Test Injection Voltage** – carry out injection test using approved test instrument. Typical 100V or alternatively, 110V or 240V test can be used depending on the test voltage available and to assist in calculation.

- **Phases/Secondary Voltage** – carry out relevant tests as required and record primary voltage used and secondary voltage measured. The values determined are used to calculate the voltage ratio. For multi-ratio VT's this test must be carried out on **all** ratios.
- **Polarity Correct (Yes/No)** – confirm direction of current flow i.e. polarity by using a standard "flick test".
- **Insulation Resistance** (Meg Ohms) – check insulation resistance of the installation wiring to earth, using an approved instrument. The minimum test voltage to be applied is 1KV with the main installation earth removed as appropriate.

  Don't forget to discharge the circuit and reinstate the main earth after testing!

5. Secondary Wiring Inspection

- **Earth Connection** – confirm the integrity of all earthing requirements.
- **Continuity** – confirm all wiring is correctly installed as appropriate and continuity is established.
- **Identification (Ferrules)** – ensure all wiring terminations are correctly identified to circuit diagrams, manufacturer's drawings and correct ferrule numbering is used etc. If in doubt, continuity testing of cores **must** be carried out to ensure that numbering is correct.
- **Insulation Resistance** – confirm as per previous test requirements.
- **Sealing Check** – on completion of all work ensure that all relevant seals are applied e.g. cut-out, Test Terminal Block etc.
- **Installed Fuse Size** – confirm rating and correct size of fuse is installed for the appropriate circuit arrangement.
- **Multicore Type** – ensure multicore cable conforms to Harlaxton Energy Networks specification i.e. 12 core.
- **Multicore Length** – ensure multicore cable conforms to the Harlaxton Energy Networks specification to minimise the "Burden" on the overall circuit.
- **Meter Tail Size** – ensure that where relevant, meter tails conform to the Harlaxton Energy Networks specification dependant on cut-out fuse size as appropriate.
- **Tails Connected** – confirm that customer meter tails are connected correctly.
- **EFLI Test** – on completion of all installation work an Earth Fault Loop Impedance test must be carried out as appropriate using an approved test instrument.
- **Declaration/Comments** – to be completed by appropriate Installation/Test Engineer as required e.g. I declare that the above installation has been fully tested in accordance with Part A of the HEN procedure etc.
- **Date HEN Notified** – copy of commissioning record form sent to the HEN office. Office.
- **Date Database Updated** – update relevant IT Systems as required.
- **Tested By/Signature/Date** – complete as required.

CTO Metering Installation & Commissioning Record Part B

This part of the form is to establish the post-commissioning testing requirements associated with CTO metering installations.

1. **MPAN Name, Address etc.**

    - **MPAN No** - insert allocated MPAN number which is essential for all installations.
    - **New/Upgrade/Other** - means New connection, Upgrade existing connection e.g. LV to HV or HV increase and Other means replacing switchgear asset etc.
    - **Name, Address & Post Code** – complete as required.
    - **Substation Name/Number/Location Details/Site Contact Details/Switchgear Manufacturer/Switchgear Type/Metering Unit Serial Number** – complete all fields as required.

2. **Meter Details (Optional)**

    - **Meter Serial Number** and **CT Ratio Displayed** fields are to be completed as supporting information where available, but this is not required by Harlaxton Energy Networks for record purposes but may be a requirement for Technical Assurance Agents (TAA) inspections on behalf of ELEXON.

3. **Approved Test Equipment Details/Calibration Dates**

    The following information is included for traceability of testing:-

    - **Serial/ID No** – enter Test Equipment details as required.
    - **Test Equipment CT Ratio** – enter details as required.
    - **Test Equipment VT Ratio** – enter details as required i.e. "Direct" means voltage source normally from terminal block and "kV/110V" from appropriate source.

4. **Voltage Transformer On-Load Tests**

    - **Phase Sequence at Meter Standard (Yes/No)** – confirm that the phase sequence at the Test Terminal Block is standard forward rotation using an approved test instrument. If due to local conditions there is a reverse phase sequence on the Distribution System, then the Meter Operator **must** ensure that this is corrected at the meter terminals as appropriate.
    - **Measured Voltages** – confirm and record voltages using an approved test instrument.

- **CT Secondary Earth Voltage** - confirm and record voltage using an approved test instrument.

5. Current Transformer On-Load Tests

- **Measured Primary Current** – measure LV and HV Primary amps where possible using an approved test instrument.
- **Measured Secondary Current** – measure LV and HV Secondary amps using an approved test instrument.
- **Calculated CT Ratio** – use values obtained from Measured Primary/Secondary Current to determine the actual CT Ratio.
- **Test Equipment Current Reading (Amps)** – using an approved test instrument, ensure that there are no differences between the Primary/Secondary Current amps measured from the previous tests.
- **Test Equipment Load Reading (kW/kVA/kVAr)** – using an approved test instrument, ensure that the values for kW, kVA or kVAr as required, are the correct recorded values expected from previous test results.
- **Calculation:** – the formula is to be used to calculate that the measured/recorded test results using an approved test instrument are satisfactory.

6. Declaration/Comments

- **Declaration/Comments** – to be completed by appropriate Installation/Test Engineer as required.
- **Date Installation Tested/Commissioned** – enter date procedure was completed.
- **Tested By/Signature/Date** – complete as required.
- **Date HEN Notified** – copy of Part B CM1 form sent to NCAT at Pegasus Office.
- **Date Database Updated** – update relevant IT Systems as required.
- **Approved By/Signature/Date** – complete as required.

CT Metering Installation & Commissioning Record

CT Metering Installation & Commissioning Record – Part A

MPAN No														**New/Upgrade/Other**	

Name:
Address:

Postcode:

Substation Name:														Substation No:	
Substation Location Details:														Site Contact Details:	
Switchgear Manf:														Switchgear Type:	Metering Unit Serial No:
Voltage Transformers														**Single/Dual-Ratio**	
Manufacturer:														Manufacturer:	Combined CT's Y / N
Ratio's Available:	/	/												Ratio's Available: / /	
Connected Ratio:	/													**Connected Ratio:**	/
Class:	Rating:	VA												Class: Rating:	VA
Serial No L1:														Serial No L1:	
Serial No L2:														Serial No L2:	
Serial No L3:														Serial No L3:	

Current Transformer Injection Tests	**L1**	**L2**	**L3**
Primary Injection Current (Amps)	A	A	A
High-Ratio Secondary Current (Amps)	A	A	A
Secondary Wiring Connections Used	D D	D D	D D
Ratio Calculated /			D
Low-Ratio Secondary Current (Amps)	A	A	A
Secondary Wiring Connections Used	D D	D D	D D
Ratio Calculated /			
Ratio Connected to Test Terminal Block	/	/	/
Polarity Correct (Yes/No) – ('Flick/Test')	**L1**	**L2**	**L3**
Circuit Resistance C.T. Leads (Ohms)	/	/	/
Insulation Resistance (Meg Ohms)	/	/	/

Voltage Transformer Injection Tests to identify phasing & ratio		Secondary LV winding voltage Note VT Primary 11kv = 2.4 v secondary voltage & 6.6kv = 4.0v secondary voltage		
Primary HV voltage	HV Phases	**L1-L2**	**L2-L3**	**L1-L3**
240v	L1-L2	v	v	v
240v	L2-L3	v	v	v
240v	L1-L3	v	v	v
Polarity Correct (Yes/No) – ('Flick/Test')		L1	L2	L3
Insulation Resistance (Meg Ohms)		MΩ		

Secondary Wiring Inspections – Tick (√)			**Enter Details**
Earth Connection		Installed Fuse Size	(Amps)
Continuity		Multicore Type	(Core)
Identification (Ferrules)		Multicore Length	(Metres)
Insulation Resistance		Meter Tails Size	(mm^2)
Seal Check?		Tails Connected	(Y/N)
		ELI Test (Ohms)	(Ohms)

Declaration/Comments:

Tested By (Print Name): Signature: Date:

Low Voltage CT Metering Installation & Commissioning Record

Low Voltage CT Metering Installation & Commissioning Record

MPAN No														**New/Upgrade/Other**	

Name:

Address:

Postcode:

Location Details:

Current Transformers														**Single/Dual/Multi-Ratio**	
Manufacturer:															Combined CT's Y / N
Ratio's Available:	/	/													
Connected Ratio:															/
Class:	Rating:	VA													
Serial No L1:															
Serial No L2:															
Serial No L3:															

Current Transformer Injection Tests	**L1**	**L2**	**L3**
Primary Injection Current (Amps)	A	A	A
High-Ratio Secondary Current (Amps)	A	A	A
Secondary Wiring Connections Used	D D	D D	D D
Ratio Calculated	/	/	/
Low-Ratio Secondary Current (Amps)	A	A	A
Secondary Wiring Connections Used	D D	D D	D D
Ratio Calculated	/	/	/
Ratio Connected to Test Terminal Block	/	/	/
Polarity Correct (Yes/No) – ('Flick/Test')	**L1**	**L2**	**L3**
Circuit Resistance C.T. Leads (Ohms)	/	/	/
Insulation Resistance (Meg Ohms)	/	/	/

Secondary Wiring Inspections – Tick (√)			**Enter Details**
Earth Connection		Installed Fuse Size	(Amps)
Continuity		Meter Tails Size	(mm^2)
Identification (Ferrules)		Tails Connected	(Y/N)
Insulation Resistance		ELI Test (Ohms)	(Ohms)
Seal Check?			

Declaration/Comments:

Tested By (Print Name): Signature: Date:

CT Metering Installation & Commissioning Record

CT Metering Installation & Commissioning Record – Part B

MPAN No														New/Upgrade/Other
Name: Address: Postcode:														Supply/Feeder No: Tracker No:

Substation Name:	Substation No:	
Substation Location Details:	Site Contact Details:	
Switchgear Manf: Switchgear Type:	Metering Unit Serial No:	
Meter Details (Optional)		
Meter Serial No: Main/Check	CT Ration Displayed: /	
Meter Serial No: Main/Check	CT Ration Displayed: /	
Approved Test Equipment Details / Calibration Dates		
Serial/ID No:	Test Equipment CT Ratio: CT	Test Equipment VT Ratio: Direct/ kV/110v

Voltage Transformer On-Load Tests	Voltages at Test Terminal Block		
Phase sequence at Meter standard (Yes/No)	LV & HV	LV only	LV & HV
Measured Voltage	L1-L2: v	L1-N: v	L1-L2: v
Measured Voltage	L2-L3 v	L2-N: v	L2-L3 v
Measured Voltage	L3-L1 v	L3-N: v	L3-L1 v
CT Secondary Earth Voltage	L1 CT-E v	L2 CT-E v	L3 CT-E v

Current Transformer On-Load Tests	L1	L2	L3
Measured Primary Current			
Measured Secondary Current			
Calculated CT Ratio			
Test Equipment Current Reading (Amps)			
Test Equipment Load Reading (kW/kVA/kVAr)			

Calculation:

kVA = √3 x Voltage (Ph-Ph) x Average Current = $\frac{\sqrt{3} \times \quad \times}{1000}$ = kVA

Values: kW kVA kVAr

Declaration/Comments:

Date Installation Tested/Commissioned:

Tested By (Print Name): Signature: Date:

Date Notified: Date Database Updated:

Tested By (Print Name): Signature: Date:

CT Metering Installation & Commissioning Record – B2

CT Metering Installation & Commissioning Record – Part B

MPAN No														New/Upgrade/Other
Name: Address: Postcode:														Supply/Feeder No: Tracker No:

Substation Name:	Substation No:	
Substation Location Details:	Site Contact Details:	
Switchgear Manf: Switchgear Type:	Metering Unit Serial No:	
Meter Details (Optional)		
Meter Serial No: Main/Check	CT Ration Displayed: /	
Meter Serial No: Main/Check	CT Ration Displayed: /	
Approved Test Equipment Details / Calibration Dates		
Serial/ID No:	Test Equipment CT Ratio: CT	Test Equipment VT Ratio: Direct/ kV/110v

Voltage Transformer On-Load Tests	Voltages at Test Terminal Block		
Phase sequence at Meter standard (Yes/No)	LV & HV	LV only	LV & HV
Measured Voltage	L1-L2: v	L1-N: v	L1-L2: v
Measured Voltage	L2-L3 v	L2-N: v	L2-L3 v
Measured Voltage	L3-L1 v	L3-N: v	L3-L1 v
CT Secondary Earth Voltage	L1 CT-E v	L2 CT-E v	L3 CT-E v

Current Transformer On-Load Tests	L1	L2	L3
Measured Primary Current			
Measured Secondary Current			
Calculated CT Ratio			
Test Equipment Current Reading (Amps)			
Test Equipment Load Reading (kW/kVA/kVAr)			
Readings from meter (amps)			
Readings from meter (volts)			

Calculation:

kVA = √3 x Voltage (Ph-Ph) x Average Current = $\frac{\sqrt{3} \times \quad \times}{1000}$ = kVA

Values: kW kVA kVAr

Maximum Injection

Max = $\frac{\text{(Max Output (kW)÷Phase Voltage)}}{\sqrt{3}}$ x 1000 =

Chosen Injection

Chosen injection =
Time Period = 30 mins

Current Injection = $\frac{\text{(Chosen Injection÷Phase Voltage)}}{\sqrt{3}}$ x 1000

Secondary injection

Current Injection = $\frac{\text{CT secondary current}}{\text{CT primary current}}$ x kW Injection

Maximum Demand

Take note of any meter readings at the present time

KVAh =
kW =

Inject the meter for a 30 min period with the chosen secondary injection

After the 30 min period take down the reading for maximum demand

=

Is the reading correct to the estimated reading?

Comments

Commissioned by – Signature –

Date -

CT TEST REPORT

Harlaxton Engineering Services Limited

DATE _____ PAGE 1

AMBIENT TEMP. _____ °C JOB # _____

SUBSTATION _____ HUMIDITY _____ % ASSET ID _____

POSITION _____ TEST STATUS _____

EQUIPMENT LOCATION _____

NAMEPLATE DATA CT: _____

MANUFACTURER _____ SERIAL NO. _____ PHASE _____

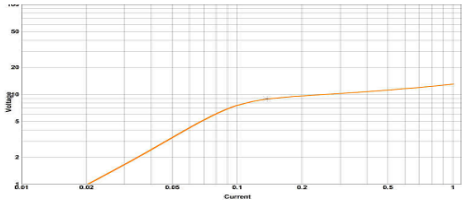
ASSET ID _____ ACCURACY CLASS _____ SATURATION STD _____

FS _____ VA _____ IN SERVICE TAP _____

Secondary Voltage Injection

	Tap	S1-S2
RATIO	Nameplate	
	Measured	
	% Error	
	Test V (V)	
	Test I (A)	
	Prim V (V)	
Phase Dev.		
Polarity		
Knee	Volt.(V)	
	Curr.(A)	
Resist. (Ohms)		
Resist. at 75°C		

Insulation Resistance	Primary To Secondary	Primary To Ground	Secondary To Ground



TEST EQUIPMENT USED: _____ TESTED BY: _____

CT TEST REPORT

Harlaxton Engineering Services Limited

PAGE 2

#	Voltage/Current	S1-S2
1	VOLTAGE (volts)	
	CURRENT (amps)	
2	VOLTAGE (volts)	
	CURRENT (amps)	
3	VOLTAGE (volts)	
	CURRENT (amps)	
4	VOLTAGE (volts)	
	CURRENT (amps)	
5	VOLTAGE (volts)	
	CURRENT (amps)	
6	VOLTAGE (volts)	
	CURRENT (amps)	
7	VOLTAGE (volts)	
	CURRENT (amps)	
8	VOLTAGE (volts)	
	CURRENT (amps)	
9	VOLTAGE (volts)	
	CURRENT (amps)	
10	VOLTAGE (volts)	
	CURRENT (amps)	
11	VOLTAGE (volts)	
	CURRENT (amps)	
12	VOLTAGE (volts)	
	CURRENT (amps)	
13	VOLTAGE (volts)	
	CURRENT (amps)	
14	VOLTAGE (volts)	
	CURRENT (amps)	
15	VOLTAGE (volts)	
	CURRENT (amps)	
16	VOLTAGE (volts)	
	CURRENT (amps)	
17	VOLTAGE (volts)	
	CURRENT (amps)	
18	VOLTAGE (volts)	
	CURRENT (amps)	
19	VOLTAGE (volts)	
	CURRENT (amps)	
20	VOLTAGE (volts)	
	CURRENT (amps)	
21	VOLTAGE (volts)	
	CURRENT (amps)	
22	VOLTAGE (volts)	
	CURRENT (amps)	
23	VOLTAGE (volts)	
	CURRENT (amps)	
24	VOLTAGE (volts)	
	CURRENT (amps)	
25	VOLTAGE (volts)	
	CURRENT (amps)	
26	VOLTAGE (volts)	
	CURRENT (amps)	
27	VOLTAGE (volts)	
	CURRENT (amps)	
28	VOLTAGE (volts)	
	CURRENT (amps)	
29	VOLTAGE (volts)	
	CURRENT (amps)	
30	VOLTAGE (volts)	
	CURRENT (amps)	

CT TEST REPORT

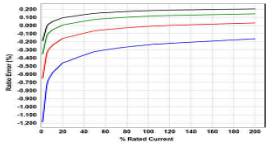
Harlaxton Engineering Services Limited

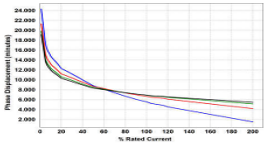
PAGE 3

Ratio and Phase Error **S1-S2**

VA / PF	Ratio Error (%) at % of Rated Current							
	1	5	10	20	50	100	120	200
7.5 VA/ 0.80								
3.8 VA/ 0.80								
1.9 VA/ 0.80								
0.9 VA/ 0.80								

VA / PF	Phase Displacement (minute) at % of Rated Current							
	1	5	10	20	50	100	120	200
7.5 VA/ 0.80								
3.8 VA/ 0.80								
1.9 VA/ 0.80								
0.9 VA/ 0.80								





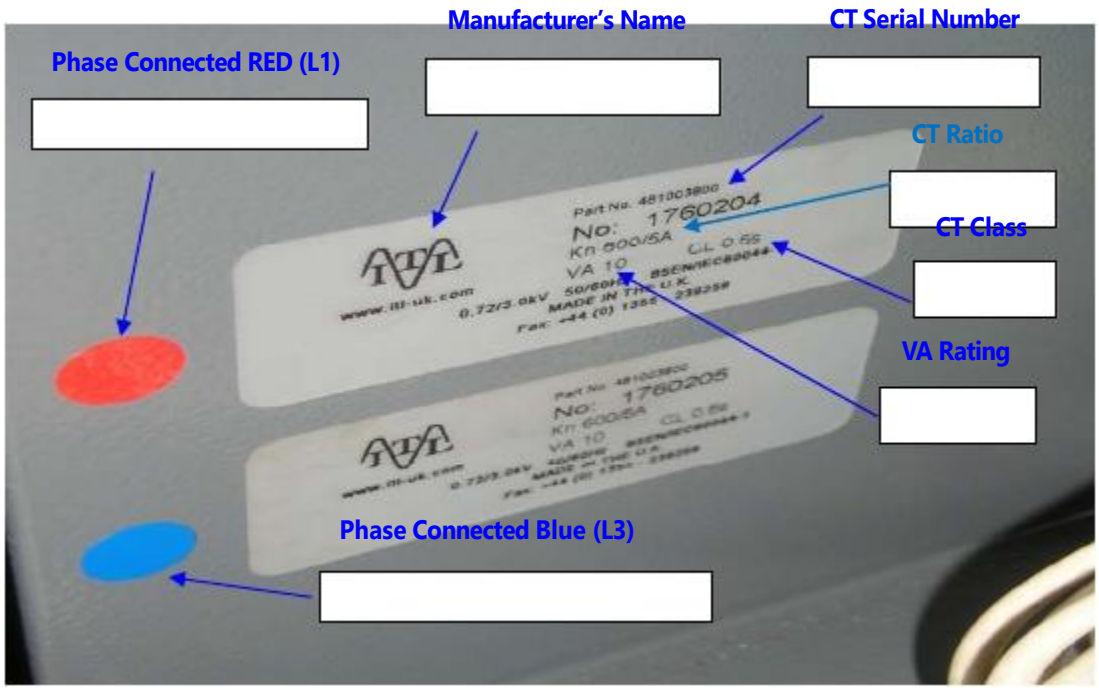
6.1.4.1 Manufacturers VT/CT Certificates

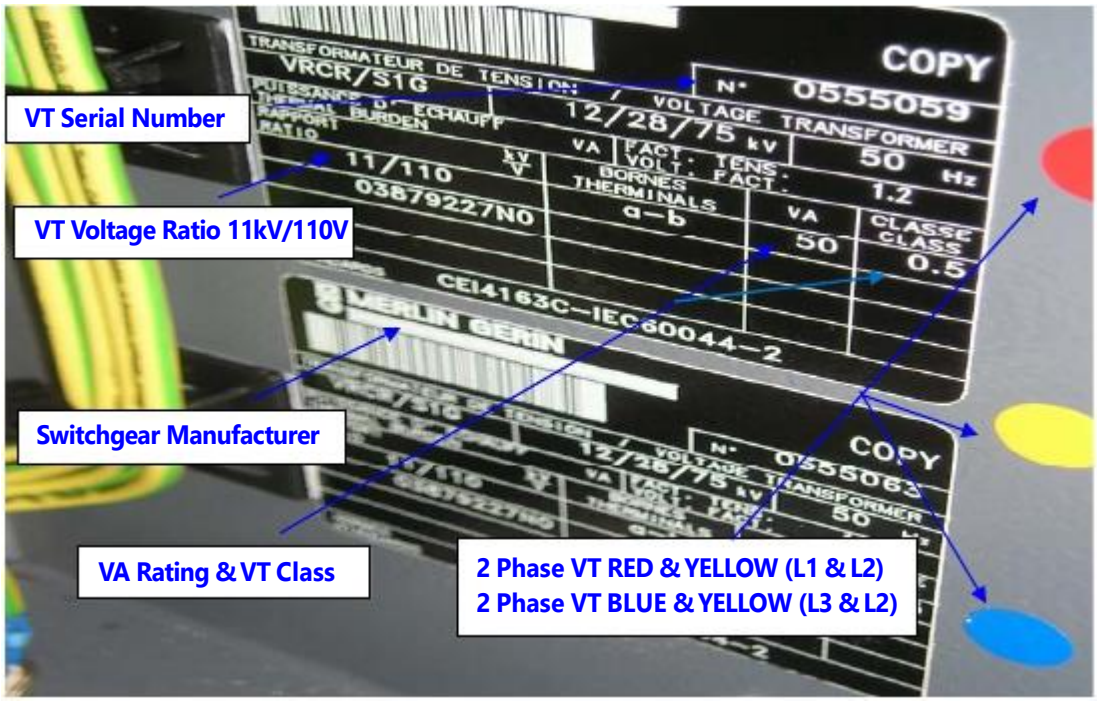
In addition to completing and submitting the relevant forms as detailed in the previous sections, it will be the responsibility of the "installer" to provide the manufacturers VT/CT certificates and also include cross referenced information to the forms as required.

The Company has an obligation to retain the certificates for the life of the electricity connection in the event of disputes etc concerning the overall accuracy of the metering installation.

A typical example of the nameplate information provided for VT and CT equipment on modern day switchgear is as follows, which can vary on older type equipment, but the principles of labelling remain the same.

It should be noted that although the switchgear Manufacturer's name may be stated externally on the nameplate, certain internal equipment i.e. CT and VT, could be made and provided by a different Manufacturer. This can often be confirmed by reference to the Test Certificates contained within the "Brown Envelope" as supplied with the equipment.





6.1.4.2 Electricity Supplier/Meter Operator Obligations

It is the responsibility of the customer's Electricity Supplier and/or appointed Meter Operator (MO), to undertake full commissioning tests and **must** confirm and record the following information to comply with ELEXON commissioning requirements:-

- VT/CT location, ratio, polarity and phase rotation.
- Correct "Burdens" on VT/CT equipment fitted.
- Meters programmed to correct VT/CT Ratios.
- Correct compensation for VT/CT errors and losses where appropriate.
- Correct energy measurements at Point of Supply (PoS).
- Phase failure detection and alarm operation.

A fundamental requirement for the completion of all commissioning tests is to prove that the correct CT Ratio is used by measuring the primary current and comparing this to the secondary measurements taken.

Where primary current measurement is not possible, then an independent reliable measurement must be made, or confirmation is established from the information recorded under the requirements of **Part A** of **Section 6.1.4. – CTO Metering Installation and Commissioning (CM1)** of this Manual.

6.1.4.3 General Obligations

The Company and both the Electricity Supplier/Meter Operators have an obligation to support the function outlined in **Section 7.1.3 – Codes of Practice** of this Manual to ensure compliance with the periodic administration and audit process undertaken by ELEXON through their appointed Technical Assurance Agents (TAA).

In addition, the Company has an obligation to ensure that through periodic substation maintenance programmes that protection and metering functionality testing is carried out as required and details fully recorded.

7 METERING REQUIREMENTS

The following section outlines the basic requirements for metering installations.

The Company's responsibility ends at the outgoing side of our equipment i.e. cut-out, but there are still obligations on all parties under the **Electricity Safety, Quality and Continuity Regulations 2002 (as amended)** and in particular, **Regulation 24 – Equipment on a Consumer's Premises**, **Regulation 25 – Connections to Installations or to Other Networks** and **Regulation 26 – Disconnection of Supply, Refusal to Connect and Resolution of Disagreements.**

The Company will always reserve the right not to energise an electricity connection where it deems that the installation does not meet the above requirements.

7.1.1 Low Voltage (WC)

The actual installation of meters and associated equipment is the responsibility of the Electricity Supplier and/or their appointed Meter Operator and typical connection arrangements are shown in **Section 8 – Single Phase Metering** and **Section 9 – Three Phase Metering** of this Manual.

7.1.2 Low and High Voltage (CTO)

The actual installation of meters and associated equipment is the responsibility of the Electricity Supplier and/or their appointed Meter Operator.

The Company is responsible for the provision of the relevant wiring installation up to the interface as described in **Section 5.1.5.2 – Metering Wiring Installations** of this Manual.

The wiring installation up to the interface and typical connection arrangements are shown in **Section 10 – LV Current Transformer Operated (CTO) Metering** and **Section 11 – HV Current Transformer Operated (CTO) Metering** of this Manual.

7.1.3 Codes of Practice

The important factor to consider in any LV or HV CTO metering installation is the relevant Code of Practice applicable to a particular type of installation and this depends on the electrical capacity to meet the customer's requirements and whether they are Non Half Hourly (NHH) or Half Hourly (HH) metered.

The relevant Codes are determined under the governance of ELEXON and to ensure compliance, they are administered through an audit process by their appointed Technical Assurance Agents (TAA).

For larger customers the installation must comply with the relevant Codes as follows:

Code 5 – the metering involves one meter with a minimum accuracy rating of 2% for Active power and 3% for Reactive power. Testing facilities involve one means of current control with voltage connections provided.

Code 3 – The metering installations requires two meters (main and check) with a minimum accuracy rating of 1% for Active power and 3% for Reactive power. Testing facilities involve one means of current control with independent meter voltage protection.

Code 2 – The metering installations requires two meters (main and check) with a minimum accuracy rating of 0.5% for Active power and 3% for Reactive power. Testing facilities involve independent current control and independent meter voltage protection.

7.1.4 VT/CT Specifications

The Company require the minimum standards for VT and CT specifications as follows:-

Non-Half Hourly Installations (NHH)

CT Class – 0.5V0.7
CT Rating (Typical) - 5.0/7.5/10.0 VA as required on type of installation.

Half Hourly (HH)

Code 5 & Code 3

VT Class - 0.5
CT Class – 0.5V0.7
CT Rating - 7.5 & 10.0 VA as required on type of installation.

Code 2

VT Class - 0.2
CT Class –0.2s
CT Rating - 50.0 VA minimum as required on type of installation.

7.1.5 Small Wiring Identification

All small wiring **will** conform to the Energy Networks Association (ENA) Technical Specification 50-19 2004 – Standard Numbering for Small Wiring.

The following table is an extract of information from Table 1 – Small Wiring Identification for Circuit Function of the ENA publication associated with CTO metering installations.

Letter	Circuit Function	Wire Number
D	Current Transformers for Metering and Voltage Control.	• 10-29 L1 (RED) Phase. • 30-49 L2 (Yellow) Phase. • 50-69 L3 (BLUE) Phase. • 70-89 Residual Circuits and Neutral Current Transformers • 90 – Earth Wires Directly connected to the Earth Bar • 91-99 – Test Windings normally, inoperative.
E	Reference Voltage for Instruments, Metering and Protection.	As above

7.1.6 Metering Connection Requirements

There may be existing installations that are old two phase and neutral systems and these are not included within this Manual.

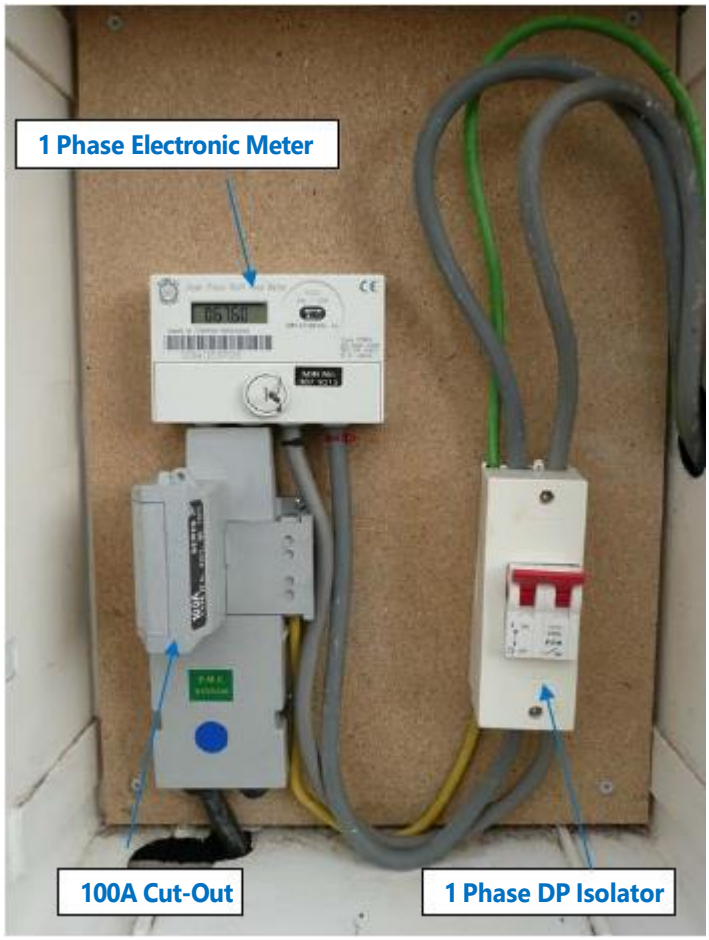
For further information on this type of installation please refer to the Network Standards Manager.

8 SINGLE PHASE METERING

8.1 Single Phase Whole Current (WC)

8.1.1 Single Rate

Appendix HEN1 shows a Single Phase/Single Rate Meter with Supply Switch as illustrated.



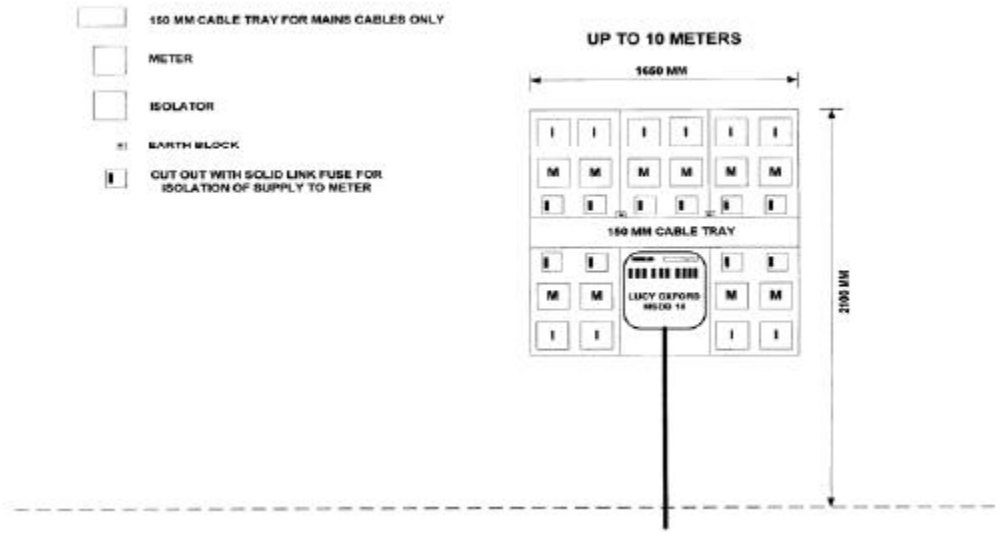
8.1.2 Multi-Service Distribution Board (MSDB)

Where a number of single phase electricity connections are required to be installed in multi-occupied buildings e.g. a block of flats, then the normal arrangement is for the Developer to provide a Group Metering Position (GMP) on the ground floor of the premises and HEN will install a MSDB.

The type of installation and equipment arrangement can vary and HEN will always reserve the right to amend our specifications without prior notice and use equipment supplied from different Manufacturers" as required. The normal installation will comprise, a 3 Phase incoming service cable terminating into the MSDB. The MSDB will contain the main

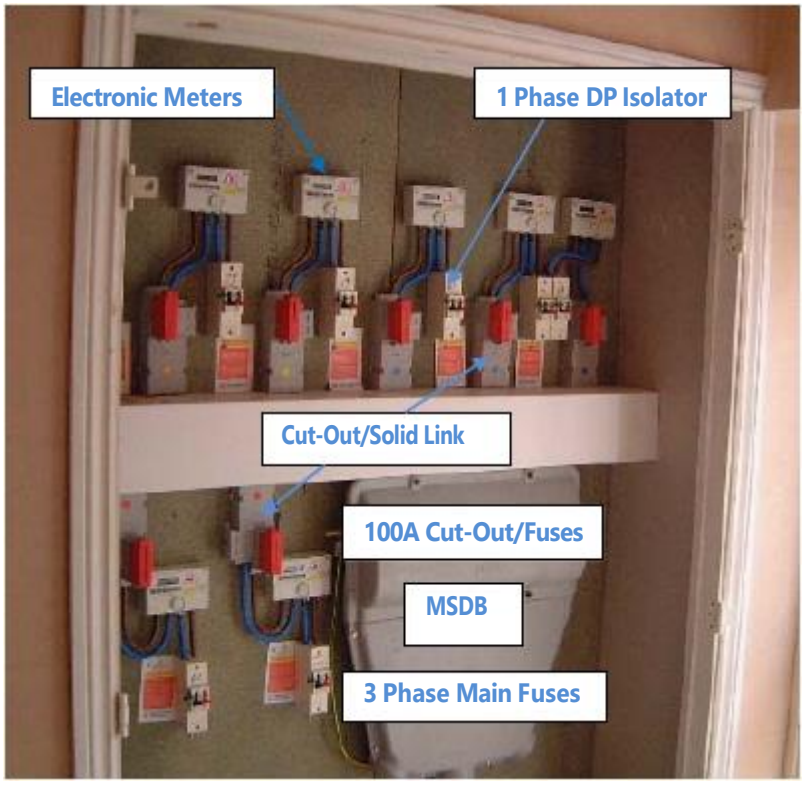
incoming fuses and fuse carriers and individual 100A 1 Phase cut-out fuses and fuse carriers, the number depending on the size of the MSDB for the connections required.

A typical arrangement is shown in the following diagram.



The actual connection arrangement for the meters will be dependant on the customers electrical load requirements e.g. Single Phase Whole Current (WC) – Appendix HEN1 above.

Where it is not possible to make direct meter tail connections into the relevant 100A 1 Phase cut-out fuses and fuse carriers within the MSDB due to operational and/or authorisation restrictions, then HEN will provide facilities as indicated in the following photograph.



The facilities provided will include the MSDB and the installation of trunking and/or cable tray as required facilitating the installation. Appropriate sized service cables will be installed from each MSD 100A 1 Phase cut-out fuses and fuse carriers to additional cut-outs that will be fitted with solid links.

It will be the responsibility of the Electricity Supplier/Meter Operator to install the meter, single phase double pole isolator and to connect the Customer's meter tails as required, utilising the additional cut-out and solid link arrangement. This is provided for isolation purposes that **must** be sealed after work completion.

Under **no** circumstances should the solid links be replaced with cut-out fuses as overload and earth fault protection for the individual electricity connections is already provided by the MSDB 100A 1 Phase cut-out fuses.

8.1.3 Multi- Rate/Time Switch

Appendix HEN O2a shows a Single Phase/Multi-Rate Meter/Time Switch/Supply Switch (No Off-Peak Circuits) as illustrated.

8.1.4 Multi-Rate/ Radio Teleswitch

Appendix HEN O3a shows a Single Phase/Multi-Rate Meter/Radio Teleswitch/Supply Switch (No Off-Peak Circuits) as illustrated.

8.2 Single Phase Whole Current (WC) With Off Peak Heating

8.2.1 Multi-Rate/Time Switch

Appendix HEN O2b shows a Single Phase/Multi-Rate Meter/Time Switch/Supply Switch (With Off-Peak Circuits) as illustrated.

8.2.2 Multi-Rate/Radio Tele Switch

Appendix HEN O3b shows a Single Phase/Multi-Rate Meter/Radio Teleswitch/Supply Switch (With Off-Peak Circuits) as illustrated.

8.2.3 Multi-Rate/Contactor

Appendix HEN O4 shows a Single Phase Four Terminal/Multi-Rate Meter/Contactor/Supply Switch (With Off-Peak Circuits) as illustrated.

8.2.4 Multi-Rate/Credit Meter

Appendix HEN O5a shows a Single Phase Five Terminal/Multi-Rate Credit Meter/Supply Switch (With Off-Peak Circuits) as illustrated.

8.2.5 Multi-Rate/Pre-Payment Meter

Appendix HEN O5b shows a Single Phase Five Terminal/Multi-Rate Pre-Payment Meter/Supply Switch (With Off-Peak Circuits) as illustrated.

8.2.6 Multi-Rate/ "HEATWISE" Radio Telemeter

Appendix HEN O6 shows a Single Phase/Multi-Rate "HEATWISE" Radio Teleswitch/Supply Switch (With Off-Peak Circuits) as illustrated.

9 THREE PHASE METERING

9.1 Three Phase Whole Current (WC)

9.1.1 Standard Phase Rotation (No Isolator)

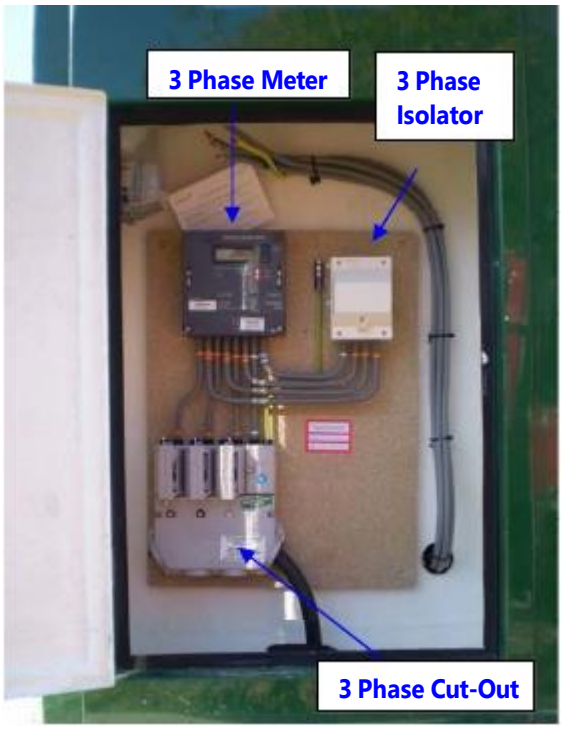
Appendix HEN 11 shows a Three Phase Whole Current Standard Phase Rotation at Cut-Out as illustrated.

9.1.2 Non-Standard (Reversed) Phase Rotation (No Isolator)

Appendix HEN 12 shows a Three Phase Whole Current Non-Standard Phase Rotation at Cut-Out as illustrated.

9.1.3 Standard Phase Rotation (With Isolator)

Appendix HEN 13 shows a Three Phase Whole Current Standard Phase Rotation at Cut-Out with Isolator as illustrated.



9.1.4 Non-Standard (Reversed) Phase Rotation (With Isolator)

Appendix HEN 14 shows a Three Phase Whole Current Non-Standard Phase Rotation at Cut-Out with Isolator as illustrated.

9.1.5 Standard & Non-Standard Phase Rotation (With Isolator)

Appendix HEN16 shows a Three Phase Whole Current Standard & Non-Standard Phase Rotation at Cut-Out with Isolator as illustrated.

This arrangement will be the normal arrangement for all new connections where a Three Phase Isolator will be fitted as standard and will replace the existing arrangements as outlined in Appendices HEN 11, HEN 12, HEN N13 and HEN 14 above.

10 LV CURRENT TRANSFORMER OPERATED (CTO) METERING

10.1 Single Phase/Single Rate

Appendix HEN 08 shows a Single Phase LV CTO/Single Rate Electro-Mechanical Meter as illustrated.

10.2 Single Phase/Multi-Rate (TTB)

Appendix HEN 09 shows a Single Phase LV CTO/Multi-Rate Electronic Meter with Test Terminal Block (TTB) as illustrated.

10.3 Single Phase/Multi-Rate (WAGO Unit)

Appendix HEN 10 shows a Single Phase LV CTO/Multi-Rate Electronic Meter with WAGO Unit as illustrated.

10.4 400 Amp Cut-Out (Old Style)

Appendix HEN 21 shows a LV CT/Meter Combined Cabinet/Lucy Oxford 400 Amp Cut-Out as illustrated.

10.5 400 Amp Cut-Out (New Style)

Appendix HEN 22 shows a LV CT/Meter Combined Cabinet/Lucy Oxford 400 Amp Cut-Out as illustrated.

10.6 600 Amp Cut-Out (Old Style)

Appendix HEN 23 shows a LV CT/Meter Combined Cabinet/Lucy Oxford 600 Amp Cut-Out as illustrated.

10.7 600 Amp Cut-Out (New Style)

Appendix HEN 24 shows a LV CT/Meter Combined Cabinet/Lucy Oxford 600 Amp Cut-Out as illustrated.

10.8 Guidance on Current Carrying Capacities

Appendix HEN 25 shows Guidance on Current Carrying Capacities for "Meter Tails" for interconnection between Central Network's and Customer's equipment.

10.9 LV CTO Combined Cabinet (TTB)

Appendix HEN 26 shows the secondary wiring arrangements for an LV CT Combined Cabinet with Test Terminal Block (TTB).

10.10 LV CTO Combined Cabinet (WAGO Unit)

Appendix HEN 27 shows the secondary wiring arrangements for an LV CT Combined Cabinet with a WAGO Unit arrangement.

10.11 LV Code 5 Remote Metering

Appendix HEN 28 shows the secondary wiring arrangements from the cut-out to a remote metering installation.

10.12 ACB Panel with Codes 5 & 3 Remote Metering

Appendix HEN 29a shows the secondary wiring arrangements for a remote box for Code 5 and 3 metering associated with a Schneider Air Circuit Breaker (ACB) Panel arrangement.

Appendix HEN 29b shows the secondary wiring arrangements for a remote box for Code 5 and 3 metering associated with a Lucy ACB Panel arrangement with a Test terminal Block.

Appendix HEN 29c shows the secondary wiring arrangements for a remote box for Code 5 and 3 metering associated with a Lucy ACB Panel with a WAGO Unit.

10.13 Remote LV Codes 5 Metering (Test Terminal Block)

Appendix HEN 30 shows the secondary wiring arrangements for a remote box for Code 5 metering associated with a Test Terminal Block arrangement.

10.14 Remote LV Code 5 Metering (WAGO Unit)

Appendix HEN 31 shows the secondary wiring arrangements for a remote box for Code 5 metering associated with a WAGO Unit arrangement.

10.15 Remote LV Codes 3 Metering (Test Terminal Block)

Appendix HEN 32 shows the secondary wiring arrangements for a remote box for Code 3 metering associated with a Test Terminal Block arrangement.

10.16 Remote LV Codes 3 Metering (WAGO Unit)

Appendix HEN 33 shows the secondary wiring arrangements for a remote box for Code 3 metering associated with a WAGO Unit arrangement.

11 HV CURRENT TRANSFORMER OPERATED (CTO) METERING

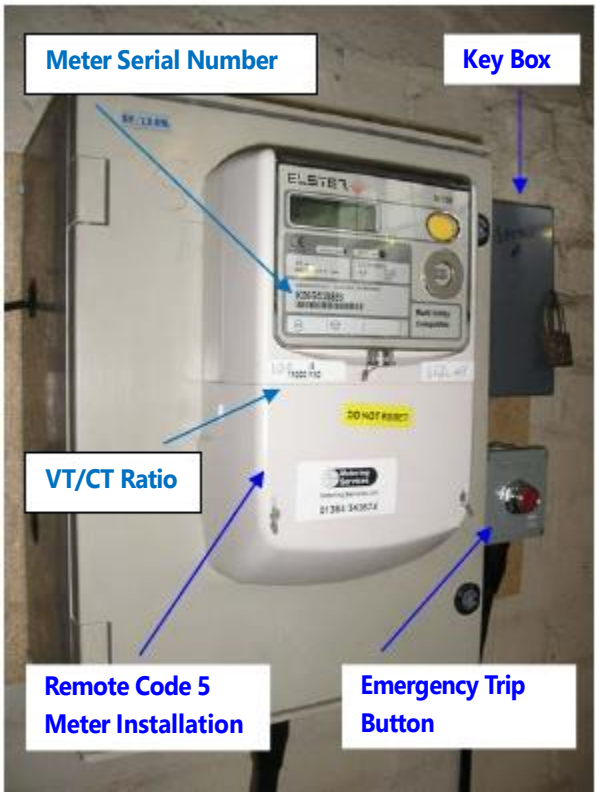
11.1 HV Code 5, 3 & 2 Remote Metering

Appendix HEN 51 shows the secondary wiring arrangements for a remote box for Code 5, 3 and 2 metering associated with a Merlin-Gerin MU2 metering Unit.

Important: The drawing shows connections for a 12 Core Steel Wire Armoured cable with the CT ratio link in the low ratio position. It is essential to comply with the relevant Manufacturer's connection arrangements to ensure that the correct ratio is selected and the CT shorting links are in the correct position.

11.2 HV Code 5 Metering (Test Terminal Block)

Appendix HEN 53 shows the secondary wiring arrangements for a remote box for Code 5 metering associated with a Test Terminal Block arrangement.



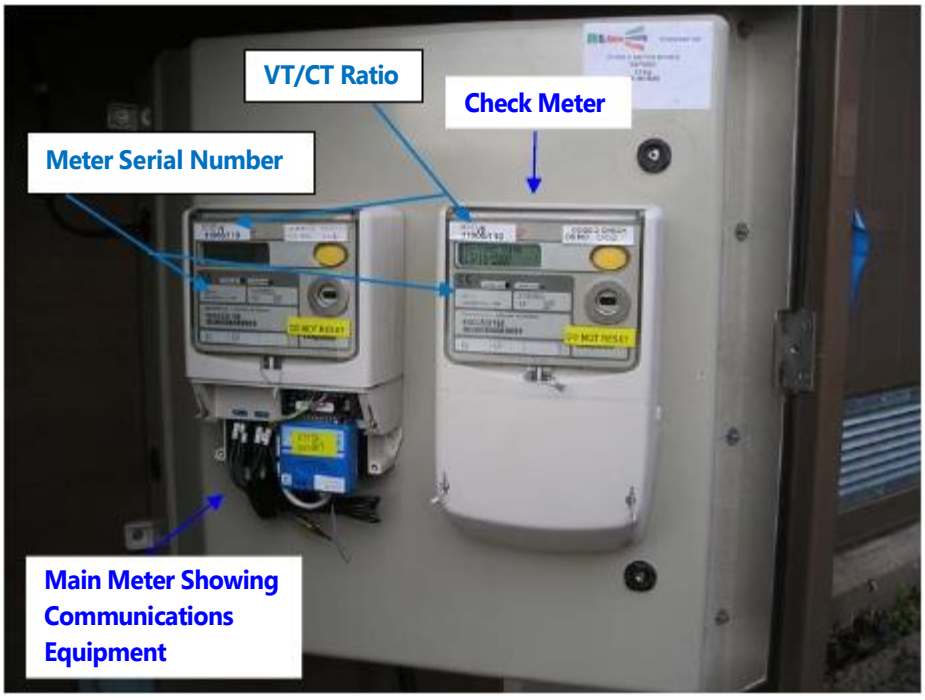
Typical Installation of Code 5 Meter and Remote Cabinet.

11.3 HV Code 5 Metering (WAGO Unit)

Appendix HEN 54 shows the secondary wiring arrangements for a remote box for Code 5 metering associated with a WAGO Unit arrangement.

11.4 HV Code 3 Metering (Test Terminal Block)

Appendix HEN 55 shows the secondary wiring arrangements for a remote box for Code 3 metering associated with a Test Terminal Block arrangement.



Typical Code 3 Meter showing Communications Equipment.

11.5 HV Code 3 Metering (WAGO Unit)

Appendix HEN 56 shows the secondary wiring arrangements for a remote box for Code 3 metering associated with a WAGO Unit arrangement.

11.6 HV Code 2 Metering (3 Wire Test Terminal Block)

Appendix HEN 57 shows the secondary wiring arrangements for a remote Code 2 box for a 3 Wire metering system associated with a Test Terminal Block arrangement.

11.7 HV Code 2 Metering (3 Wire WAGO Unit)

Appendix HEN 58 shows the secondary wiring arrangements for a remote Code 2 box for a 3 Wire metering system associated with a WAGO Unit arrangement.

11.8 HV Code 2 Metering (3 Phase 4 Wire Test Terminal Block)

Appendix HEN 59 – FUTURE USE.

11.9 HV Code 2 Metering (3 Phase 4 Wire WAGO Unit)

Appendix HEN 60 – FUTURE USE.

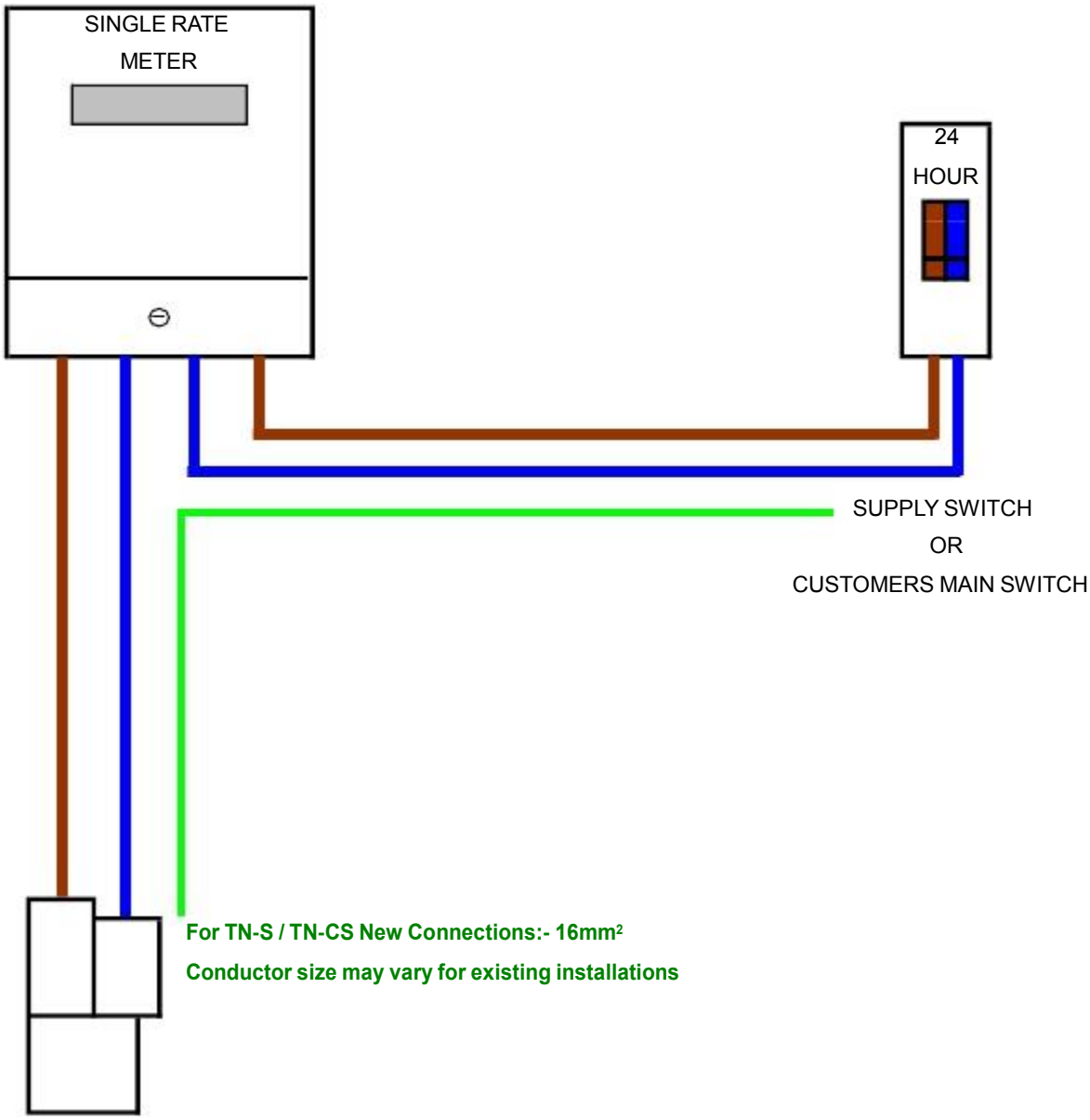
12 APPENDICES

The following Appendices relate to specific wiring diagrams associated with

- Section 8 – SINGLE PHASE METERING
- Section 9 – THREE PHASE METERING
- Section 10 – LV CURRENT TRANSFORMER OPERATED (CTO) METERING
- Section 11 - HV CURRENT TRANSFORMER OPERATED (CTO) METERING

The Company reserve the right to make amendments as required to these wiring diagrams without prior notice.

SINGLE PHASE SINGLE RATE CREDIT / PREPAYMENT METER



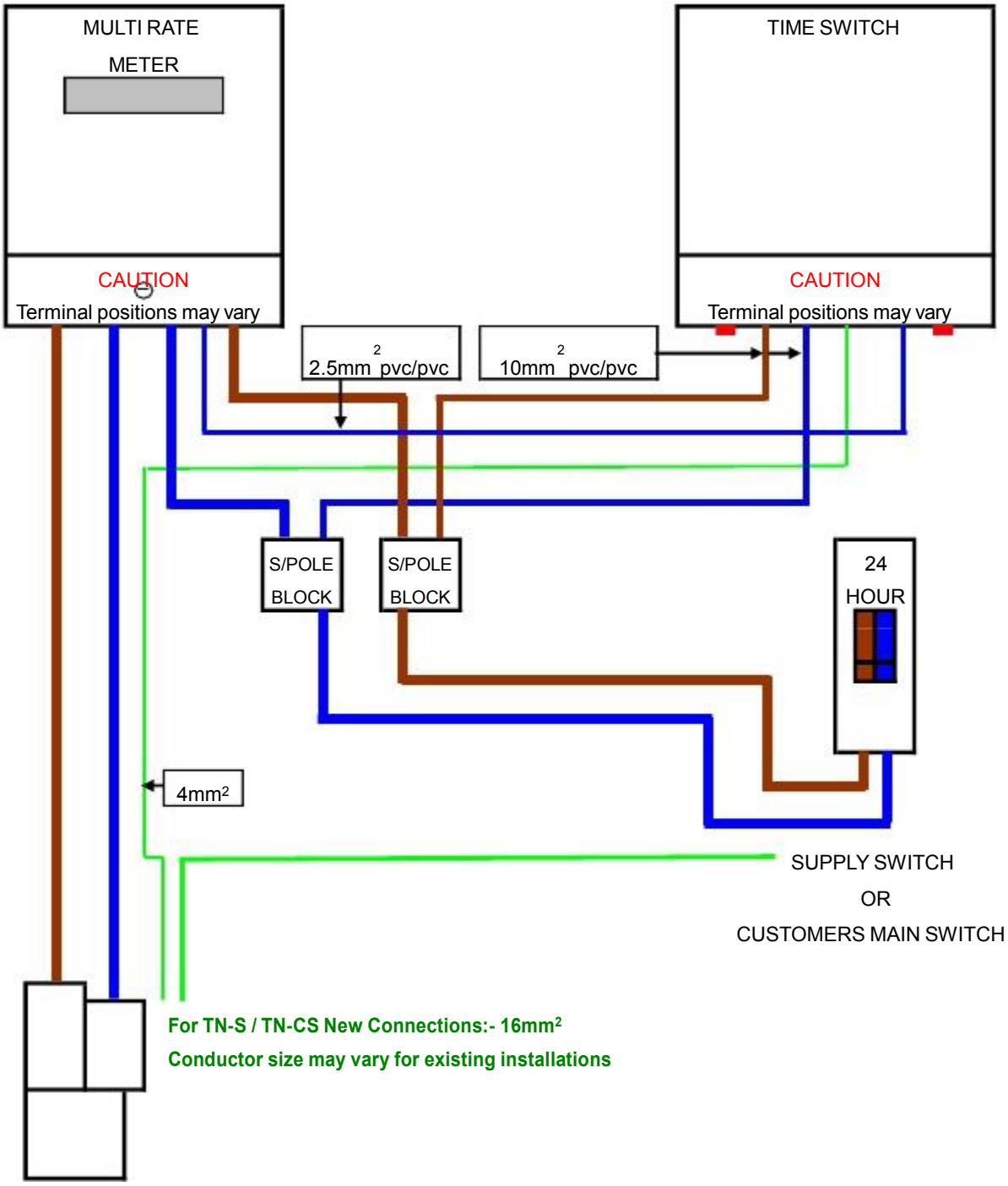
The above diagram is schematic only

All wiring to be 25mm² PVC/PVC unless otherwise stated.

Always refer to the meter terminal cover instructions to confirm connections.

SINGLE PHASE MULTI-RATE METER / TIME SWITCH / SUPPLY SWITCH

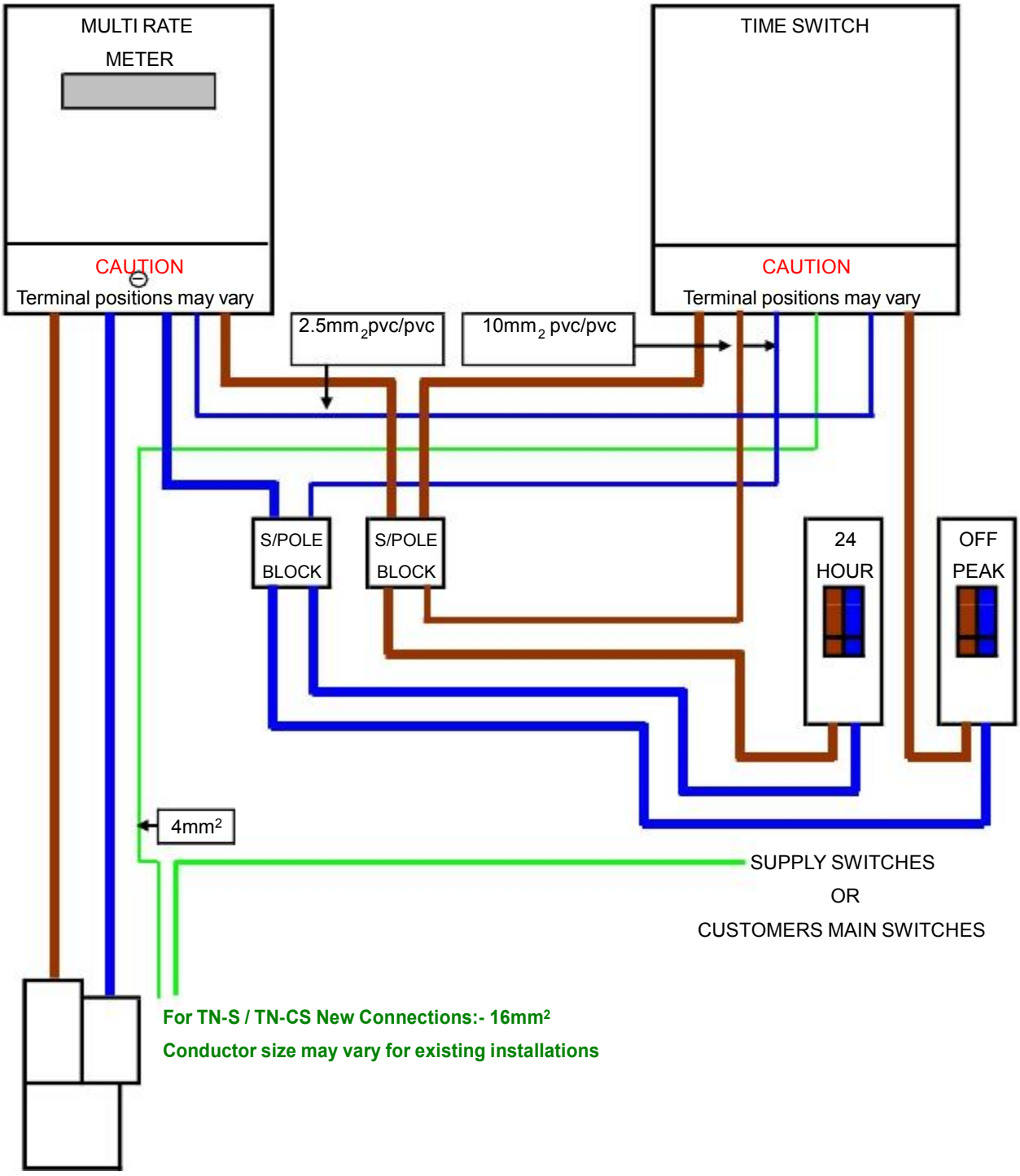
NO OFF PEAK CIRCUITS



The above diagram is schematic only

All wiring to be 25mm² PVC/PVC unless otherwise stated.
Always refer to the meter terminal cover instructions to confirm connections.

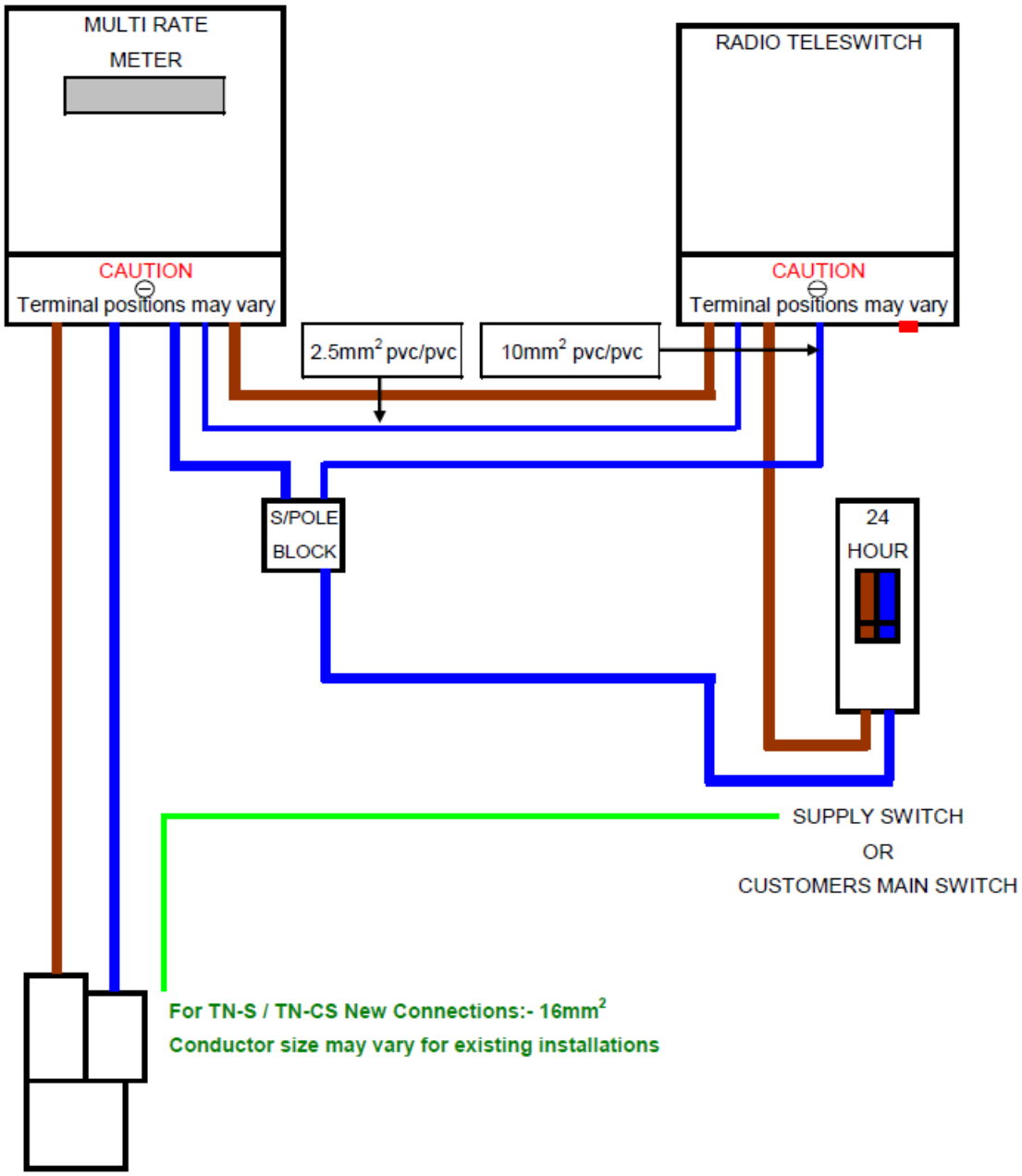
SINGLE PHASE MULTI-RATE METER / TIME SWITCH / SUPPLY SWITCHES
WITH OFF PEAK CIRCUITS



The above diagram is schematic only
All wiring to be 25mm $_2$PVC/PVC unless otherwise stated.

Always refer to the meter terminal cover instructions to confirm connections.

SINGLE PHASE MULTI-RATE METER / RADIO TELESWITCH / SUPPLY SWITCH
NO OFF PEAK CIRCUITS

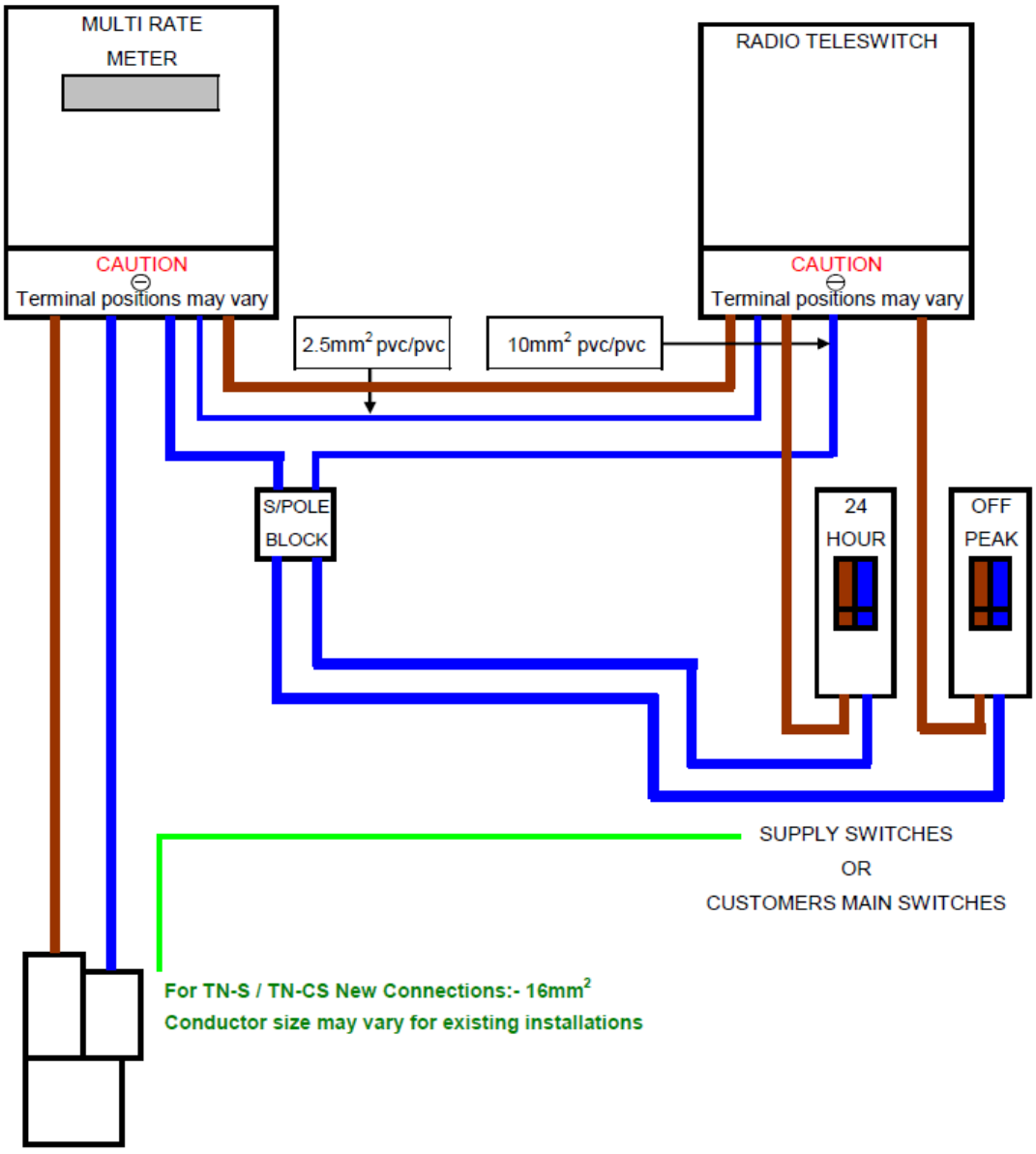


The above diagram is schematic only

All wiring to be 25mm² PVC/PVC unless otherwise stated.

Always refer to the meter terminal cover instructions to confirm connections.

SINGLE PHASE MULTI-RATE METER / RADIO TELESWITCH / SUPPLY SWITCHES
WITH OFF PEAK CIRCUITS

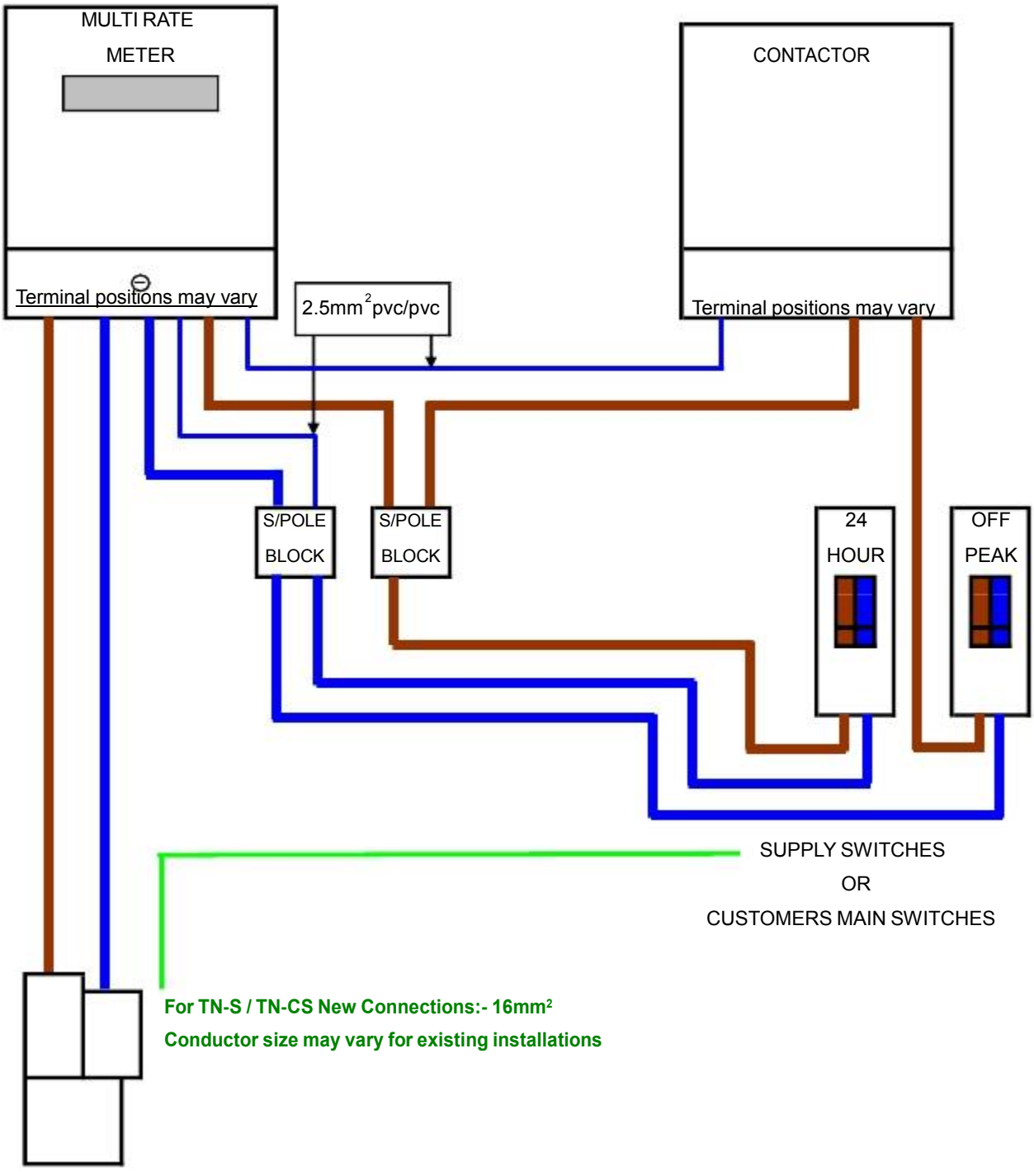


The above diagram is schematic only

All wiring to be 25mm² PVC/PVC unless otherwise stated.

Always refer to the meter terminal cover instructions to confirm connections.

SINGLE PHASE 4 TERMINAL MULTI-RATE METER / CONTACTOR / SUPPLY SWITCHES
WITH OFF PEAK CIRCUITS

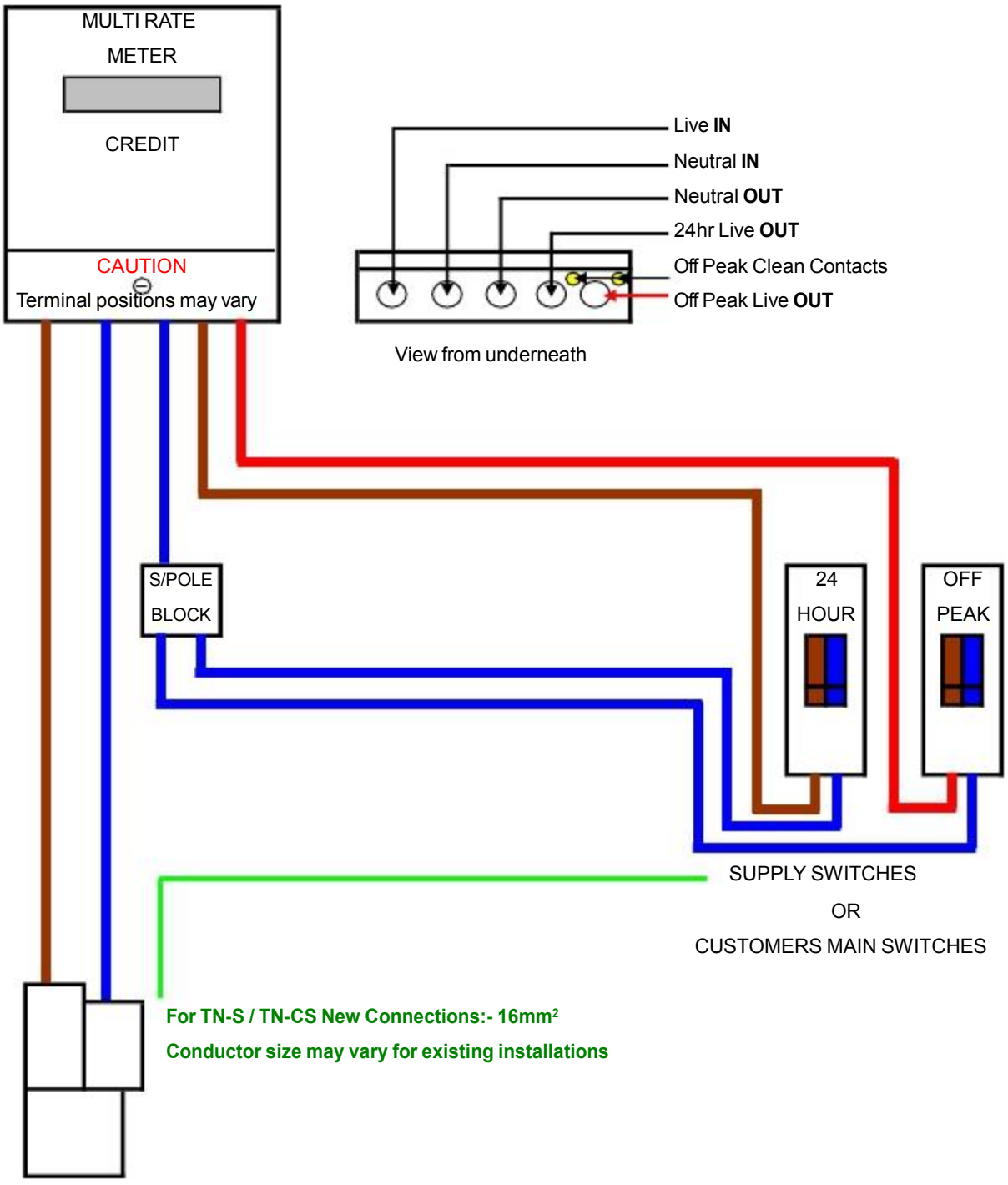


The above diagram is schematic only

All wiring to be 25mm² PVC/PVC unless otherwise stated.

Always refer to the meter terminal cover instructions to confirm connections.

SINGLE PHASE 5 TERMINAL MULTI-RATE CREDIT METER / SUPPLY SWITCHES
WITH OFF PEAK CIRCUITS

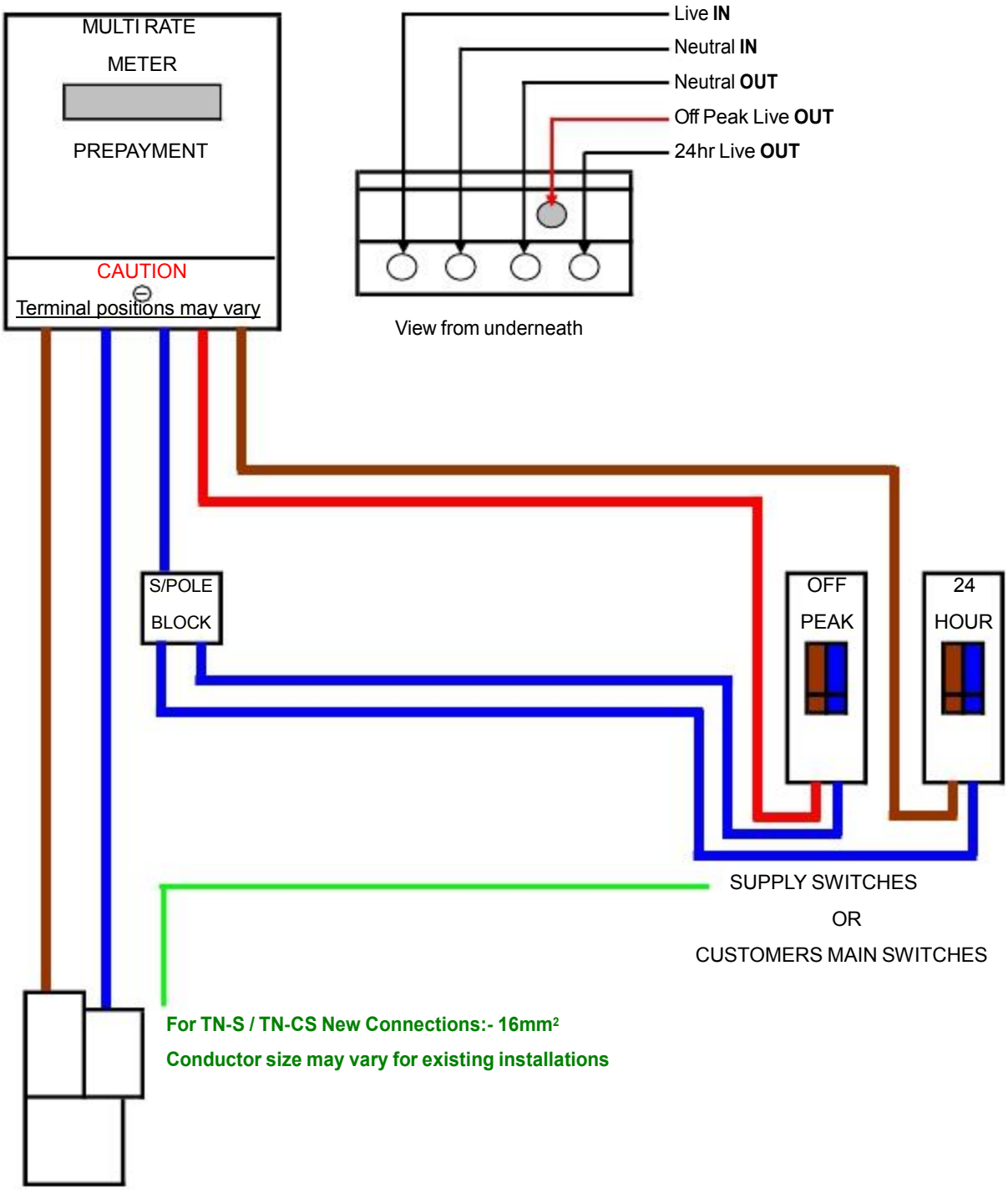


The above diagram is schematic only

All wiring to be 25mm² PVC/PVC unless otherwise stated.

Always refer to the meter terminal cover instructions to confirm connections.

SINGLE PHASE 5 TERMINAL MULTI-RATE PREPAYMENT METER / SUPPLY SWITCHES
WITH OFF PEAK CIRCUITS

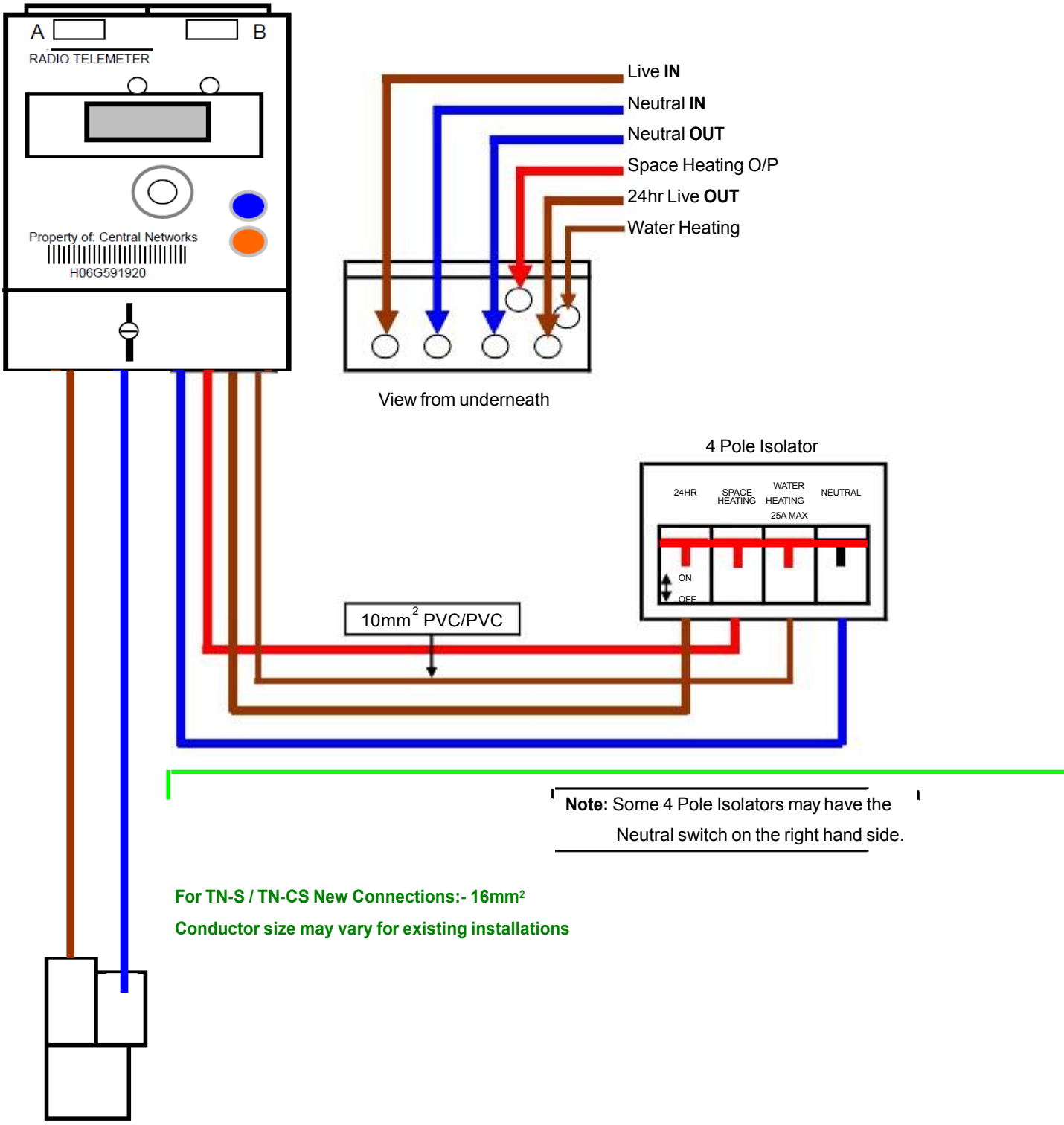


The above diagram is schematic only

All wiring to be 25mm² PVC/PVC unless otherwise stated.

Always refer to the meter terminal cover instructions to confirm connections.

SINGLE PHASE MULTI-RATE (HEATWISE) RADIO TELEMETER



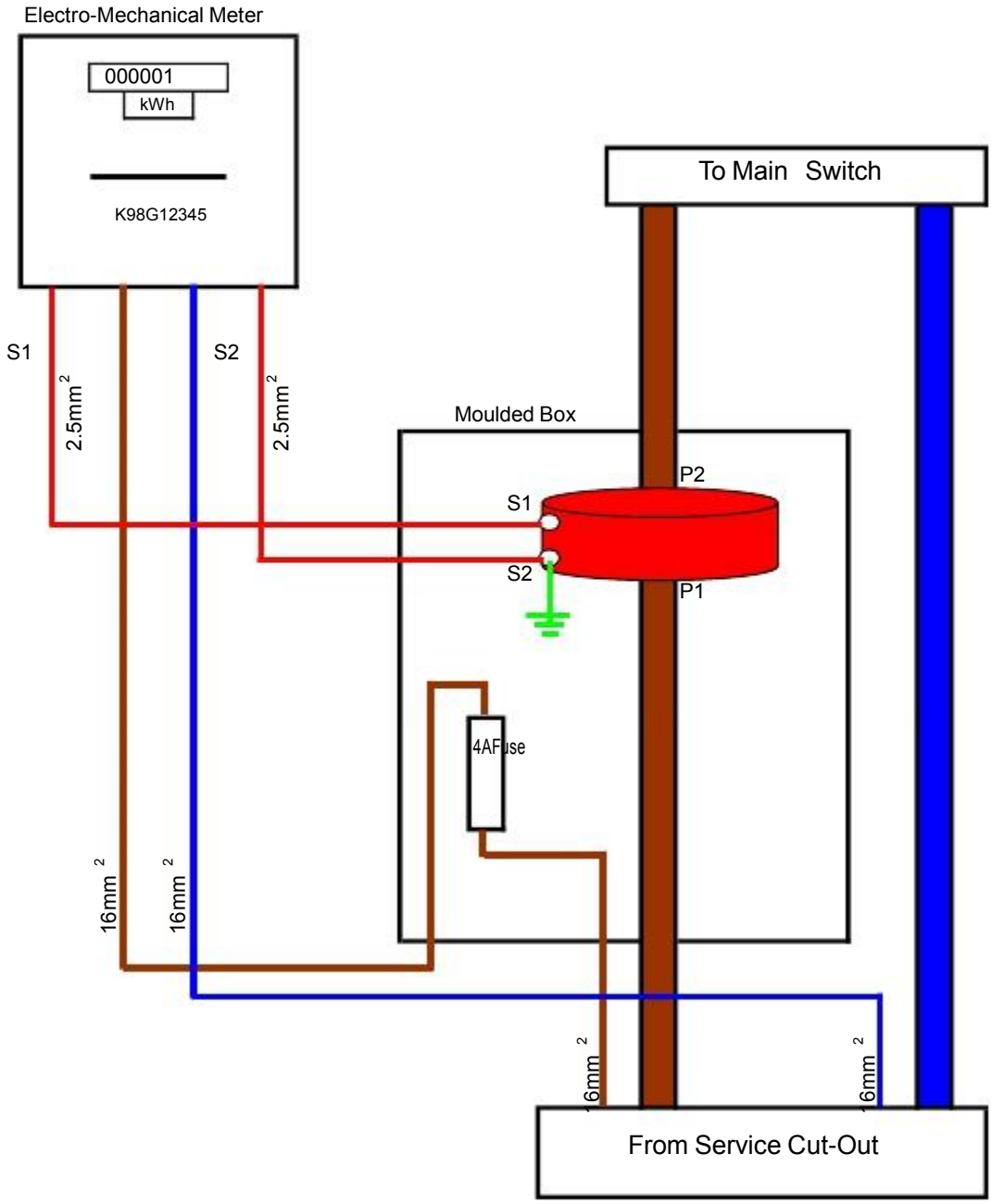
The above diagram is schematic only

All wiring to be 25mm ^{2}PVC/PVC unless otherwise stated.

Space Heating cable shown in Red for clarity only.

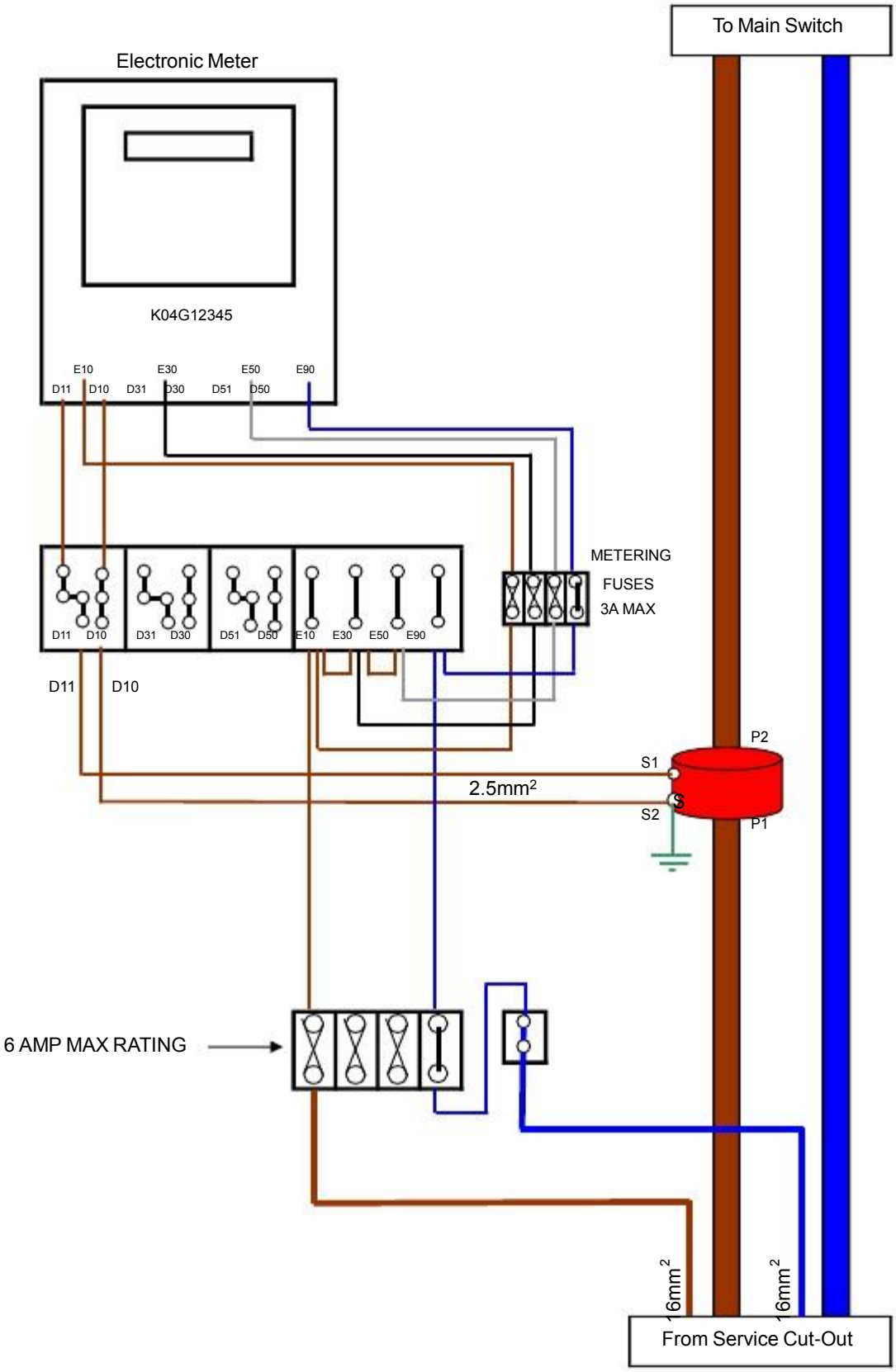
Always refer to the meter terminal cover instructions to confirm connections.

SINGLE PHASE LV CTO
SINGLE RATE ELECTRO-MECHANICAL METER

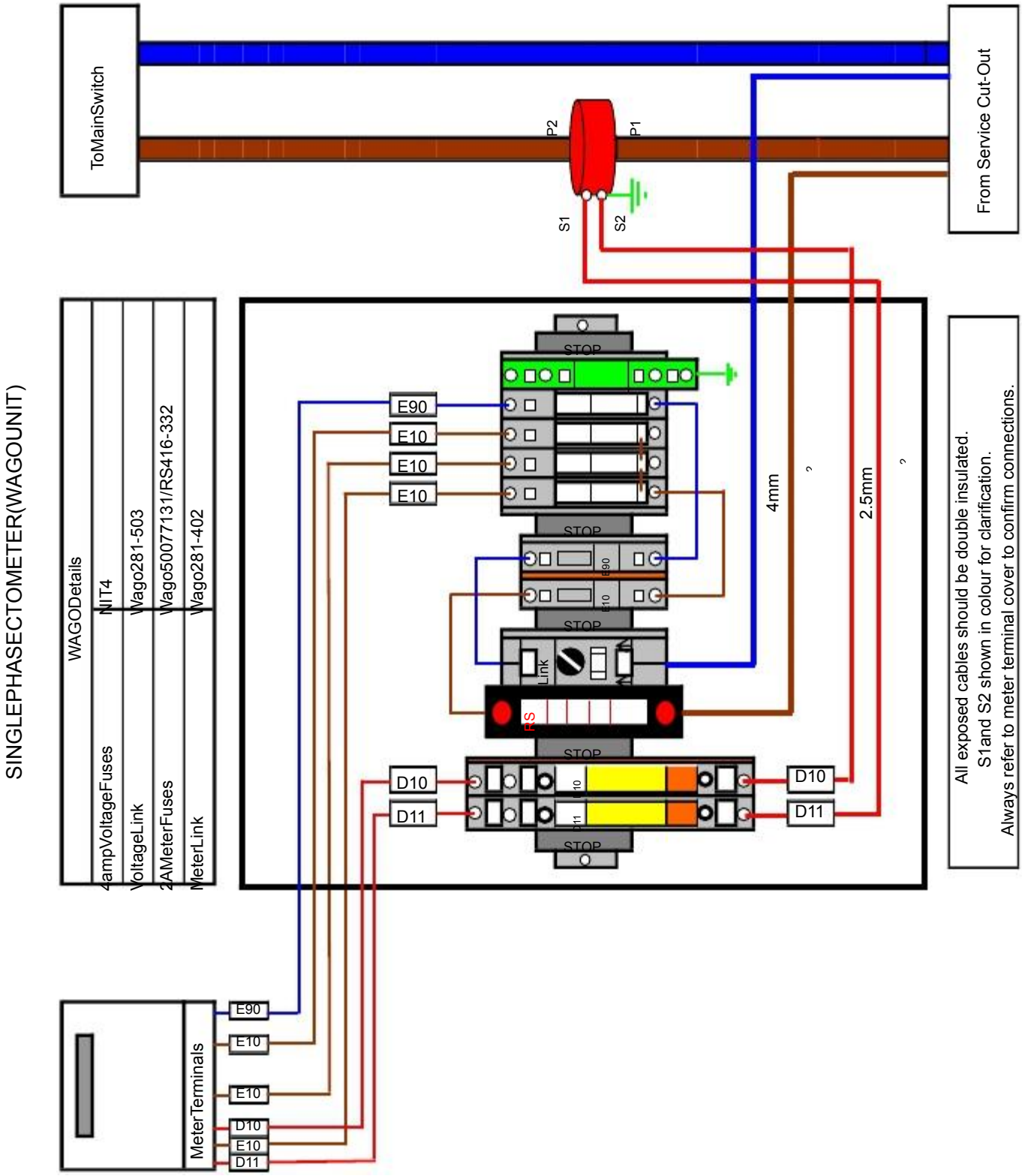


2.5mm² and 16mm² cables should be double insulated.
S1 and S2 shown in colour for clarification.
Always refer to meter terminal cover to confirm connections.

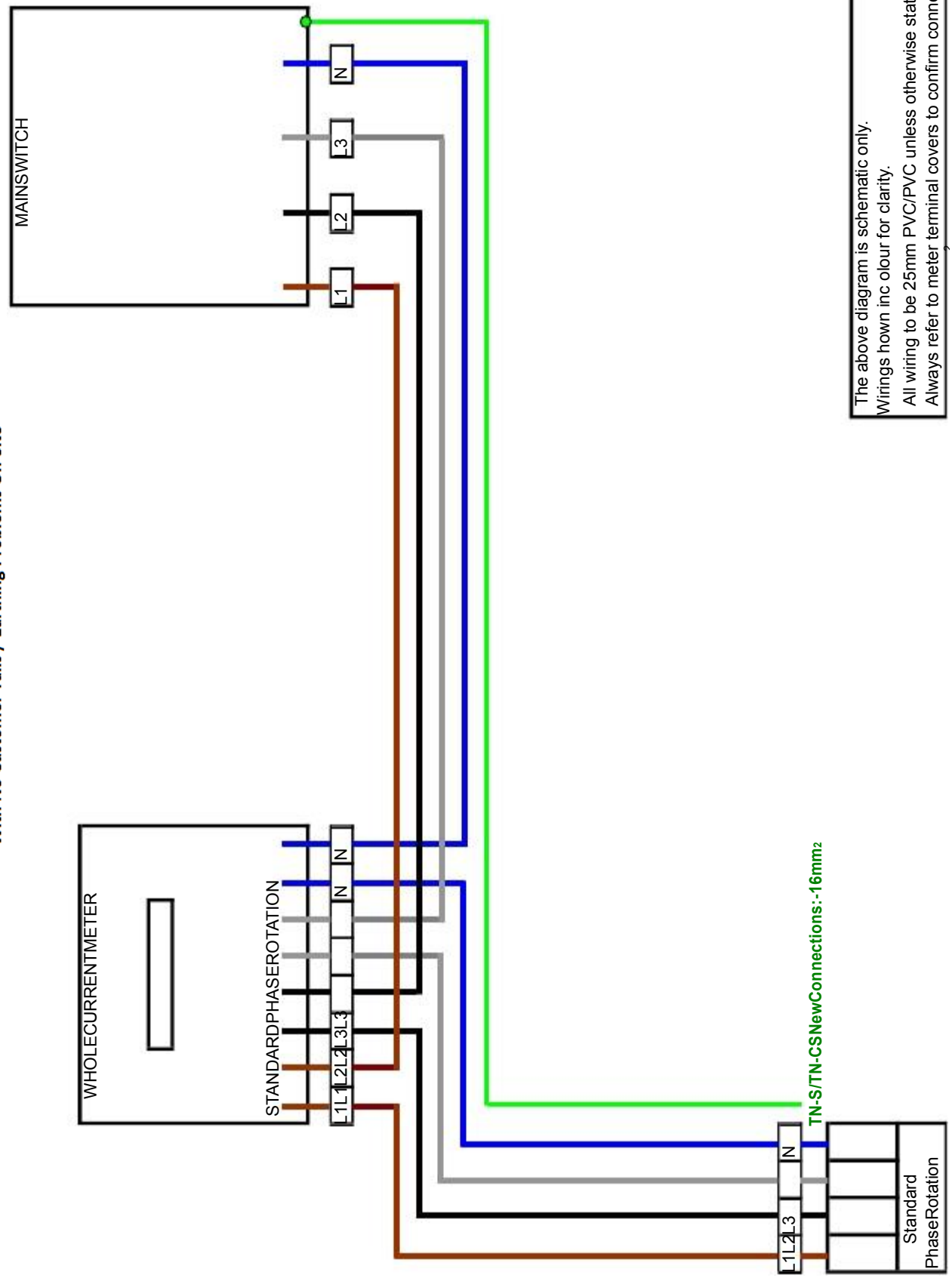
SINGLE PHASE LV CTO MULTI-RATE ELECTRONIC METER
TEST TERMINAL BLOCK



2.5mm ^{2} and 16mm ^{2} cables should be double insulated.
S1 and S2 shown in colour for clarification.
Always refer to meter terminal cover to confirm connections.

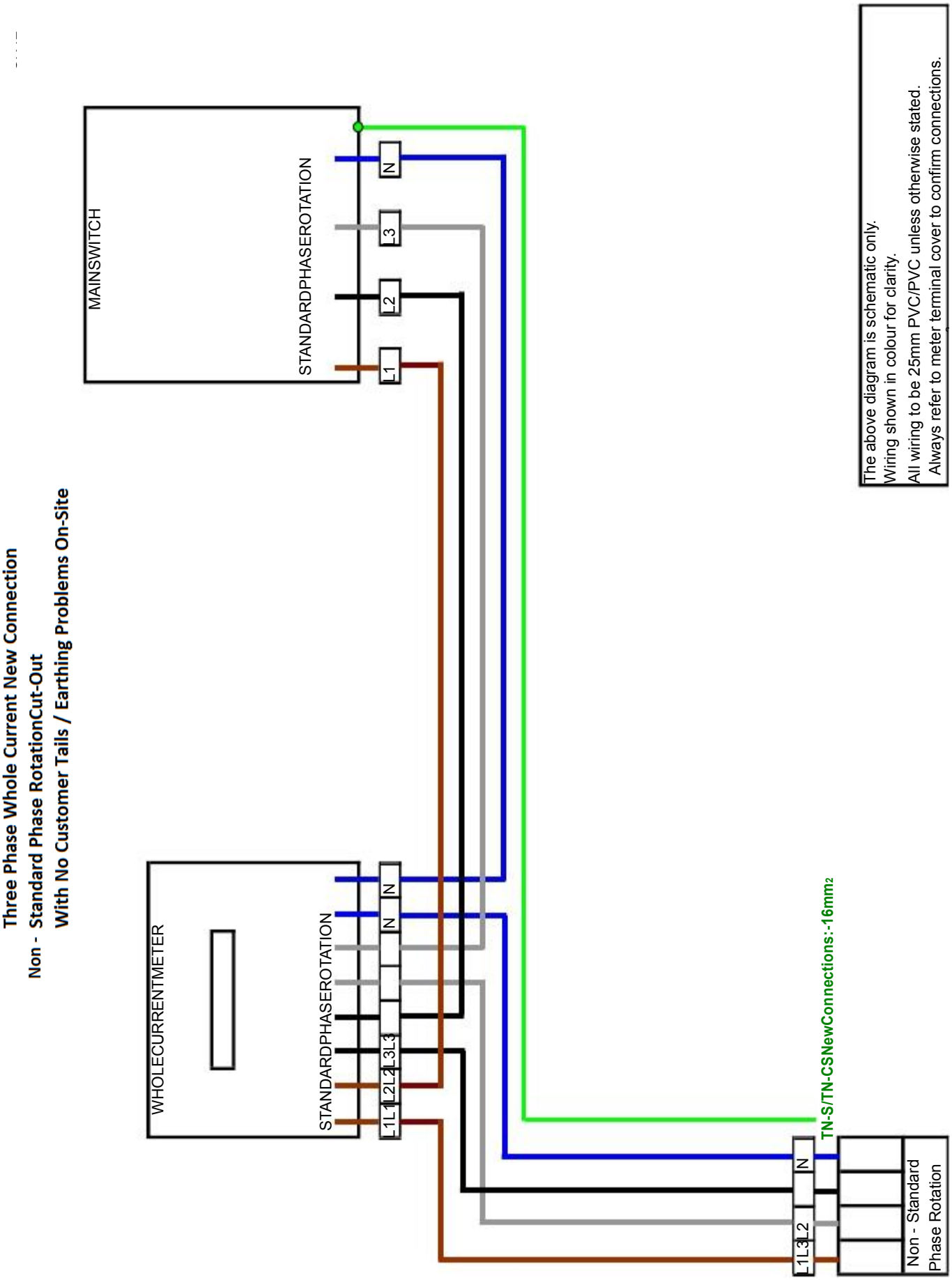

SINGLEPHASECTOMETER(WAGOUNIT)
ToMainSwitch
From Service Cut-Out
P2
P1
S1
S2
WAGODetails
4ampVoltageFuses
NIT4
VoltageLink
Wago281-503
2AMeterFuses
Wago50077131/RS416-332
MeterLink
Wago281-402
E90
E10
E10
E10
D10
D11
D10
D11
4mm
2.5mm
All exposed cables should be double insulated.
S1and S2 shown in colour for clarification.
Always refer to meter terminal cover to confirm connections.
MeterTerminals
E90
E10
E10
D10
E10
D11

Three Phase Whole Current New Connection
Standard Phase RotationCut-Out
With No Customer Tails / Earthing Problems On-Site



The above diagram is schematic only.
Wirings hown inc olour for clarity.
All wiring to be 25mm PVC/PVC unless otherwise stated.
Always refer to meter terminal covers to confirm connections.

Three Phase Whole Current New Connection
Non - Standard Phase RotationCut-Out
With No Customer Tails / Earthing Problems On-Site

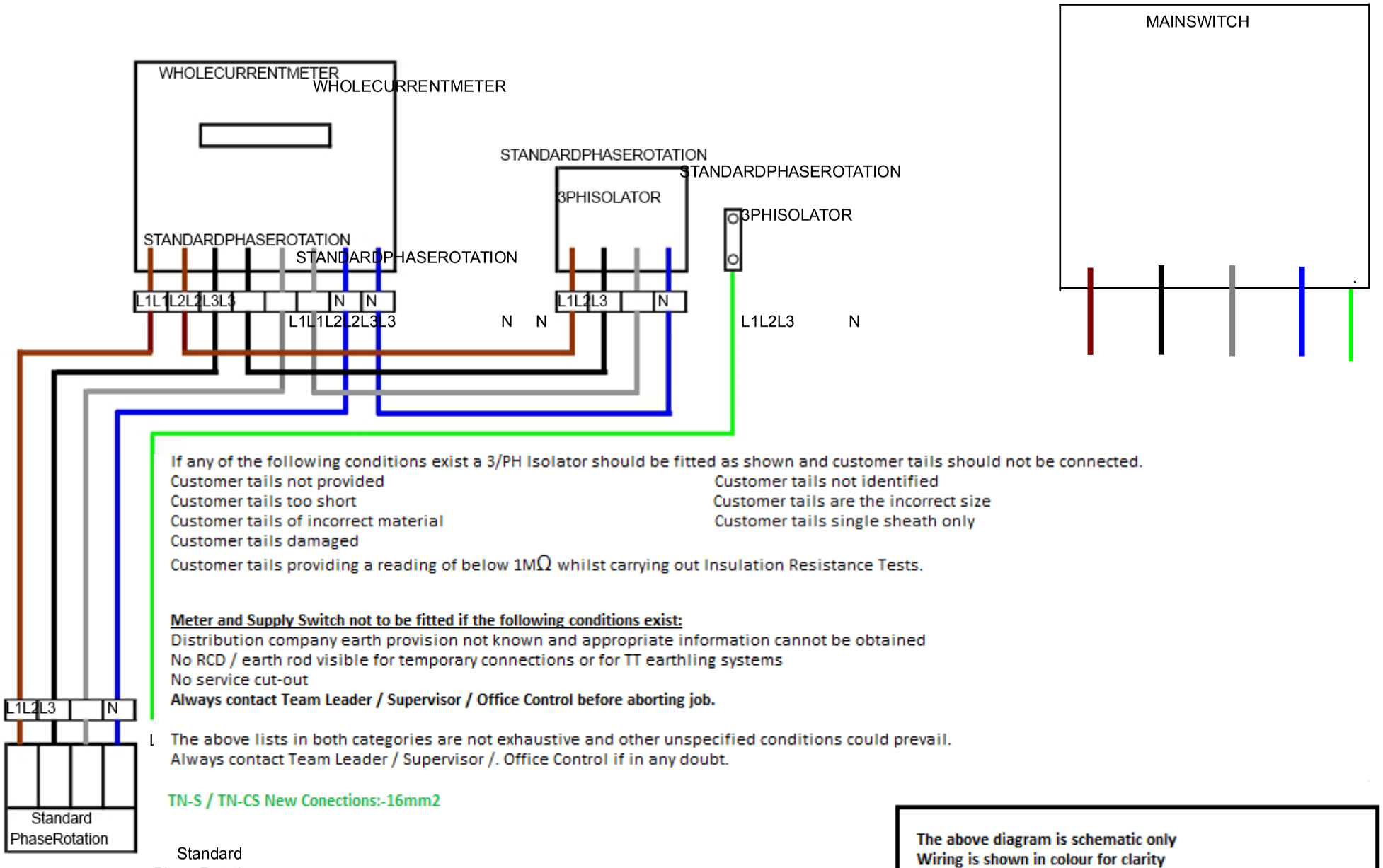


MS806

THREEPHASEWHOLECURRENTNEWCONNECTION

STANDARDPHASEROTATIONATCUT-OUT

3/PHISOLATOR



If any of the following conditions exist a 3/PH Isolator should be fitted as shown and customer tails should not be connected.

Customer tails not provided
Customer tails too short
Customer tails of incorrect material
Customer tails damaged
Customer tails not identified
Customer tails are the incorrect size
Customer tails single sheath only

Customer tails providing a reading of below 1MΩ whilst carrying out Insulation Resistance Tests.

Meter and Supply Switch not to be fitted if the following conditions exist:

Distribution company earth provision not known and appropriate information cannot be obtained
No RCD / earth rod visible for temporary connections or for TT earthling systems
No service cut-out
Always contact Team Leader / Supervisor / Office Control before aborting job.

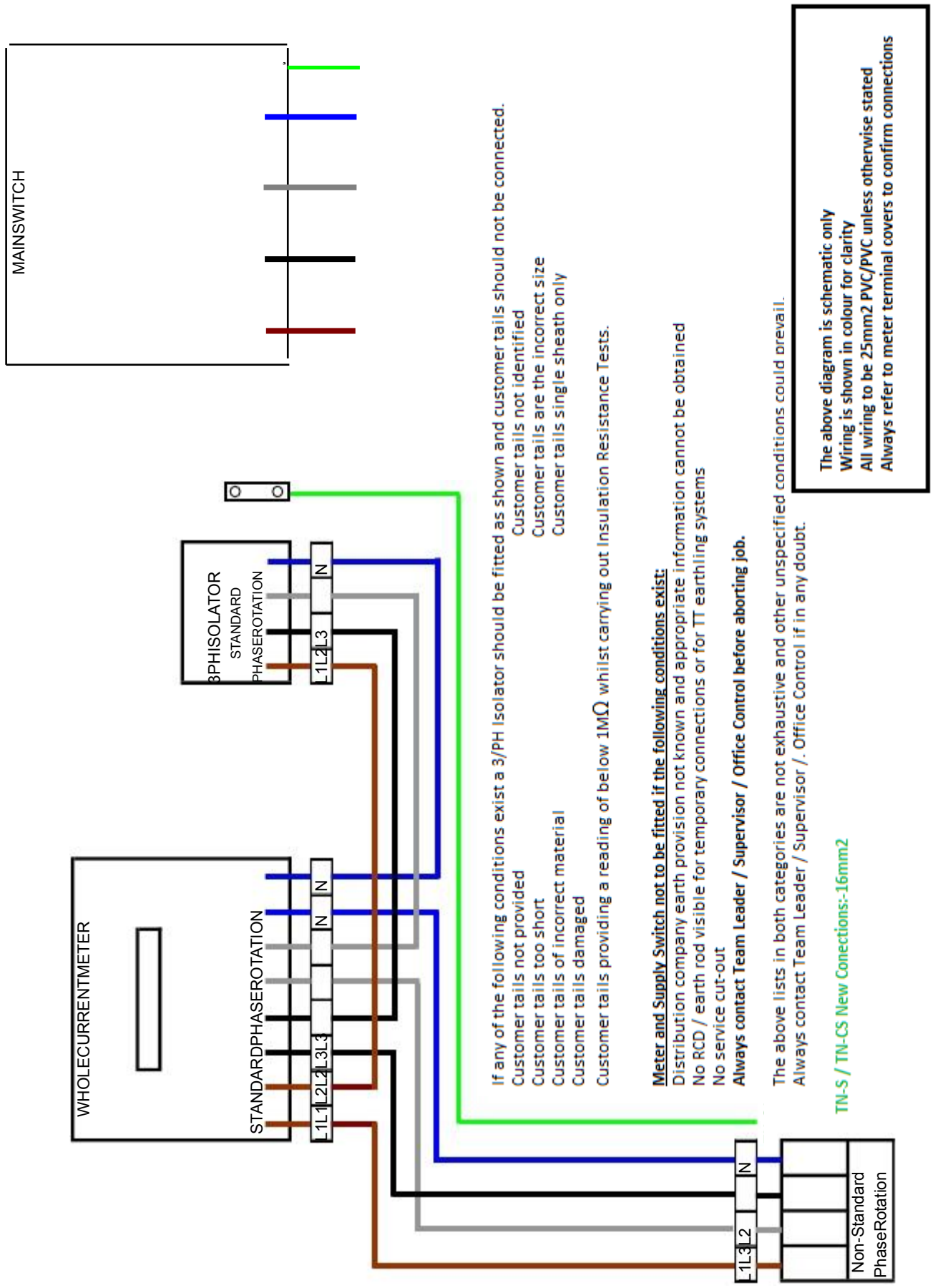
The above lists in both categories are not exhaustive and other unspecified conditions could prevail.
Always contact Team Leader /. Office Control if in any doubt.

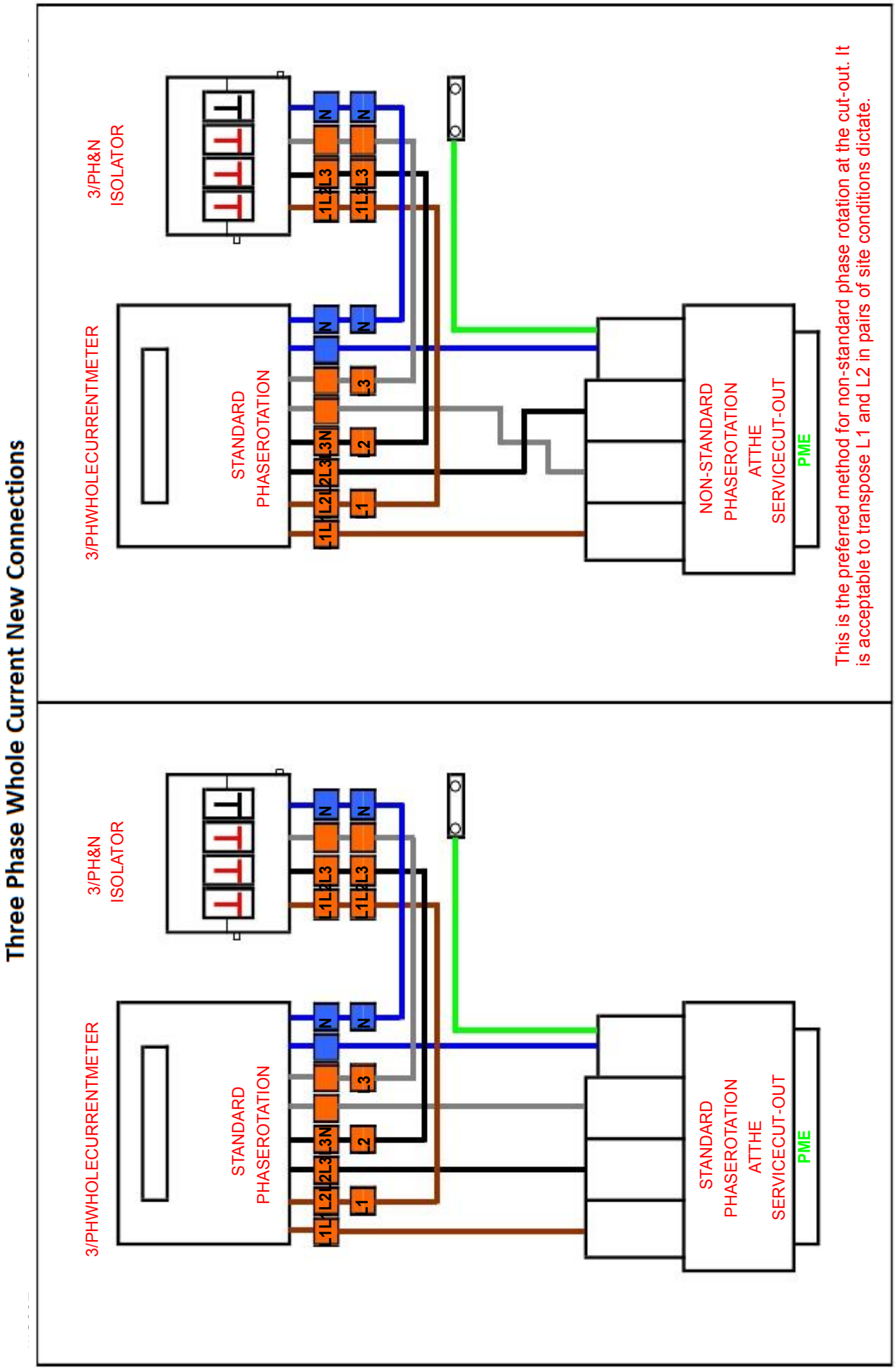
TN-S / TN-CS New Conections:-16mm2

The above diagram is schematic only
Wiring is shown in colour for clarity
All wiring to be 25mm2 PVC/PVC unless otherwise stated
Always refer to meter terminal covers to confirm connections

APPENDIX HEN 13

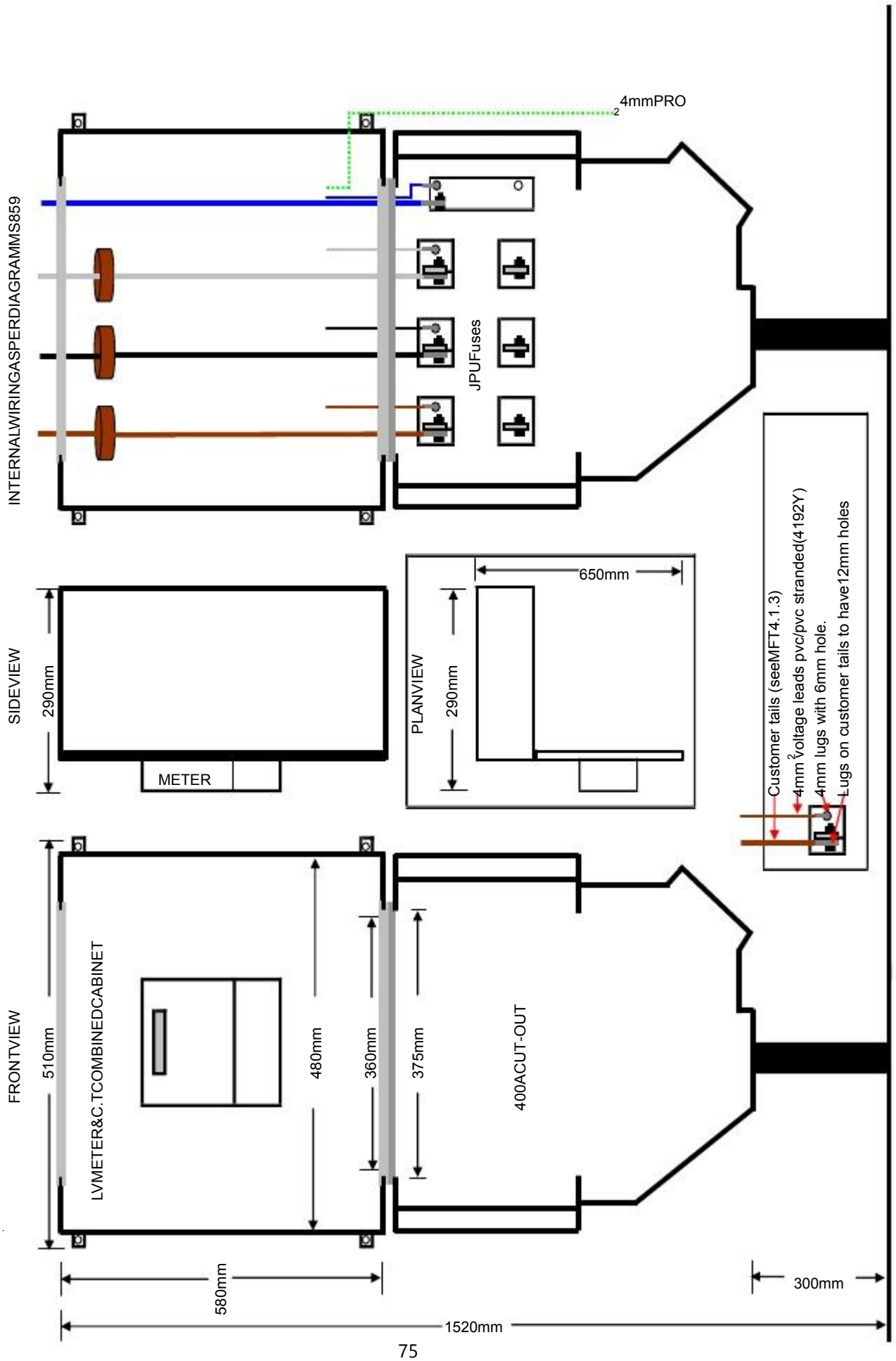
THREEPHASEWHOLECURRENTNEWCONNECTION
NON-STANDARDPHASEROTATIONATCUT-OUT
3/PHISOLATOR

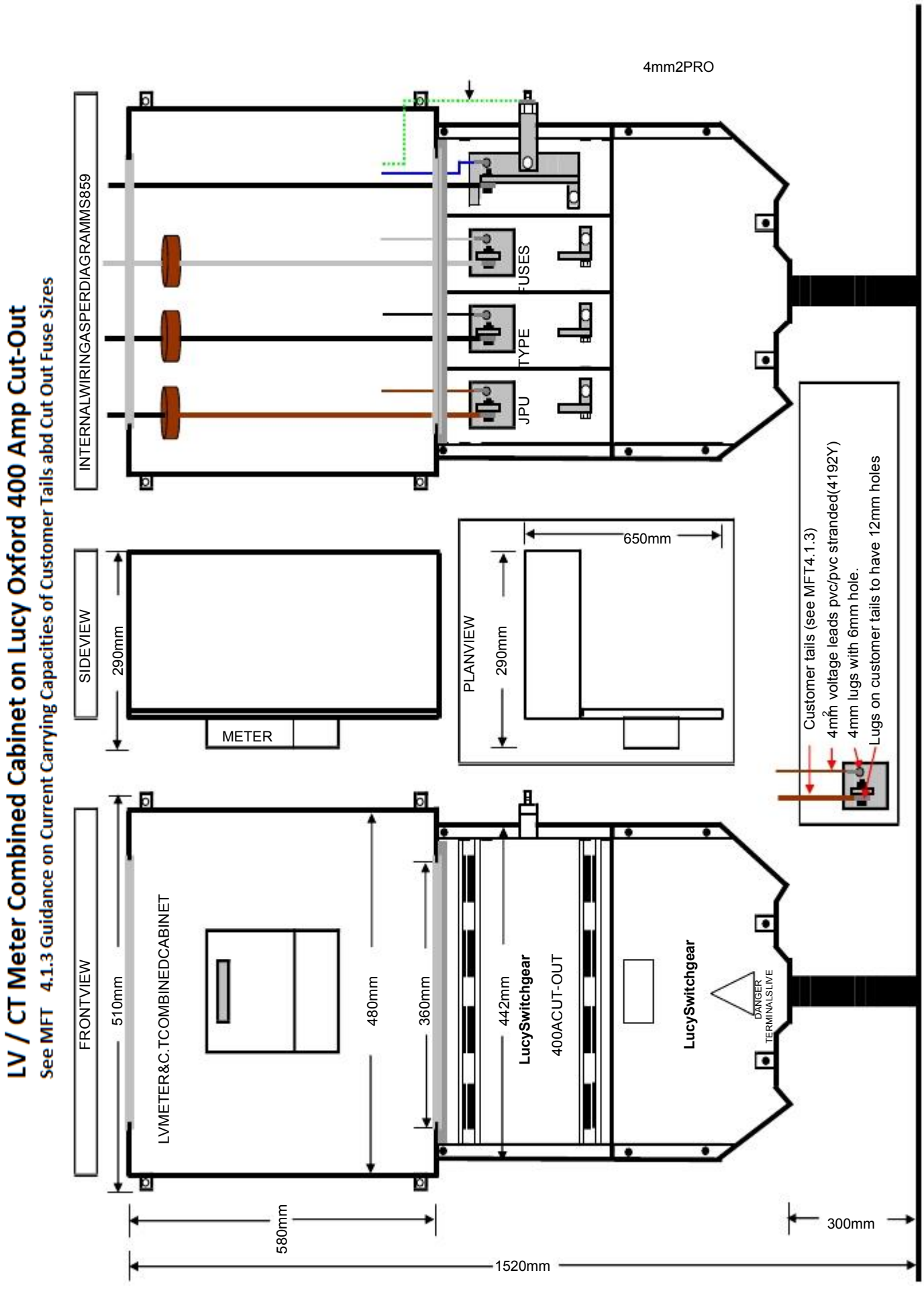


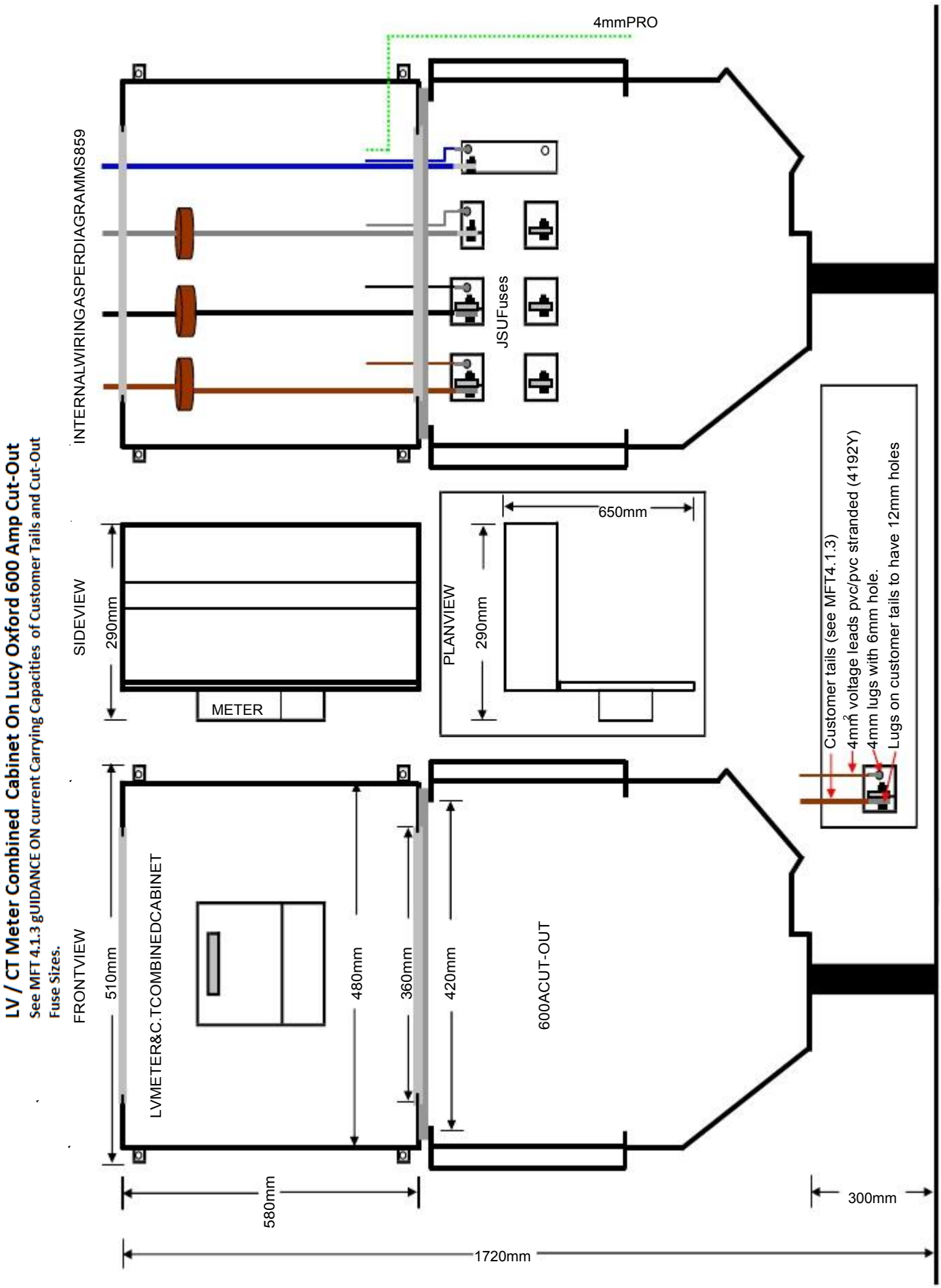

Three Phase Whole Current New Connections
3/PH&N
ISOLATOR
3/PHWHOLECURRENTMETER
STANDARD
PHASEROTATION
NON-STANDARD
PHASEROTATION
ATTHE
SERVICECUT-OUT
PME
L1
L2
L3
N
This is the preferred method for non-standard phase rotation at the cut-out. It is acceptable to transpose L1 and L2 in pairs of site conditions dictate.
Cables shown in colour for clarity only.
Diagrams schematiconly,connections may differ on some 3/PH&N Isolators.

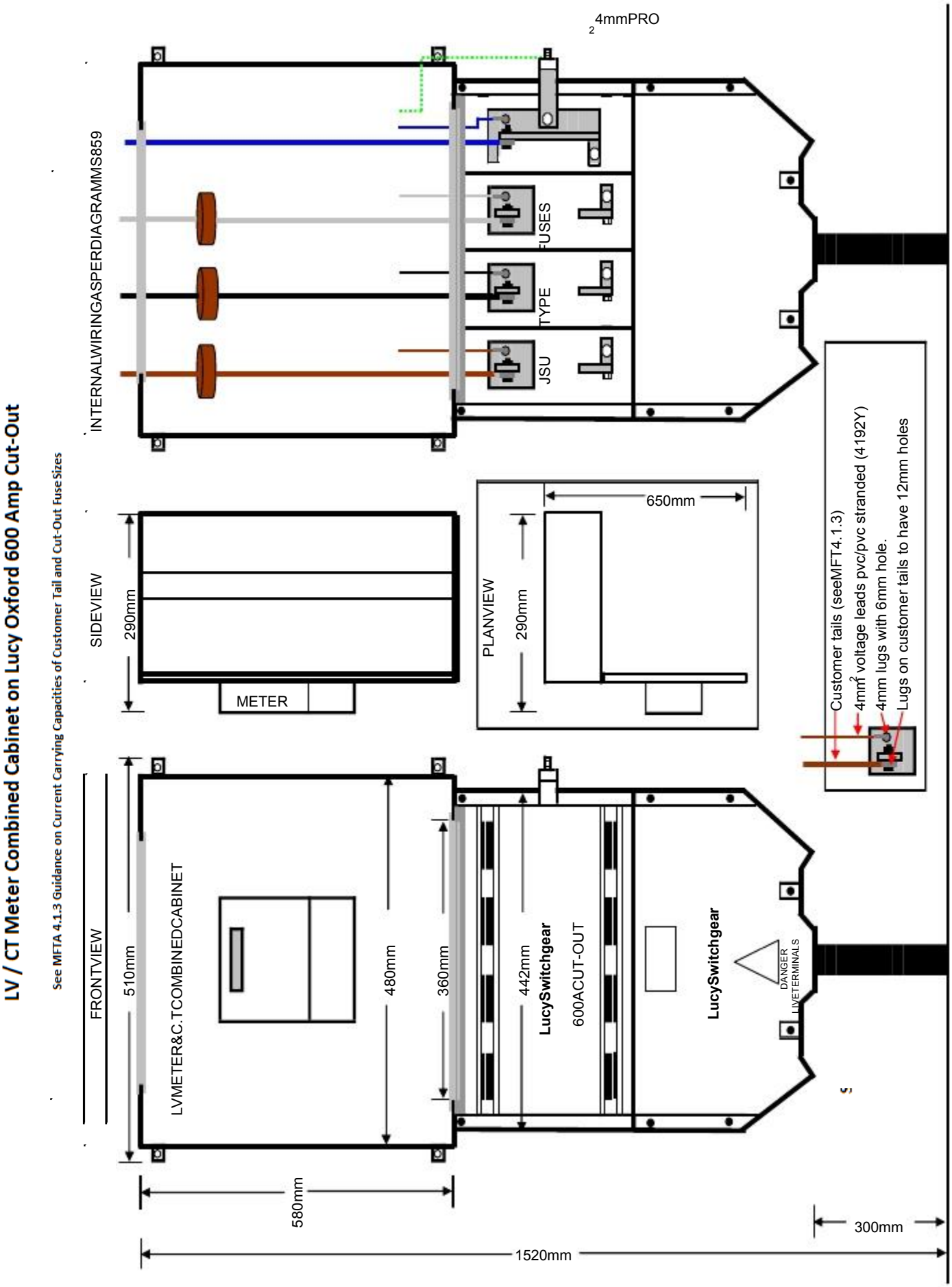
LV / CT Meter Combined Cabinet on Lucy Oxford 400 Amp Cut-Out

See MFT 4.1.3 Guidance on Current Carrying Capacities of Customer Tails and cut out fuses sizes.




LV / CT Meter Combined Cabinet on Lucy Oxford 400 Amp Cut-Out
See MFT 4.1.3 Guidance on Current Carrying Capacities of Customer Tails abd Cut Out Fuse Sizes
INTERNALWIRINGASPERDIAGRAMMS859
4mm2PRO
FUSES
TYPE
JPU
SIDEVIEW
290mm
METER
PLANVIEW
650mm
290mm
Customer tails (see MFT4.1.3)
4mm² voltage leads pvc/pvc stranded(4192Y)
4mm lugs with 6mm hole.
Lugs on customer tails to have 12mm holes
FRONTVIEW
510mm
LVMETER&C.TCOMBINEDCABINET
480mm
360mm
442mm
LucySwitchgear
400ACUT-OUT
LucySwitchgear
DANGER
TERMINALSLIVE
580mm
300mm
1520mm


LV / CT Meter Combined Cabinet On Lucy Oxford 600 Amp Cut-Out
See MFT 4.1.3 gUIDANCE ON current Carrying Capacities of Customer Tails and Cut-Out Fuse Sizes.
INTERNALWIRINGASPERDIAGRAMMS859
4mmPRO
JSUFuses
SIDEVIEW
290mm
METER
PLANVIEW
650mm
290mm
Customer tails (see MFT4.1.3)
4mm² voltage leads pvc/pvc stranded (4192Y)
4mm lugs with 6mm hole.
Lugs on customer tails to have 12mm holes
FRONTVIEW
510mm
LVMETER&C.TCOMBINEDCABINET
480mm
360mm
420mm
600ACUT-OUT
580mm
300mm
1720mm


LV / CT Meter Combined Cabinet on Lucy Oxford 600 Amp Cut-Out
See MFTA 4.1.3 Guidance on Current Carrying Capacities of Customer Tail and Cut-Out Fuse Sizes
FRONTVIEW
SIDEVIEW
PLANVIEW
INTERNALWIRINGASPERDIAGRAMMS859
4mmPRO2
FUSES
TYPE
JSU
650mm
290mm
290mm
METER
Customer tails (seeMFT4.1.3)
4mm2 voltage leads pvc/pvc stranded (4192Y)
4mm lugs with 6mm hole.
Lugs on customer tails to have 12mm holes
LVMETER&C.TCOMBINEDCABINET
510mm
480mm
360mm
442mm
LucySwitchgear
600ACUT-OUT
LucySwitchgear
DANGER
LIVETERMINALS
580mm
300mm
1520mm

MFT 4.1.3 GUIDANCE ON CURRENT CARRYING CAPACITIES

STANDARD INSULATED CABLE				XLPE (THERMOSETTING) INSULATED CABLE		
CONDUCTOR OPERATING TEMPERATURE: 70⁰ C				CONDUCTOR OPERATING TEMPERATURE: 90⁰ C		
BASED ON TABLE 4D1A IEE REGS 16TH EDITION				BASED ON TABLE 4E1A IEE REGS 16TH EDITION		
INSTALLED METHOD			CONDUCTOR CROSS - SECTIONAL AREA IN SQ.MM.	INSTALLED METHOD		
ENCLOSED IN TRUNKING	SHEATHED OPEN CLIPPED DIRECT	SHEATHED ON PERFORATED CABLE TRAY NOT ENCLOSED		ENCLOSED IN TRUNKING	SHEATHED OPEN CLIPPED DIRECT	SHEATHED ON PERFORATED CABLE TRAY NOT ENCLOSED
AMPS	AMPS	AMPS		AMPS	AMPS	AMPS
89	104	112	25 mm^2	111	130	140
110	129	141	35 mm^2	138	161	176
134	167	172	50 mm^2	168	209	215
171	214	223	70 mm^2	214	268	279
207	261	273	95 mm^2	259	326	341
239	303	318	120 mm^2	299	379	398
262	349	369	150 mm^2	328	436	461
296	400	424	185 mm^2	370	500	530
346	472	504	240 mm^2	433	590	630
394	545	584	300 mm^2	493	681	730
467	634	679	400 mm^2	584	793	849
533	723	778	500 mm^2	666	904	973
611	826	892	630 mm^2	764	1033	1115

COLOUR GUIDE TO MAXIMUM FUSE SIZE ON CABLE RATINGS

63 A
100 A
160 A
200 A
250 A
315 A
400 A
500 A
600 A

GENERAL NOTES.

Where the customers switchgear or consumer unit is installed such that the connections to the supply point would be more than 3m in length, an additional means of isolation and overcurrent protection must be installed.

TRI-RATED CABLES.

Tri-Rated cable is acceptable, enclosed or clipped direct / surface mid air, providing the electrical contractor provides the necessary lugs and crimping tool.

For current carrying capacity see guide for STANDARD INSULATED CABLE * See Note

*We will accept Contractor's own calculations in writing.

Where tri-rated cables are to be terminated via a screwed pin connection (e.g. some 200a cut-outs). The appropriate crimped thimble must be supplied and crimped (compression) by the electrical contractor.

If the electrical contractor is unable to provide suitable connections then the electrical contractor must change the customer tails to the appropriate standard / XLPE insulated copper cables.

STRIPPED DOWN STEEL WIRED ARMOURED.

Stripped down SWA is acceptable providing:

1. Electrical Contractor provides the necessary lugs and crimping tool (Indentation).
2. The cable is totally enclosed.

For current carrying capacity see guide for STANDARD INSULATED CABLE

PARALLELED CABLES.

Must be of the same length, construction, material, cross sectional area and have the same start / end point.

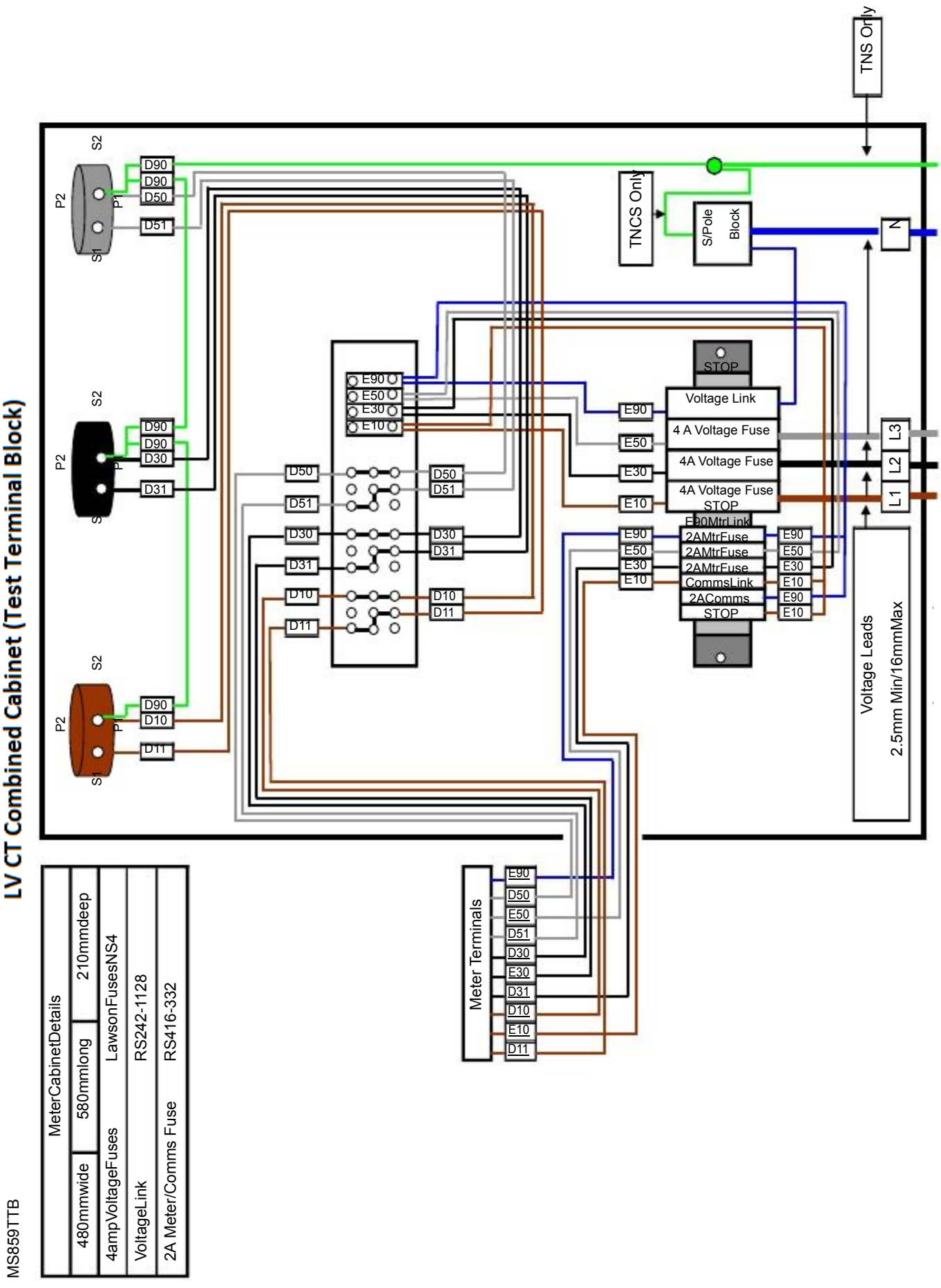
REQUIRED SIZE OF MAIN EARTHING CONDUCTOR for NEW CONNECTIONS.

The main earthing conductor between the customers main earthing terminal and the Distributors TN-C-S earthing terminal must be a single conductor. The IEE Wiring Regulations states that for 25mm^2 and 35mm^2 customer tails the required size of the main earthing conductor is 16mm^2. For customer tails in excess of 35mm^2 the required size of the main earthing conductor is half the size of the phase conductors.

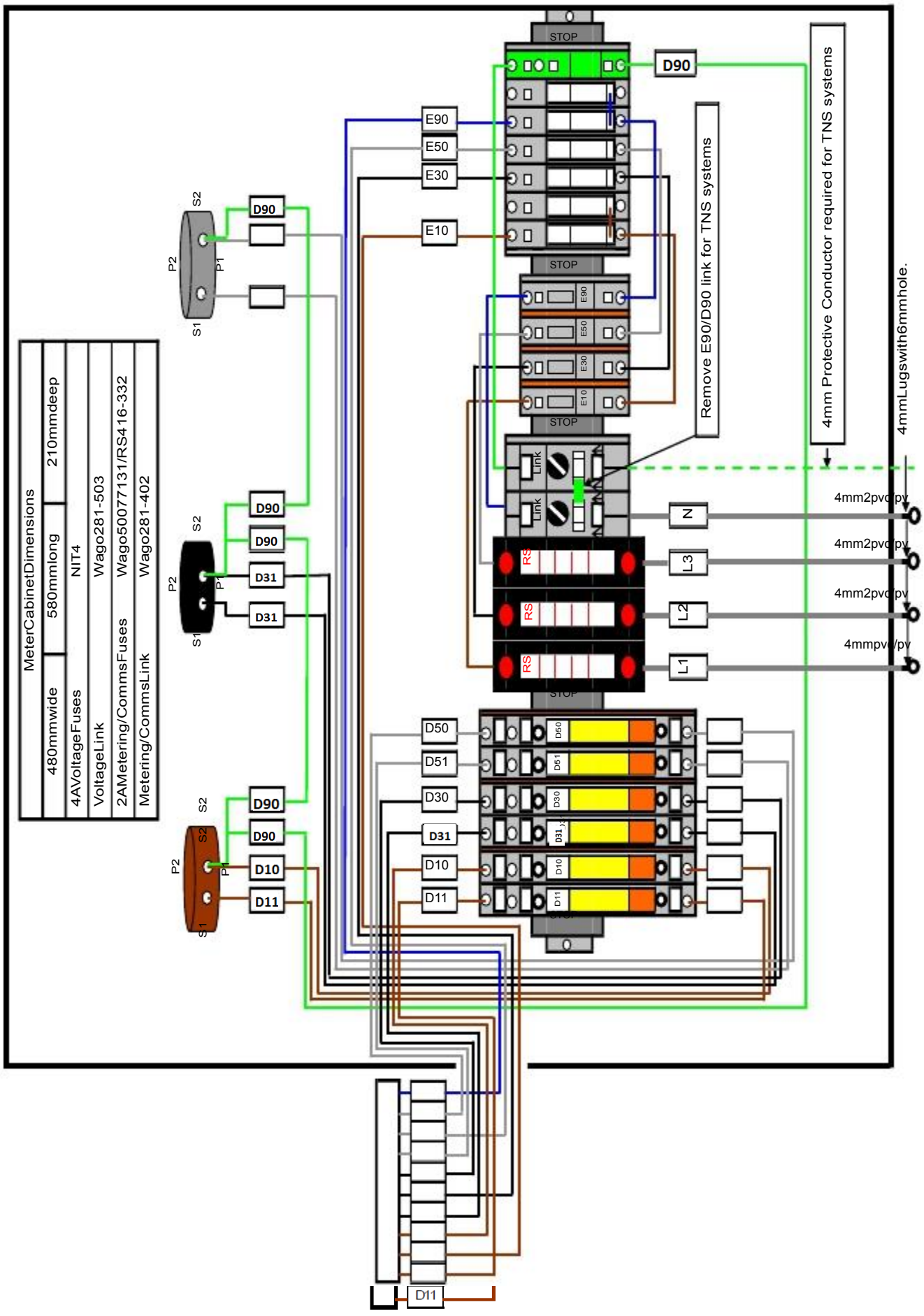
e.g. for 150mm^2 customer tails, the required main earthing conductor will be 95mm^2
or for 95mm^2 customer tails, the required main earthing conductor will be 50mm^2

Notes: i) The IEE Wiring Regulations do not differentiate between earthing systems:
e.g. TN-C-S (PME) TN-S (Sheath) TT (Earth Rod)

ii) The Electrical Contractor has the option of producing his own calculations based on a formula contained in the IEE Wiring Regulations.

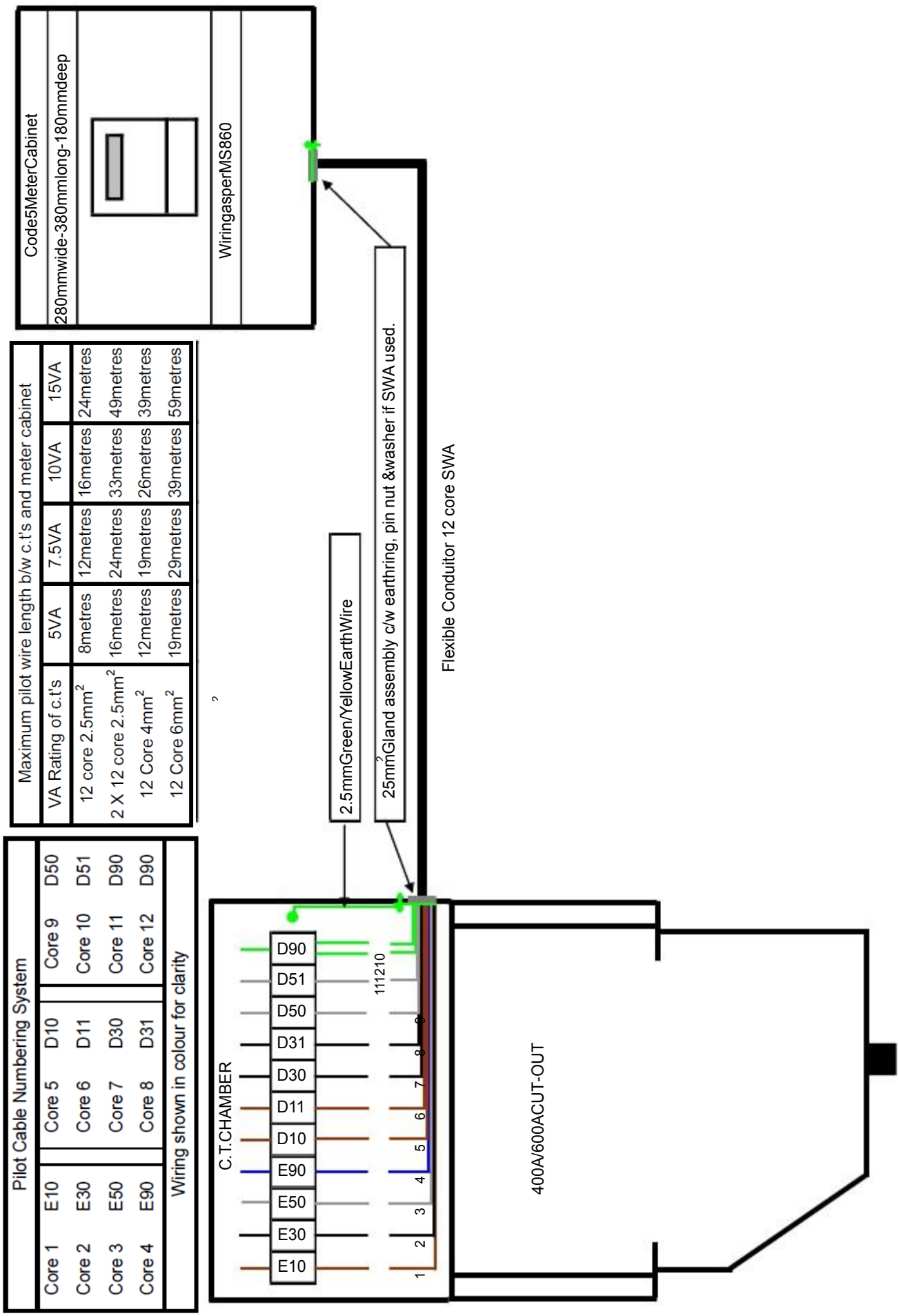

LV CT Combined Cabinet (Test Terminal Block)
MS859TTB
MeterCabinetDetails
480mmwide
580mmlong
210mmdeep
4ampVoltageFuses
LawsonFusesNS4
VoltageLink
RS242-1128
2A Meter/Comms Fuse
RS416-332
TNS Only
TNCS Only
S/Pole Block
N
L1
L2
L3
STOP
Voltage Link
4 A Voltage Fuse
4A Voltage Fuse
4A Voltage Fuse
STOP
E90MtrLink
2AMtrFuse
2AMtrFuse
2AMtrFuse
CommsLink
2AComms
STOP
Voltage Leads
2.5mm Min/16mmMax
Meter Terminals
P1
P2
S1
S2
D90
D50
D51
D30
D31
D10
D11
E90
E50
E30
E10

LV CT Combined Cabinet (WAGO)

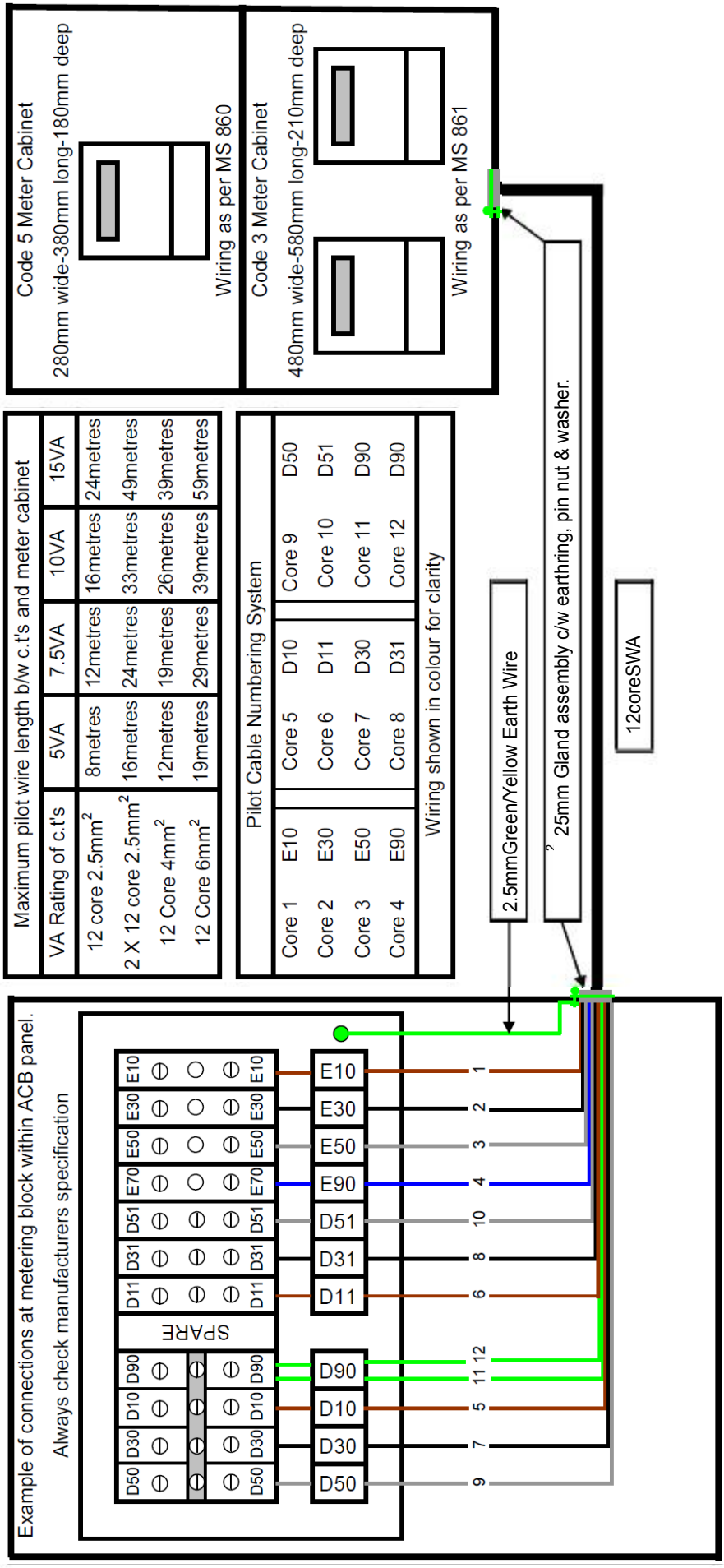


859WAGO

LV Code 5 Remote Metering



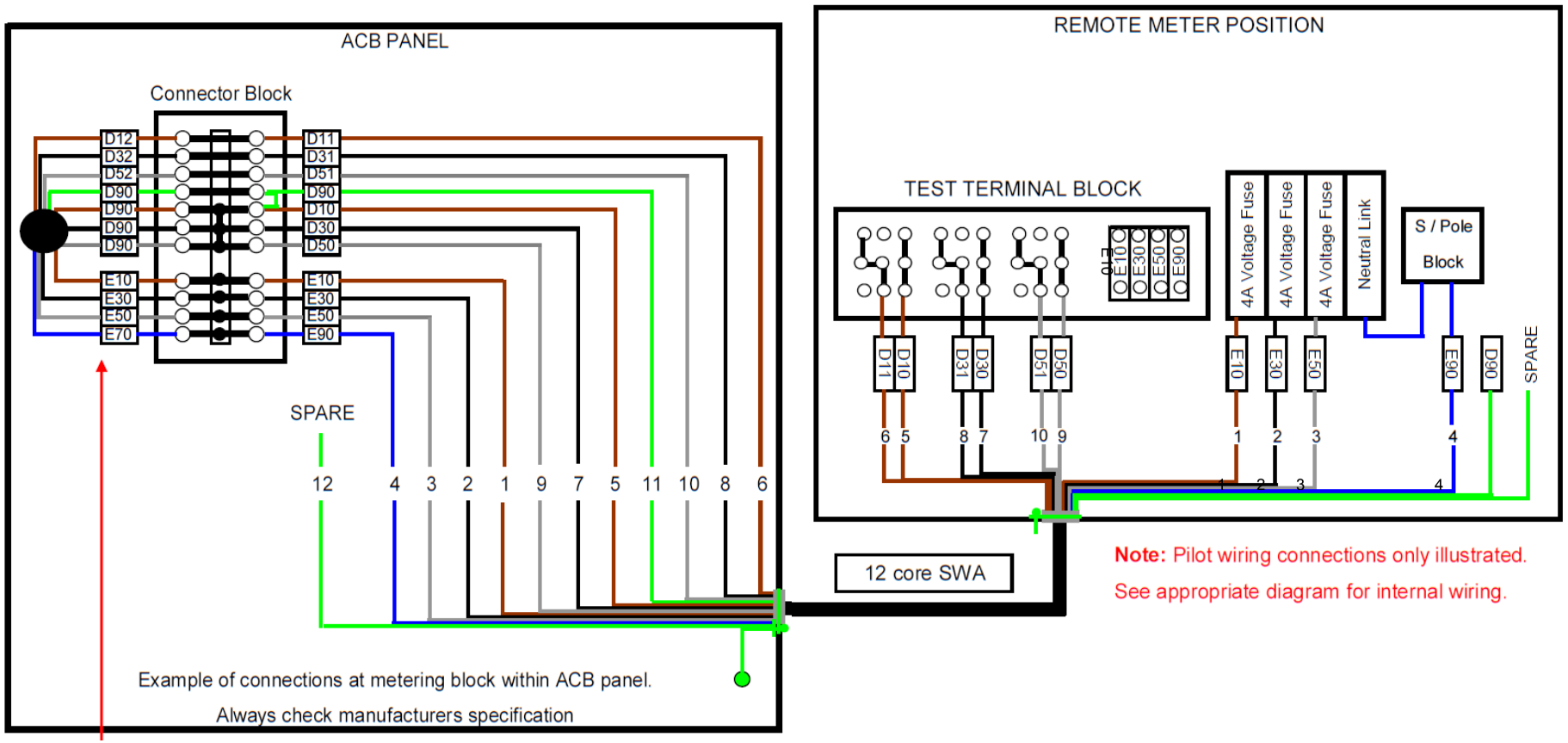
ACB PANEL WITH CODES 5 & 3 REMOTE METERING



Maximum pilot wire length b/w c.t's and meter cabinet				
VA Rating of c.t's	5VA	7.5VA	10VA	15VA
12 core 2.5mm²	8metres	12metres	16metres	24metres
2 X 12 core 2.5mm²	16metres	24metres	33metres	49metres
12 Core 4mm²	12metres	19metres	26metres	39metres
12 Core 6mm²	19metres	29metres	39metres	59metres

Pilot Cable Numbering System					
Core 1	E10	Core 5	D10	Core 9	D50
Core 2	E30	Core 6	D11	Core 10	D51
Core 3	E50	Core 7	D30	Core 11	D90
Core 4	E90	Core 8	D31	Core 12	D90
Wiring shown in colour for clarity					

ACB Panel With Code 5 Metering Panel



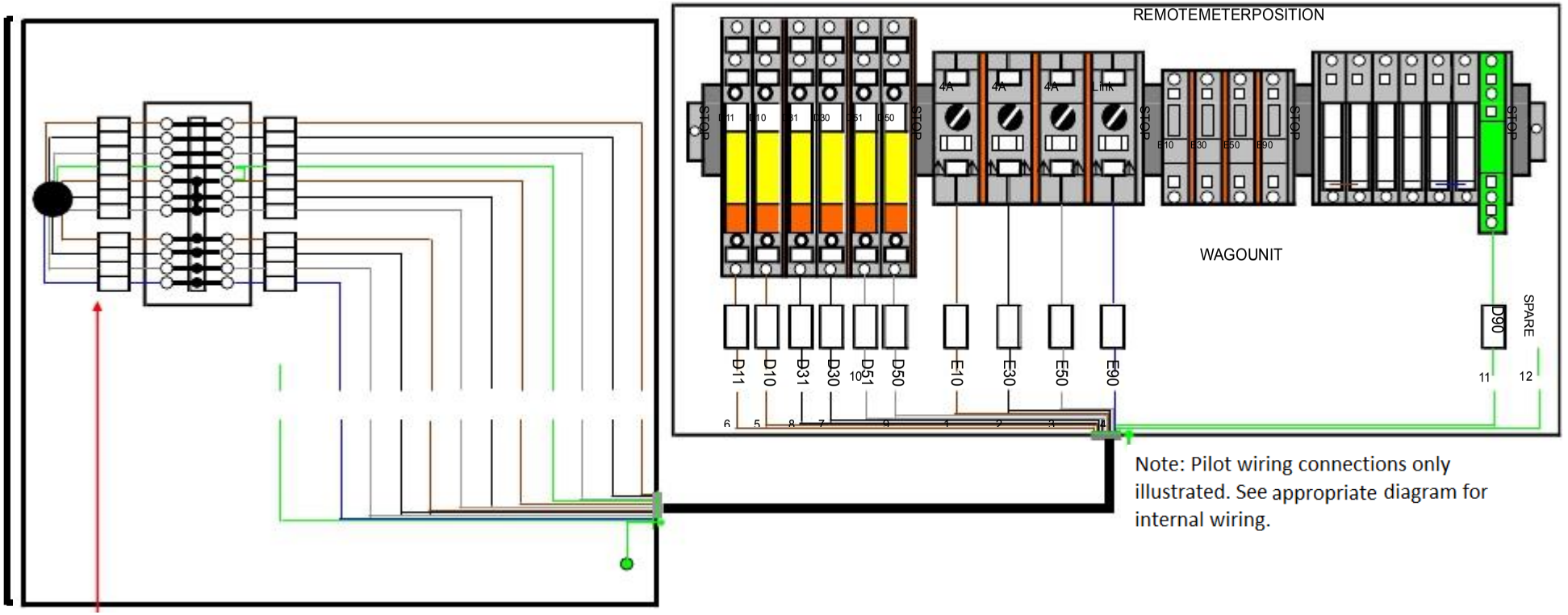
Note: Ferrule marker numbers applied to incoming wires at connector block may differ e.g. current wires could be prefixed with C in place of D
In addition manufacturers incoming wires may enter connector blcok from the right.

Pilot Cable Numbering System					
Core 1	E10	Core 5	D10	Core 9	D50
Core 2	E30	Core 6	D11	Core 10	D51
Core 3	E50	Core 7	D30	Core 11	D90
Core 4	E90	Core 8	D31	Core 12	Spare
Wiring shown in colour for clarity					

Maximum pilot wire length b/w c.t's and meter cabinet				
VA Rating of c.t's	5VA	7.5VA	10VA	15VA
12 core 2.5mm^2	8metres	12metres	16metres	24metres
2 X 12 core 2.5mm^2	16metres	24metres	33metres	49metres
12 Core 4mm^2	12metres	19metres	26metres	39metres
12 Core 6mm^2	19metres	29metres	39metres	59metres

APPENDIX HEN 29b

ACB PANEL WITH CODE 5 METERING PANEL

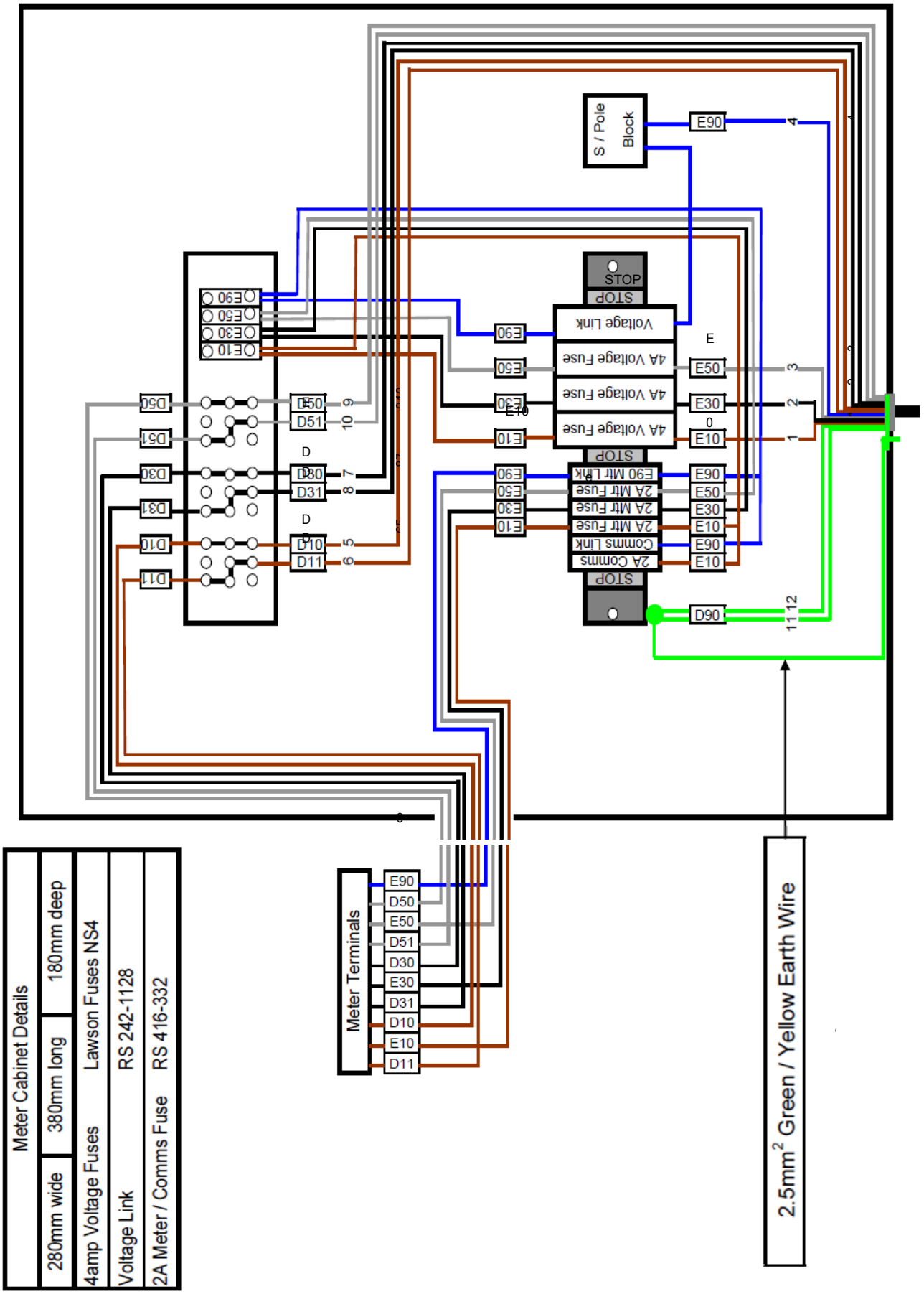


Note: Pilot wiring connections only illustrated. See appropriate diagram for internal wiring.

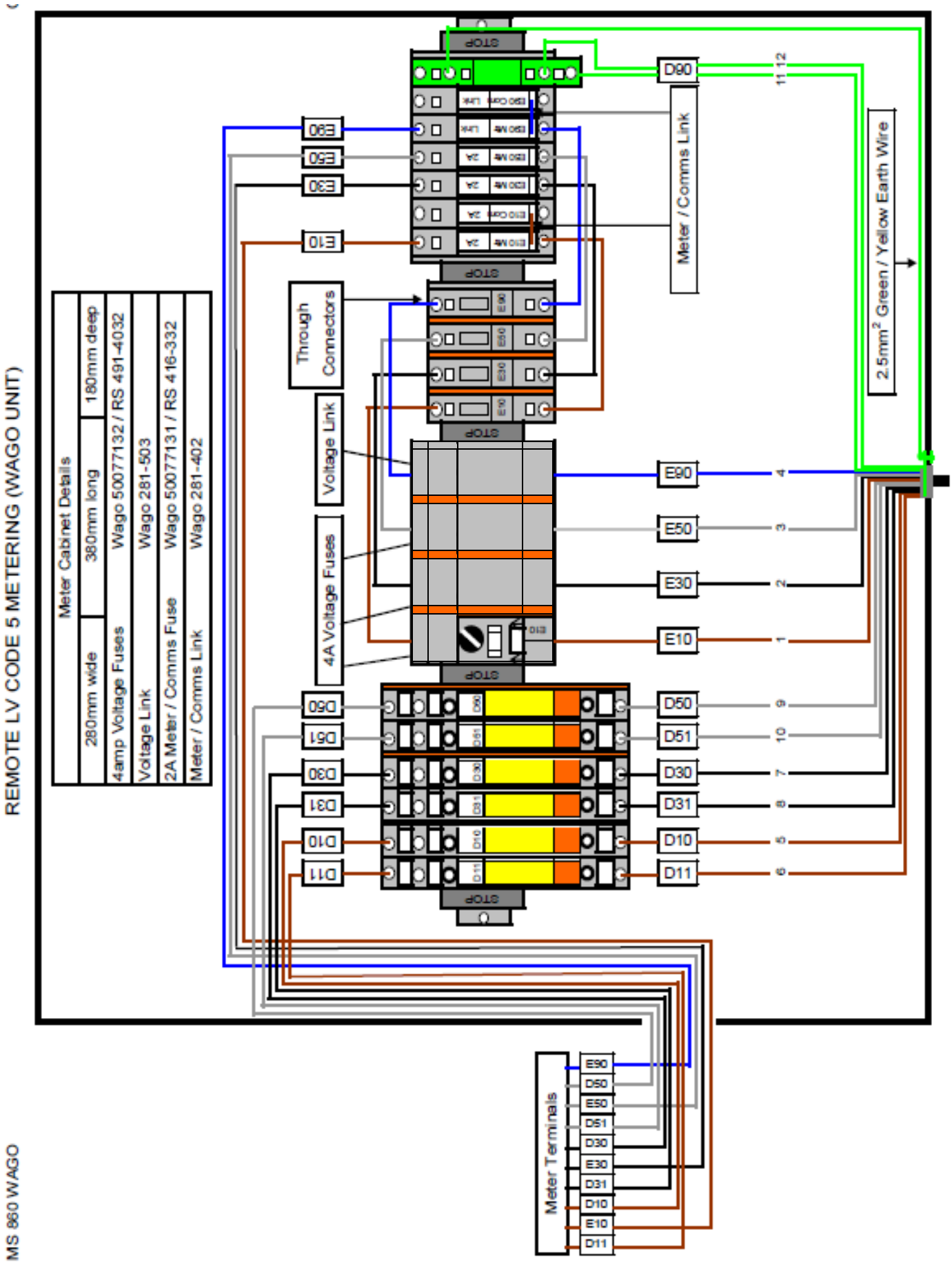
Note: Ferrule marker numbers applied to incoming wires at connector block may differ
e.g. current wires could be prefixed with C in place of D
In addition manufacturers incoming wires may enter connector blcok from the right.

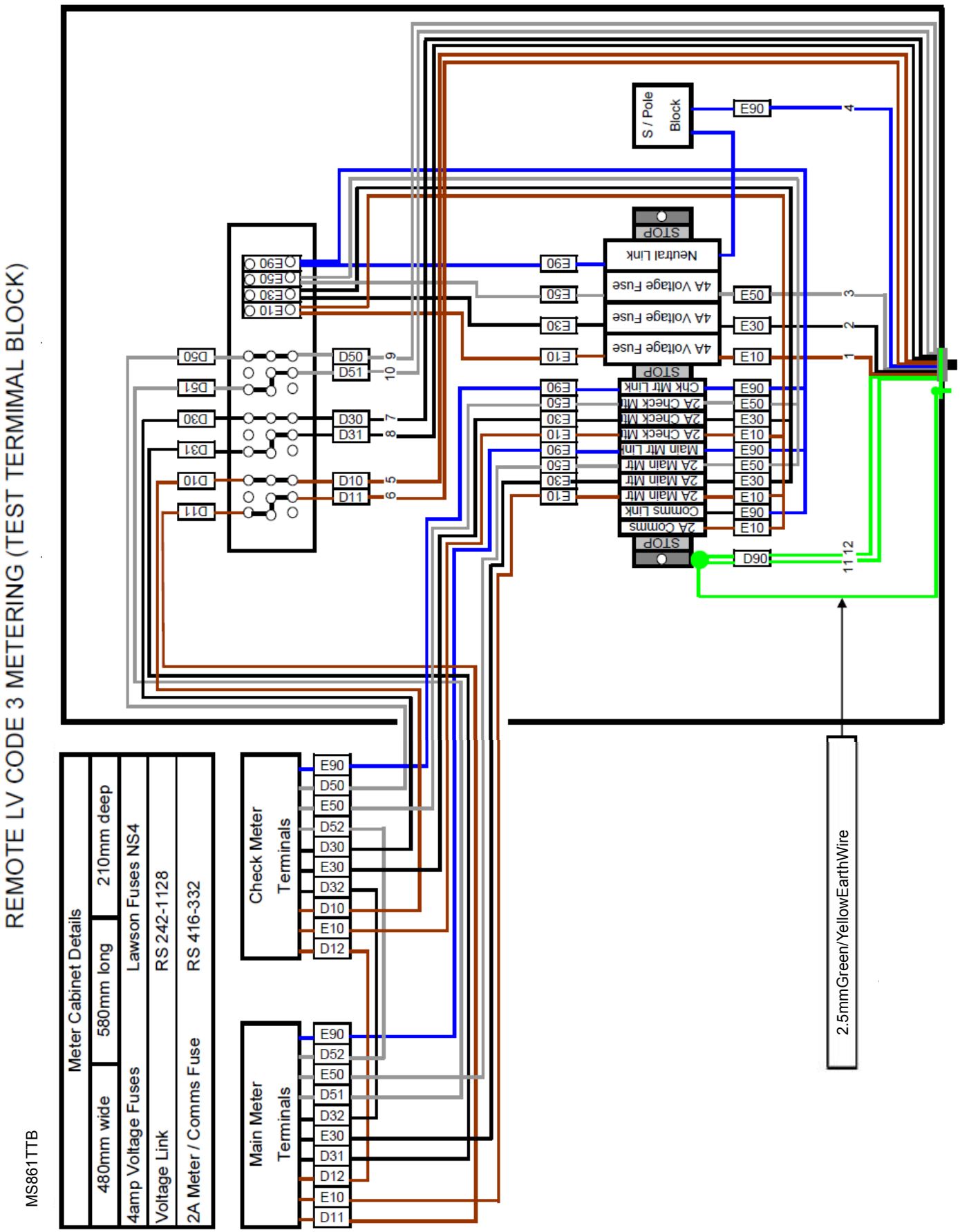
Maximum pilot wire length b/w c.t's and meter cabinet				
VA Rating of c.t's	5VA	7.5VA	10VA	15VA
12 core 2.5mm^2	8metres	12metres	16metres	24metres
2 X 12 core 2.5mm^2	16metres	24metres	33metres	49metres
12 Core 4mm^2	12metres	19metres	26metres	39metres
12 Core 6mm^2	19metres	29metres	39metres	59metres

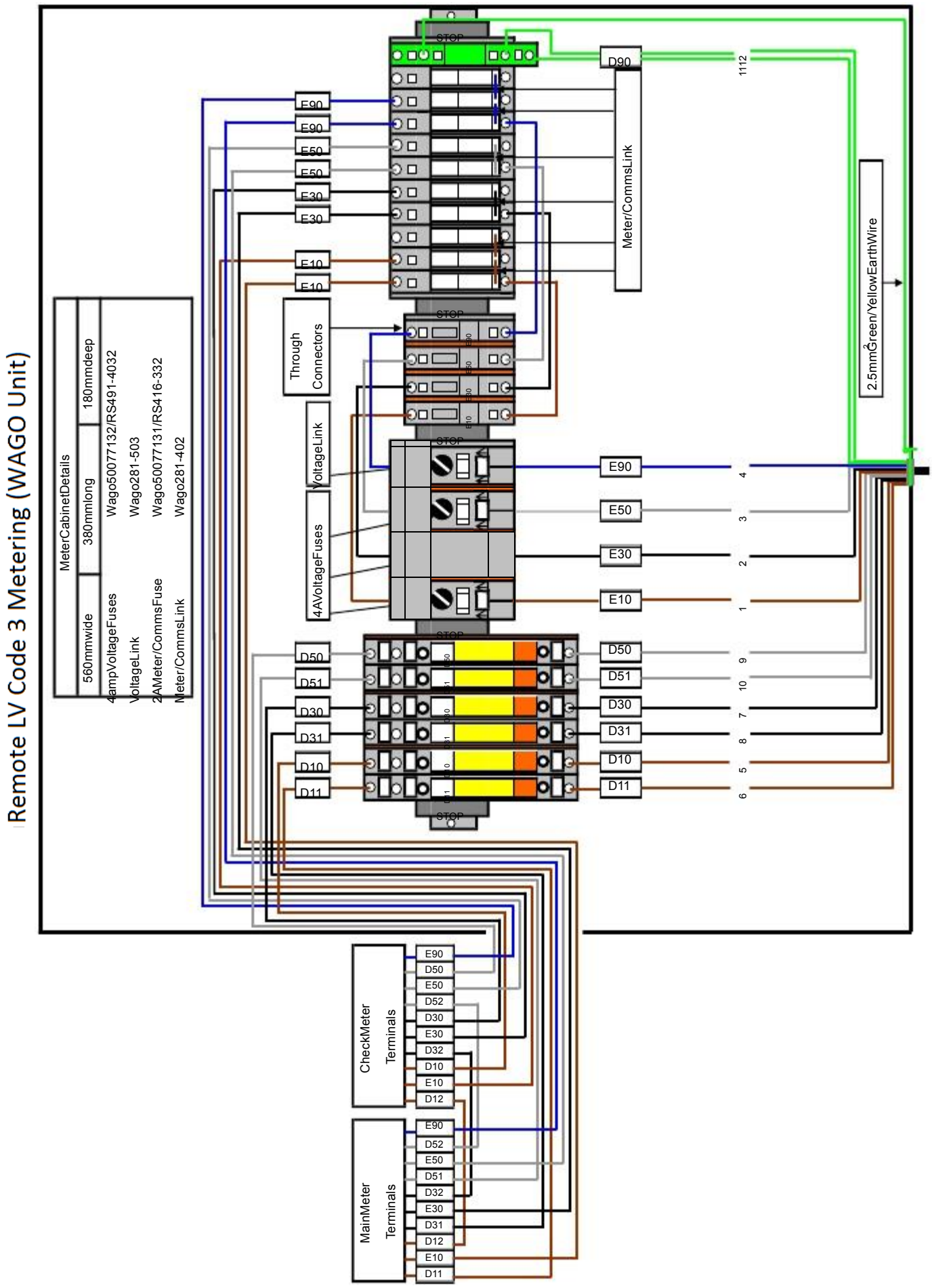
REMOTE LV CODE 5 METERING (TEST TERMIMAL BLOCK)



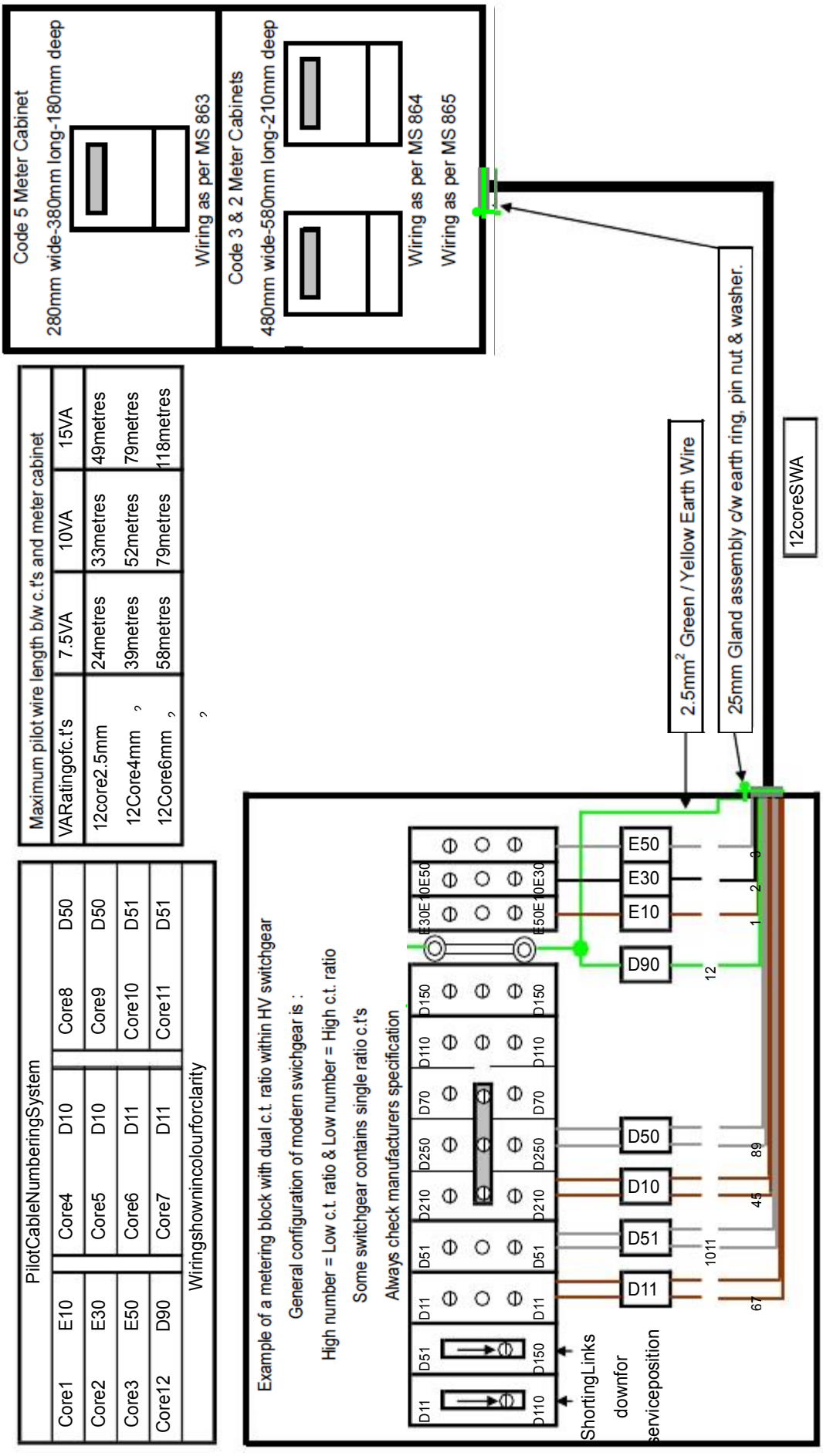
Meter Cabinet Details	
280mm wide	380mm long
180mm deep	
4amp Voltage Fuses	Lawson Fuses NS4
Voltage Link	RS 242-1128
2A Meter / Comms Fuse	RS 416-332


REMOTE LV CODE 5 METERING (WAGO UNIT)
MS 860 WAGO
Meter Cabinet Details
280mm wide
380mm long
180mm deep
4amp Voltage Fuses
Wago 500771132 / RS 491-4032
Voltage Link
Wago 281-503
2A Meter / Comms Fuse
Wago 500771131 / RS 416-332
Meter / Comms Link
Wago 281-402
Through Connectors
Voltage Link
4A Voltage Fuses
Meter / Comms Link
2.5mm² Green / Yellow Earth Wire
Meter Terminals
E90
E50
E30
E10
D90
D50
D51
D30
D31
D10
D11
11 12
4
3
2
1
9
10
7
8
5
6


REMOTE LV CODE 3 METERING (TEST TERMIMAL BLOCK)
MS861TTB
Meter Cabinet Details
480mm wide
580mm long
210mm deep
4amp Voltage Fuses
Lawson Fuses NS4
Voltage Link
RS 242-1128
2A Meter / Comms Fuse
RS 416-332
Check Meter Terminals
E90
D50
E50
D52
D30
E30
D32
D10
E10
D12
Main Meter Terminals
E90
D52
E50
D51
D32
E30
D31
D12
E10
D11
S / Pole Block
E90
4
Neutral Link
4A Voltage Fuse
4A Voltage Fuse
4A Voltage Fuse
E90
E50
E30
E10
E50
E30
E10
3
2
1
STOP
Chk Mtr Link
2A Check Mtr
2A Check Mtr
2A Check Mtr
Main Mtr Link
2A Main Mtr
2A Main Mtr
2A Main Mtr
Comms Link
2A Comms
STOP
E90
E50
E30
E10
E90
E50
E30
E10
E90
E10
D90
11
12
E90
E50
E30
E10
D50
D51
D30
D31
D10
D11
10
9
8
7
6
5
2.5mmGreen/YellowEarthWire

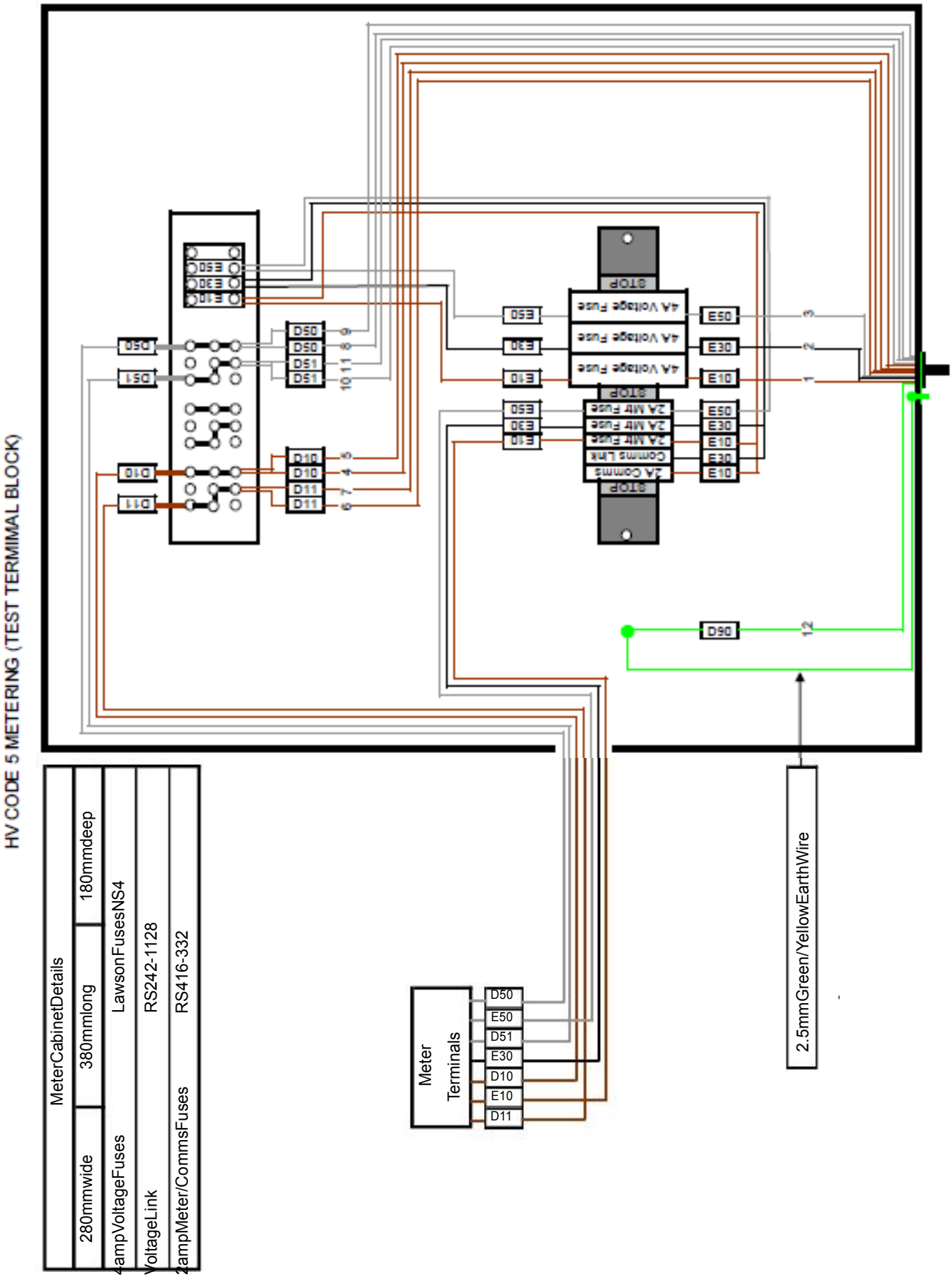

Remote LV Code 3 Metering (WAGO Unit)
MeterCabinetDetails
560mmwide
380mmlong
180mmdeep
4ampVoltageFuses
Wago50077132/RS491-4032
VoltageLink
Wago281-503
2AMeter/CommsFuse
Wago50077131/RS416-332
Meter/CommsLink
Wago281-402
STOP
D90
1112
Meter/CommsLink
2.5mm2Green/YellowEarthWire
E90
E90
E50
E50
E30
E30
E10
E10
Through Connectors
VoltageLink
4AVoltageFuses
E90
E50
E30
E10
4
3
2
1
D50
D51
D30
D31
D10
D11
D50
D51
D30
D31
D10
D11
9
10
7
8
5
6
CheckMeter Terminals
E90
D50
E50
D52
D30
E30
D32
D10
E10
D12
MainMeter Terminals
E90
D52
E50
D51
D32
E30
D31
D12
E10
D11

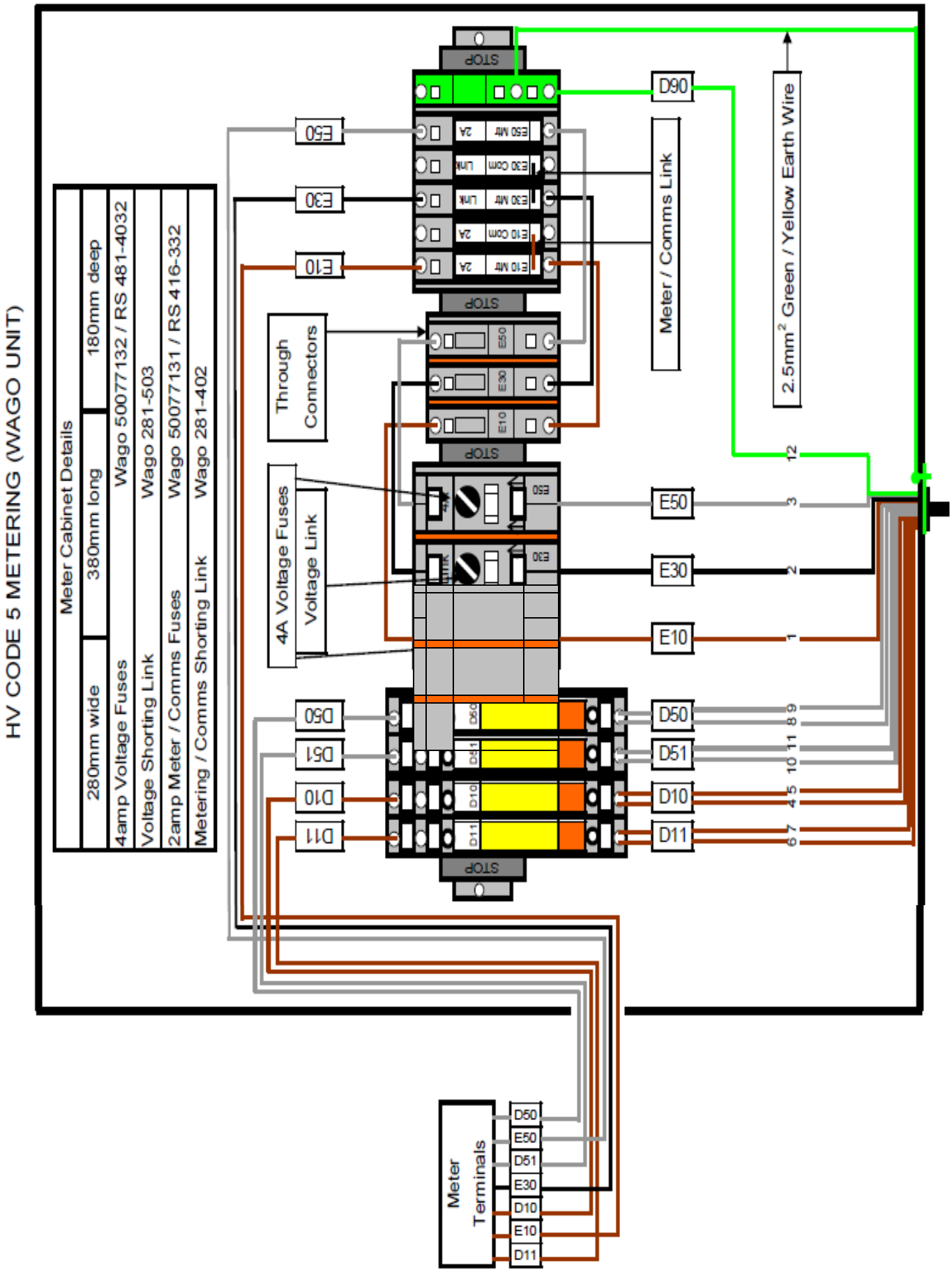
HV CODES 5, 3 & 2 REMOTE METERING



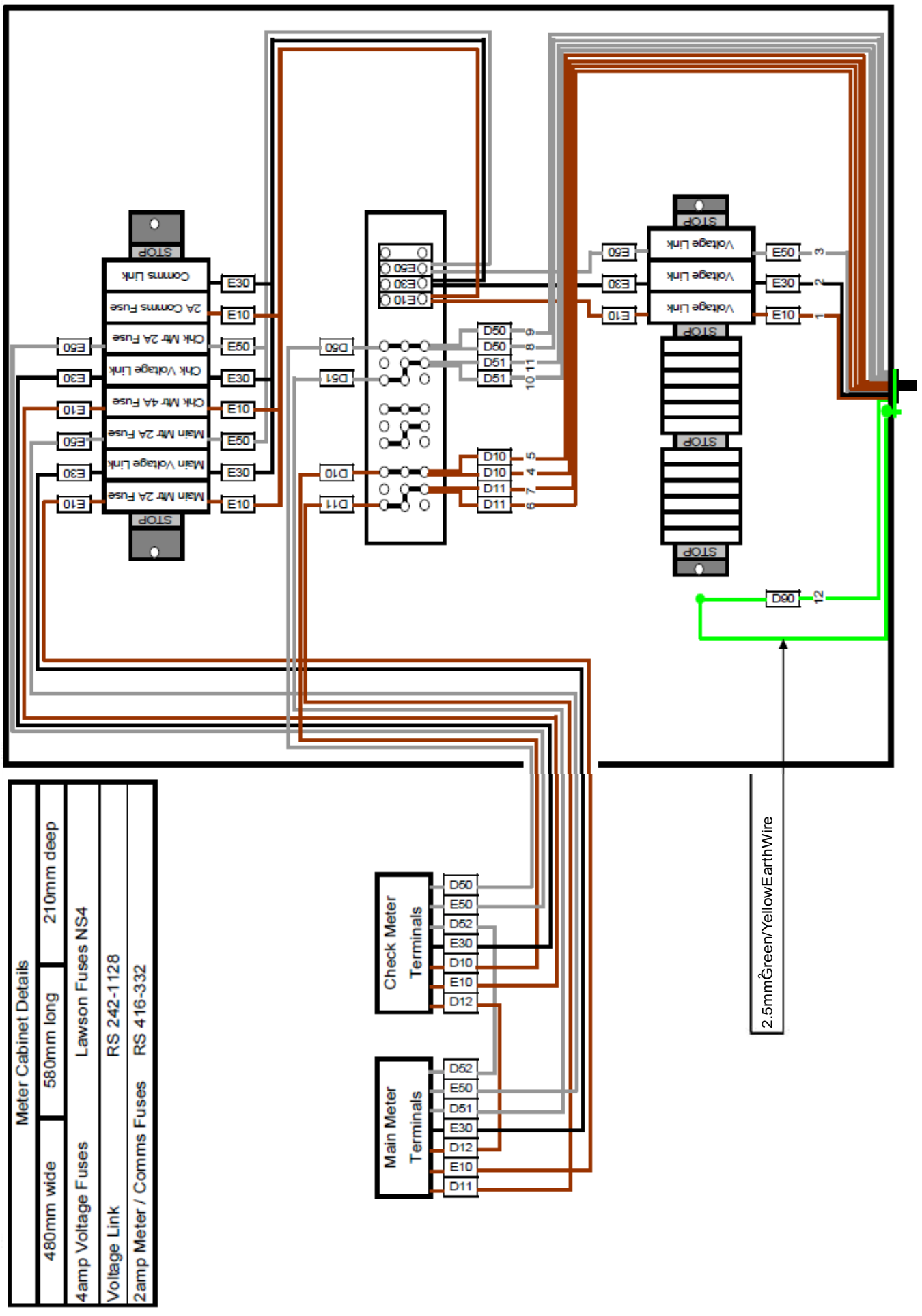
Maximum pilot wire length b/w c.t's and meter cabinet			
VARatingofc.t's	7.5VA	10VA	15VA
12core2.5mm	24metres	33metres	49metres
12Core4mm ²	39metres	52metres	79metres
12Core6mm ²	58metres	79metres	118metres

PilotCableNumberingSystem						
Core1	E10	Core4	D10	Core8	D50
Core2	E30	Core5	D10	Core9	D50
Core3	E50	Core6	D11	Core10	D51
Core12	D90	Core7	D11	Core11	D51
Wiringshownincolourforclarity					

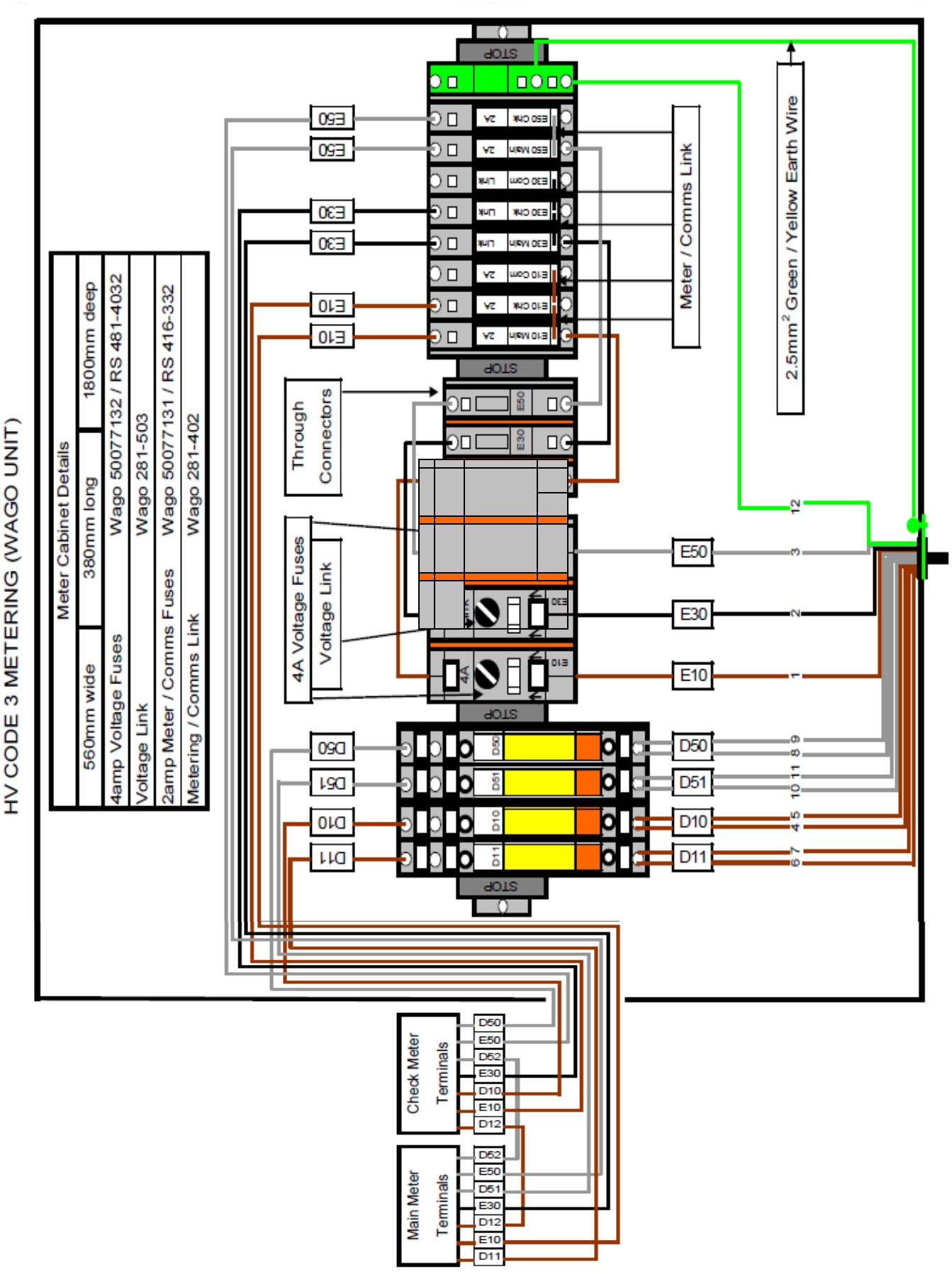

HV CODE 5 METERING (TEST TERMIMAL BLOCK)
MeterCabinetDetails
280mmwide
380mmlong
180mmdeep
4ampVoltageFuses
LawsonFusesNS4
VoltageLink
RS242-1128
2ampMeter/CommsFuses
RS416-332
Meter Terminals
D50
E50
D51
E30
D10
E10
D11
2.5mmGreen/YellowEarthWire
4A Voltage Fuse
2A MF Fuse
2A Comms
Comms Link
D90

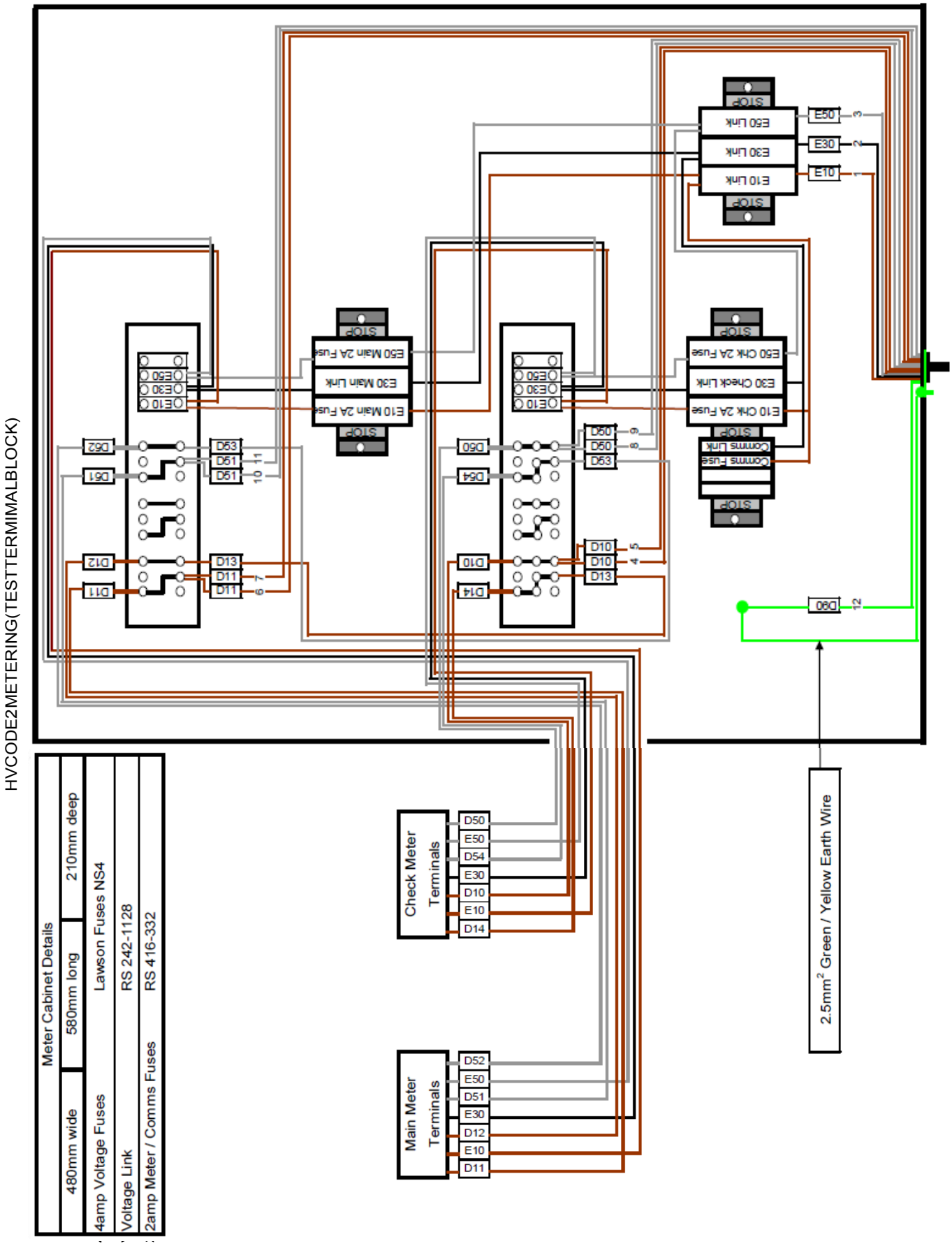

HV CODE 5 METERING (WAGO UNIT)
Meter Cabinet Details
280mm wide
380mm long
180mm deep
4amp Voltage Fuses
Wago 50077132 / RS 481-4032
Voltage Shorting Link
Wago 281-503
2amp Meter / Comms Fuses
Wago 50077131 / RS 416-332
Metering / Comms Shorting Link
Wago 281-402
STOP
E50
E30
E10
D90
Meter / Comms Link
2.5mm² Green / Yellow Earth Wire
Through Connectors
4A Voltage Fuses
Voltage Link
D50
D51
D10
D11
12
3
2
1
9
8
11
10
5
4
7
6
Meter Terminals

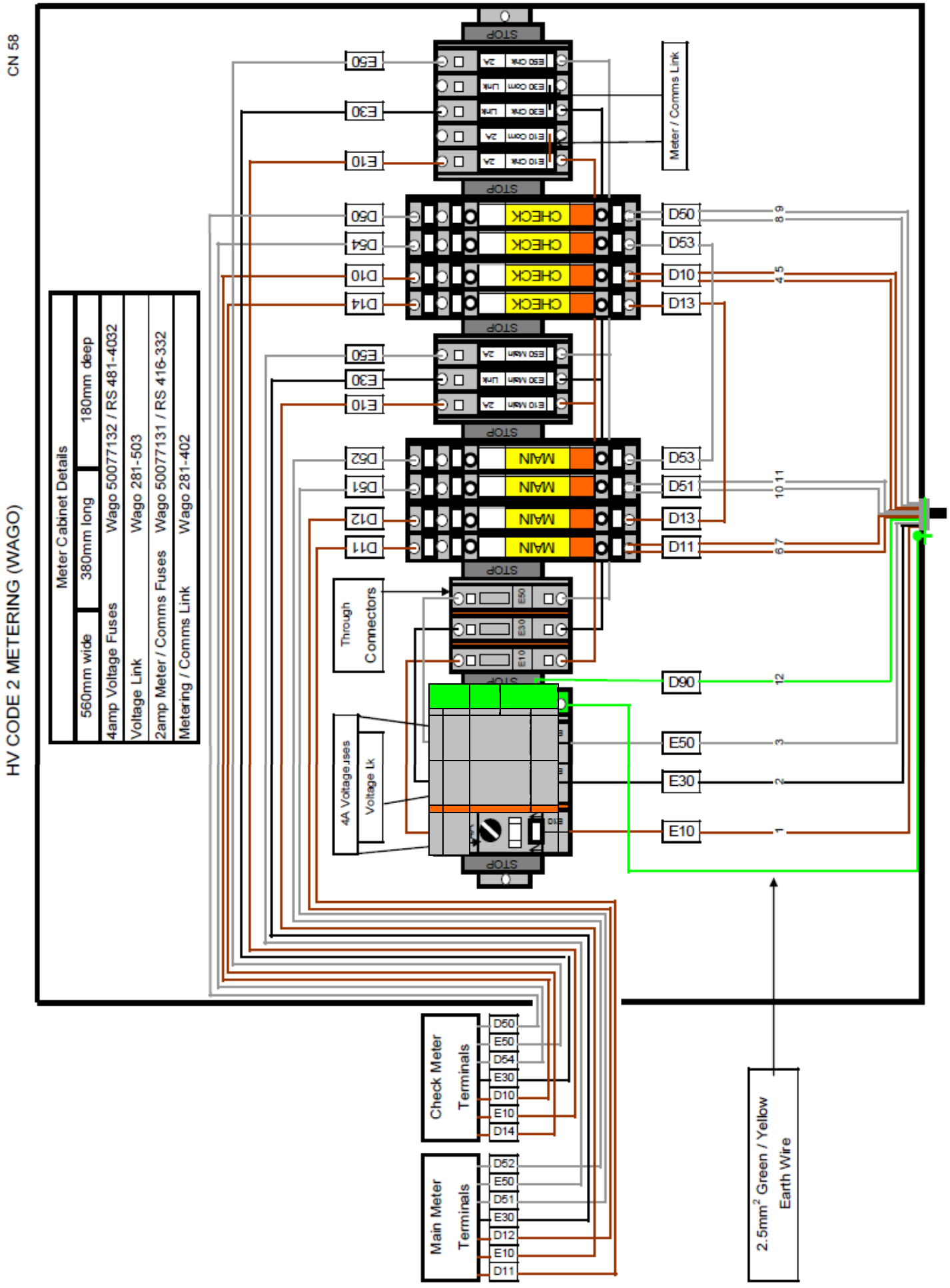
HV CODE 3 METERING (TEST TERMIMAL BLOCK)



MS864TTB


HV CODE 3 METERING (WAGO UNIT)
Meter Cabinet Details
560mm wide
380mm long
1800mm deep
4amp Voltage Fuses
Wago 50077132 / RS 481-4032
Voltage Link
Wago 281-503
2amp Meter / Comms Fuses
Wago 50077131 / RS 416-332
Metering / Comms Link
Wago 281-402
Meter / Comms Link
2.5mm² Green / Yellow Earth Wire
Through Connectors
4A Voltage Fuses
Voltage Link
STOP
E50
E30
E10
D50
D51
D10
D11
Check Meter Terminals
Main Meter Terminals


HVCODE2METERING(TESTTERMIMALBLOCK)
Meter Cabinet Details
480mm wide
580mm long
210mm deep
4amp Voltage Fuses
Lawson Fuses NS4
Voltage Link
RS 242-1128
2amp Meter / Comms Fuses
RS 416-332
Check Meter Terminals
D50
E50
D54
E30
D10
E10
D14
Main Meter Terminals
D52
E50
D51
E30
D12
E10
D11
2.5mm² Green / Yellow Earth Wire
E50 Link
E30 Link
E10 Link
E50 Main 2A Fuse
E30 Main Link
E10 Main 2A Fuse
E50 Chk 2A Fuse
E30 Check Link
E10 Chk 2A Fuse
Comms Fuse
Comms Link
STOP
D62
D61
D12
D11
D63
D51
D51
D13
D11
D11
D60
D64
D10
D14
D60
D60
D53
D10
D10
D13
D90


CN 58
HV CODE 2 METERING (WAGO)
Meter Cabinet Details
560mm wide
380mm long
180mm deep
4amp Voltage Fuses
Wago 50077132 / RS 481-4032
Voltage Link
Wago 281-503
2amp Meter / Comms Fuses
Wago 50077131 / RS 416-332
Metering / Comms Link
Wago 281-402
Meter / Comms Link
E50
E30
E10
D50
D54
D10
D14
CHECK
D52
D51
D12
D11
MAIN
Through Connectors
4A Voltage Fuses
Voltage Lk
D90
D53
D13
Check Meter Terminals
Main Meter Terminals
2.5mm² Green / Yellow Earth Wire

End of Document