

SETTLEMENT METERING AT THE DISTRIBUTION INTERFACE**TABLE OF CONTENTS**

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PURPOSE AND SCOPE

This specification defines the requirements for Balancing and Settlement Code (BSC) Settlement Metering installed at the Distribution interface at National Grid Company plc owned substations.

The specification may be used in other situations requiring Code of Practice (COP 1 and COP2) compliant metering systems, such as for power station applications, but no responsibility can be taken or inferred for the suitability in such cases. Advice should be sought in such instances from National Grid Asset Policy.

This specification describes the overall requirements for Settlement Metering (SM) and specifically defines the functional and performance requirements for the light current aspects of the required equipment.

SM is also required to provide Operational Metering Data (OMD) in the form of active and reactive power values.

The energy meters covered by this specification may also be used to provide Quality of Supply (QoS) monitoring facilities in certain cases.

PART 1 – PROCEDURAL**1 GENERAL REQUIREMENTS****1.1 Metering System Overall Functionality**

Under the Balancing & Settlement Code (BSC), Metering Systems registered in Settlement have to be compliant with the relevant Metering Codes of Practice, which for National Grid applications are:

- a) Metering Code of Practice 1 (COP 1): Code of Practice for the Metering of circuits with a rated capacity exceeding 100 MVA for Settlement purposes
- b) Metering Code of Practice 2 (COP 2): Code of Practice for the Metering of circuits with a rated capacity between 10 and 100 MVA for Settlement purposes
- c) Metering Code of Practice 4 (COP 4): Code of Practice for the calibration, testing and commissioning requirements of metering equipment for Settlement purposes.

1.1.1 Application

Settlement Metering is required at the commercial interface between National Grid and the connected party.

These Metering Points shall be as detailed in COP 1 / 2 (unless a Dispensation has been sought and granted). In all cases the Metering point shall be as stated in the Connection Agreement.

1.1.2 Metering System Design

The great majority of National Grid applications require COP 1 Metering Systems with a small number fitting the COP 2 criteria.

For standardisation reasons a COP 1 compliant arrangement is required for all applications as far as is possible.

1.1.3 Measurement Transformers

The Voltage Transformers and Current Transformers (VTs & CTs) provided for the metering systems shall meet the requirements of TS 3.2.6 and COP 1/4.

Combined VT/CT units will be used in the majority of AIS applications.

In some cases (eg GIS insulated switchgear) individual VT and CT units will be used.

For COP 1 applications both the VTs and CTs are required to provide two separate secondary windings identified as the Main and Check windings.

1.1.4 Marshalling Boxes

- a) Marshalling boxes shall meet the requirements of TS 2.19 and in particular clause 1.6 of that document.
- b) An outdoor / indoor (as appropriate) marshalling box shall be provided to combine the individual phase VT and CT connections from the measurement transformers on each metered circuit and provide earthing, isolation and fusing facilities. . In circumstances where individual VTs and CTs are provided, additional marshalling boxes may be required.
- c) Armoured multi-core cable(s) shall be routed from the individual VT/CT units to the marshalling box and from the marshalling box to the Metering Cubicle.
- d) Facilities provided by Marshalling boxes shall include:
 - (i) Earthing of the 3 phase VT neutrals to create the VT star point by means of removable links.
 - (ii) Earthing of the 3 phase CT S1 terminals by means of removable links.
 - (iii) Earthing of all cable armouring (Cables from individual VT/CTs units and cable(s) to metering cubicle.) and any spare cores.
 - (iv) Fuses for each VT secondary winding, rated at 2A and having a dc resistance of between 0.1 to 0.18 ohms. A label shall clearly mark the fuse resistance range to avoid incorrect replacements.
 - (v) Provision of linking / termination point terminal blocks including CT shorting.

- (vi) Marshalling and termination points for VT Gas Detection Device protection / alarm circuits where these are provided. Guidance should be sought from National Grid Asset Policy.
- (vii) The marshalling box shall be lockable and meet the requirements of BSC Procedure BSCP06.
- (viii) The marshalling box shall be clearly labelled "Settlement Metering".

1.1.5 Cabling from the Measurement Transformers to the Metering Cubicles

- a) The guidance included in the Appendix E of COP 1 covering the use of multi-core cables shall be observed.
- b) The connections from the VT and CT units to the common marshalling box may use common cables for each phase. (Providing the cable runs involved are short, e.g. 50m or less), otherwise guidance should be sought from National Grid Asset Policy.
- c) For new installations separate, dedicated multi-core cables shall be used for the CT and VT connections from the common marshalling box to the metering cubicle.

Typically the cables used for new installations shall be:

- (i) 12 core cable for the CT connections and a 27 core cable for the VT connections.
 - (ii) For existing installations a single 37 core cable with specific cable core allocations may be used for both the VT and CT connections.
 - d) Separate cables with core sizes of a minimum of 2.5 mm² shall be provided for each metered circuit.
- One of the limiting factors controlling the length of the cabling distance between the instrument transformers and the metering cubicle is the contribution of the cabling resistance to the overall CT burden.*
- e) The CT circuits shall not use a common neutral conductor (i.e. Go and return conductors for each phase leg shall be used.)
 - f) The VT measurement circuit to the metering cubicle shall use two cores for each phase leg to reduce lead voltage drop errors on long cable runs from the marshalling box to the metering cubicle. A single core neutral connection is permissible.
 - g) A separate three phase VT circuit shall be provided for connecting the burden resistors which are to be located in the metering cubicle.
 - h) In cases where the check VT circuit is used to supply non-metering equipments (as allowed by the COPs) separate additional fuses located at the Marshalling Box are required.

1.1.6 Metering Cubicles – General Requirements

- a) The light current equipment provided to meet this specification should be housed in a Metering Cubicle (Indoor type). The cubicle shall be lockable and include sealing facilities that meet the requirements of BSC Procedure BSCP06.
- b) Each Metering Cubicle shall be able to accommodate all the equipment required for at least two metering systems ie two sets of main and check meters and associated equipment.

- c) Each cubicle shall be clearly labelled at both the front and rear
- d) The cubicles shall meet the requirements of TS 2.19 with the following exceptions:
 - (i) Cubicle heaters are not required.
 - (ii) Cubicle lighting is not required
 - (iii) Cubicles shall be suited to both flush and surface mounting equipment practice.
- e) The cubicle shall incorporate sufficient ventilation to ensure the temperature rise inside the cubicle does not exceed 10°C.
- f) The cubicle shall have full height glazed front doors.
- g) Cubicles shall have 19 inch rack mounting arrangements. (IEC 60297-1)
- h) Cable armouring for cables between the marshalling box and the metering cubicle shall be via insulated gland plates ie be earth free at the cubicle.
- i) Small Wiring (In the case of major replacement of equipment all the cubicle wiring should be changed to meet the current requirements.)
- j) The cubicle wiring shall use wire ferruling in accordance with standard National Grid practice. (See ENA TS 50-19)

1.1.7 Isolating and Test Facilities

- a) Isolating links shall be provided on all the VT connections received at the metering cubicle. (These may be fitted in the in-coming terminal blocks.)
- b) Separate test terminal blocks shall be provided for Main and Check Energy meters of each metered circuit included in a metering cubicle. These test facilities shall be accessible from the front of the cubicle after unlocking the front door and removing the seals.
- c) The test terminal blocks shall enable injection testing and on-line monitoring of the installed energy meters along with isolation and short circuiting (for CTs) facilities.
- d) The test terminal blocks must be high integrity types including contacts with low / stable resistance. Test evidence to confirm the performance of the units shall be available.

1.1.8 Cubicle Voltage Supply

- a) Two separate battery system D.C. supplies shall be provided at the metering cubicle(s). These supplies will be obtained from either 48 V or 110 V D.C. battery systems as specified in TS 3.12.4.
- b) For new installations use of the 110 V D.C. battery systems is preferred.

The current rating (main fuses located at the distribution boards) of these supplies shall be, 2A.

The two supplies will be obtained from separate distribution boards.

- c) The supplies shall be sub-fused or fitted with MCBs as necessary in the metering cubicle.

- d) One supply shall energise the main meters and the other the check meters in each case for up to four metered circuits (where the metered circuits are in one or two adjacent cubicles).
- e) Each meter shall be separately fused or fed by a MCB.
- f) A single equipment fault shall not cause both distribution board fuses to operate.

1.1.9 Measurement VT Burden Resistors

- a) Normally, burden resistors shall be fitted in the metering cubicle so as to achieve a nominal 25 % rated burden on each measurement VT winding. If necessary the resistors shall be fitted on heatsinks.
- b) The surface temperature rise of the resistors / heatsinks shall not exceed 15 deg C and shall be located to avoid any direct heating of the meters.
- c) To avoid inadvertent operator contact the resistors / heatsinks shall be provided with guards.
- d) The resistor shall be selected taking account of any non-metering burden fed by the VTs.

1.2 Energy Meters

Uncompensated (blank calibrated) meters shall be supplied by the meter manufacturer.

Blank calibrated meters are meters that have no compensation applied. Meters may, on application then have compensation applied for known errors of the metering installation. This compensation may be based on unique values calculated for the installation, or on values using a banding system.

Main and Check meters may be of the same or of different type.

The Main and Check meters required for each metered circuit shall meet the following requirements:

1.2.1 Accuracy Class

For both COP 1 & 2 applications the accuracy classes required are:

Active Energy	Class 0.2S meeting BS EN 62053-22
Reactive Energy	Class 2 (minimum requirement) meeting BS EN 62053-23

1.2.2 Meter Types

- a) The meter type(s) shall be as specified in the Contract.
- b) For National Grid applications, the majority are required for 3 phase 4-wire applications, with a small number for single-phase and 3 phase 3-wire applications.
- c) For standardisation 3 phase meters using three elements and measuring in the four quadrants shall be used except where the particular circumstances makes this unsuitable.
- d) Meters may be rack-mounted types or surface mounted types, the preferred type will be as stated in the purchasing specification.

- e) In the case of rack mounted meters a 19 inch rack shall be available which accommodates two meters. The rack complete with plug-in connectors shall meet specification DIN 43862 (Essailec type connectors).
- f) Subracks shall meet the requirements of TS 2.19.
- g) For each meter rack and each surface mounted meter an in-line disconnect facility (between the rack / meter and the test terminal block (s)) shall be provided in a format agreed with National Grid. The disconnect facility need not incorporate automatic CT short circuiting facilities.

1.2.3 Meter Ratings and Connections

The nominal measuring voltage and current inputs to meters shall be matched to the measurement transformers installed on site.

- a) The normal rated values being:
 - (i) Voltage $110 \sqrt{3}$ V
 - (ii) Current 1 A (In)
- b) The corresponding overload ratings being:
 - (i) Voltage 1.2 PU ($132 \sqrt{3}$ V) continuous
 - (ii) Current As a minimum 2 A (2.0 In, as BS EN 62052-11:2003) but preferably higher to match known circuit overload conditions of 3 A or higher.
- c) The short time ratings being:
 - (i) Voltage 1.5 PU ($165 \sqrt{3}$ V) for 30 seconds
 - (ii) Current 100 A for 1 second

1.2.4 Meter Auxiliary Supply

Preferably, meter auxiliary supply inputs shall be suitable for both use on 48 V (nominal) dc and 110 V (nominal) dc site battery supplies (as specified in NGTS 3.12.4), without intervention.

At a minimum, the meter auxiliary supply options shall be suitable for both battery supplies using field replaceable units.

1.2.5 Meter Registers

- d) Non-Volatile Meter Registers providing at least 6 months data retention shall be provided.
- a) The registers shall record in primary system values taking account of the ratios of the site measurement transformers and the compensations values applied in accordance with clauses 1.2.8 and 1.2.9.