

SETTLEMENT METERING

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PURPOSE AND SCOPE

This Technical Guidance Note provides guidance for project engineers and contractors to ensure that Settlement Metering meets with Balancing and Settlement Code (BSC) requirements.

The scope is restricted to 3-phase 4-wire metering which covers the majority of National Grid metering applications. Advice for other applications e.g. single phase shall be sought from National Grid Asset Integrity.

This issue has been produced to reflect modified requirements based on new solutions to be delivered under the National Grid Settlement Metering Light Current Upgrade Project (started 2013) and for new installations.

Failure to comply with the recommendations of this TGN may result in the metering system not being accepted for registration by Elexon.

PART 1 – GUIDANCE

1 GENERAL

Settlement Metering shall be fully compliant with Metering Codes of Practice as issued by Elexon, and available on their web site. These Codes define functional and performance requirements both for the component parts, and for the overall metering system.

The requirements for National Grid Settlement Metering are specified TS 3.09.13 and all metering equipment supplied shall be Type Registered against this document..

Changes in this issue arise from:

- Data Collection now being integrated into the energy meters.
- Energy meter auxiliary supply to be derived from substation dc supplies
- Energy Meters to be of 3 phase 4 wire Quadrant types combining Active and Reactive Energy, measurement, all in a single meter.

The principal of applying meter compensations for the metering system errors (as past practice) based upon measured cable resistances of the measurement transformer circuits and measured errors available for the measurement transformers is retained.

The responsibility for providing Settlement Metering rests with the energy supplier or local distribution company making use of the connection point (the Registrant *). National Grid only has responsibilities for the procurement / installation of metering where contracted to do so under the connection agreement, or by a separate contract.

National Grid responsibilities for final commissioning and ongoing maintenance is dependent on its appointment as Metering Operator Agent * by the Registrant. Duties associated with this role may only be performed by individuals authorised for this activity by Elexon, in accordance with the relevant Balancing and Settlement Code Procedures (BSCPs).

*The terms Metering Operator Agent and Registrant have precise definitions as given in the BSCPs.

2 MEASUREMENT TRANSFORMERS

Dependant on application and cost, the measurement transformers may be of the combined CT/VT type, or separate VTs and CTs. The transformers shall normally be dedicated to Settlement metering purposes; use for other purposes is subject to agreement with the Registrant and additional Code of Practice requirements.

Separate CT cores and separate VT secondary windings shall be provided for each phase of the Main and Check metering systems. Requirements for measurement transformers are given in TS 3.2.6.

2.1 Location

The measurement transformers shall be connected to the HV system at the Defined Metering Point as identified in the connection agreement.

2.2 Current Transformers

2.2.1 Orientation

In order to ensure correct meter registration of Import and Export energy quantities, the orientation of the CT primary winding shall comply with the following:

- a) For Supergrid and Feeder metering: the CT P1 terminal shall be connected nearest the National Grid Supergrid transformer.
- b) For HV generation metering: the CT P1 terminal shall be connected nearest the National Grid substation busbar.

2.2.2 Ratio Selection

The ratio shall be selected based on the circuit MVA rating from the tables given in Appendix B. The circuit rating is determined by the limiting plant item of the connected circuit.

2.2.3 Connection to Metering

The Main metering shall be connected to CT core number 1 on each of the three supply phases, the check metering to CT cores number 2.

2.3 Voltage Transformers

2.3.1 General

VTs located on feeder circuits are required to have a line discharge capability as detailed in TS 3.2.5.

2.3.2 Connection to Metering

The Main metering shall be connected to VT secondary winding 1 on each of the three supply phases, the Check metering to winding 2.

3 CABLING BETWEEN MEASUREMENT TRANSFORMERS AND THE METERING CUBICLE AND REQUIREMENTS FOR THE COMMON MARSHALLING BOX

This shall be performed in two sections. Section 1 connects the metering cubicle to a common marshalling box, located close to the measurement transformers. Section 2 connects the measurement transformers to the marshalling box.

All multi-core cabling shall be in compliance with BS 6346 and have a core cross sectional area of at least 2.5 mm². Core ferruling shall be in line with National Grid standard practice.

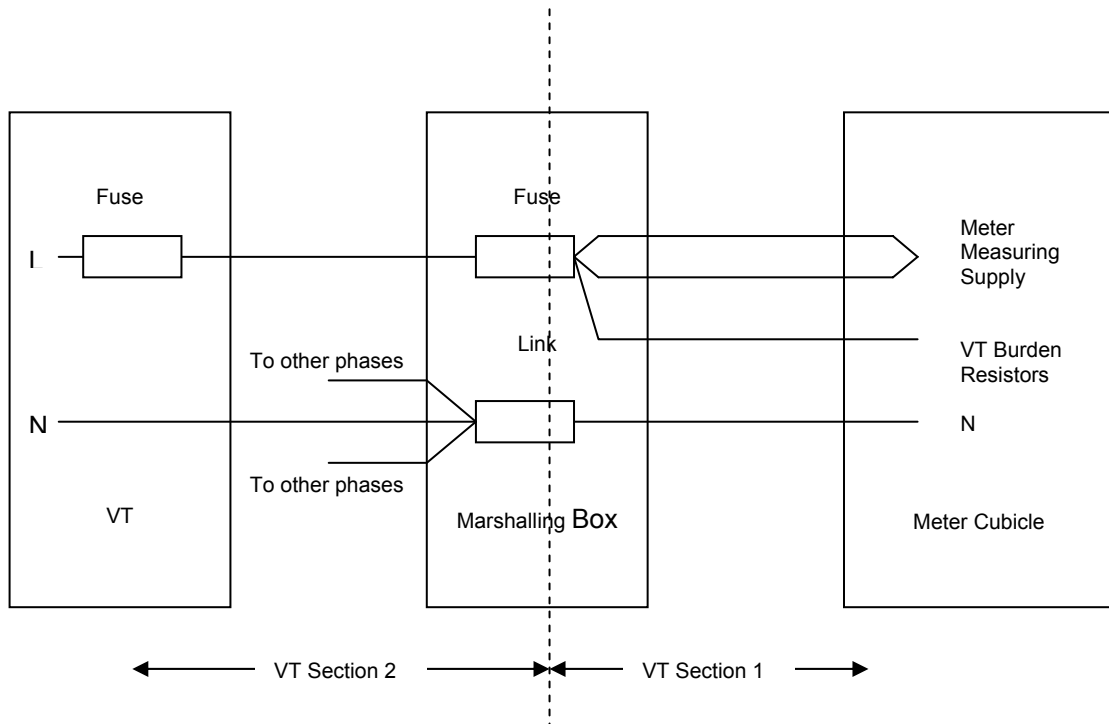


Figure 1 – Single phase diagram for cabling between VT and Metering Cubicle.

3.1 Cabling Section 1

3.1.1 Cabling Distance

a) Maximum Distance

In order to ensure that the CT rated burden is not exceeded the CT total loop impedance shall be kept below 5 ohms. This limits the cabling length to 300 metres when using 2.5 mm² cores. For distances greater than 300 metres doubling of the CT cores is required for CTs of 5 VA rated burden. For CTs of 7.5 VA rated burden, as originally used for FMS, runs of up to 500 metres are permissible. Cabling runs of greater than 500 metres shall be avoided.

b) Minimum Distance

The rule on minimum cabling distance as detailed in Issue 1 of this document is no longer a requirement.

3.1.2 Separation of Supplies

For each metering system:

- The metering voltage measuring supplies shall be run with doubled cores for each phase leg, with a separate single core neutral, for each the main and check systems; a total of fourteen cores.
- The metering auxiliary connections from the main and check windings shall use single cores; a total of six cores (no neutral).
- For each current circuit separate go and return cores shall be used; a total of twelve cores.

- d) In order to minimise errors due to coupling of signals in the measurement circuits signal segregation between voltage and current circuits is necessary. The preferred option is to use separate multicore cables for the VT and CT circuits. A 19 core cable for the current circuits and a 27 core cable for the VT circuits can be used to achieve this requirement. The alternative (only to be used where agreed with National Grid Asset Integrity) is use of a single 37 core cable connected / ferruled as per the optimised core arrangement given in Appendix C.

Informative: Legacy installations mostly utilise a single cable with various alternative approved core allocations. Although these arrangements have been proven to give acceptable performance, new installations shall only use the options given above.

- e) All cabling shall be normally dedicated to Settlement metering and not shared for protection or other purposes. In special circumstances the check metering circuits may be used for other purposes.
- f) To avoid coupling from external sources the cabling shall not run in close proximity and/or in parallel to power carrying circuits.
- g) Cable armouring shall be earthed at the marshalling box end only and be earth free (insulated cable glands) at the metering cubicle, in order to prevent metering errors due to circulating earth currents.

3.2 Common Marshalling Box

Marshalling boxes shall provide environmental protection for the equipment contained and incorporate facilities for securing the box by application of an National Grid standard padlock and a Settlement security seal. The marshalling box shall provide a common termination point for the Section 1 and 2 cabling. In circumstances where separate voltage and current transformers are to be used additional marshalling boxes may be required. All terminals and links shall be suited to their environment and provide both a high degree of immunity to corrosion and stable low resistance connections.

The following facilities shall be provided by the Marshalling Box.

- a) Earthing of the VT neutrals to create the voltage measuring circuit star point by means of removable links.
- b) Earthing of the CT secondary circuits by means of removable links on the respective S terminal legs and CT winding shorting using the same type of link.
- c) Common termination points for the metering measuring and auxiliary supplies for both the Main and Check metering systems.
- d) Fusing of the VT secondary circuits by 2 amp fuses. Since the resistance of these fuses is a critical factor affecting volt drop errors their resistance shall be limited to the range 0.12 to 0.18 ohms. The fuse assemblies shall provide high integrity low resistance connections and be of the self wiping type and include a label stating the permitted range of fuse resistance.
- e) Earthing of the Section 1 and 2 cable armouring and in the case of the use of the optimised core arrangement for Section 1 cabling earthing of the spare cores.

3.3 Cabling Section 2

3.3.1 Cabling Distance

The average cabling distance between the voltage transformers and the marshalling box shall not exceed 20 metres.

3.3.2 Separation of Supplies

For each metering system:

- a) A single core (2.5 mm²) conductor shall be provided for the phase and neutral connections from each VT winding.
- b) For each current circuit separate go and return conductors (2.5 mm²) shall be used.

4 METERING CUBICLES & FACILITIES

4.1 General

Metering cubicles shall be capable of accommodating the metering equipment for at least two circuits.

The cubicles shall be lockable and include sealing facilities that meet the requirements of BSCP06.

Informative: For sites with legacy installations, suitable spare accommodation if/ often available and shall be utilised in preference.

4.2 Test Facilities

Separate test terminal blocks shall be provided for the Main and Check metering systems for each circuit. The devices shall offer high integrity low resistance connections. Preference shall be given to proven devices that National Grid staff are familiar with.

4.3 Wiring & Isolating Facilities

The wiring core sizes for the metering measuring supplies shall be the same as the external wiring requirements. All other wiring sizes and the identification of wires by cable colour / ferruling shall be in line with the current standard National Grid practice. Metering supplies shall be segregated from all other wiring.

Isolation links shall be provided on the terminal blocks receiving the VT connections.

An in-line disconnects facility (e.g. Plug / Socket) shall be provided for each meter situated between the test terminal block and the meter.

All plug and socket connections carrying CT circuits shall be clearly labelled to identify potential safety risks.

4.4 Communication Connections

The communication facilities shall provide the following:

- a) Two incoming telephone connections (designated A and B) shall be provided, terminated in standard sockets and connected to the site CTN. Separate lines shall be used for the two systems.

Informative; for existing installations a mix of CTN and PSTN links is common).

- b) Duplicate (A and B) LAN / WAN connectivity shall be provided to the cubicle. The method of connectivity to the meters i.e. star/daisy chain is dependent on suppliers type registered solutions.

Informative; At the time of writing this facility is to be provided for the purpose of future proofing only.